Introduction
"What Corresponds to Sensation"

"What corresponds to sensation in the appearance" (A175/B217) is Kant's description of what the category of reality is supposed to represent: it is supposed to capture the common notion that certain features of our sensations correspond to certain features of things. This category is remarkable among the fundamental concepts that Kant takes to define our powers of cognition in that, by claiming a correspondence between how things seem and how things are, it is the only one to invoke this distinction directly at all. My aim in this study is to show that Kant's terse and often dark discussions of reality are at the root of his mature grasp of this distinction, and of the sense of objectivity it engenders.

To be precise, the distinction invoked by the category of reality is not simply between sensation and appearance, but rather more subtly between sensation and something "*in* the appearance": while appearances have some of their features – namely, their spatio-temporal features – imposed upon them by the faculty of sensation itself in virtue of its form, the category of reality rather pertains to what appearances have in them *beyond* those formal features; it captures what appearances contribute to sensation rather than the other way around. This is what Kant is trying to express by further describing reality as the concept of the *matter*, rather than the *form*, of appearance (A20/B34).

These two descriptions should cause practiced readers of Kant to feel that the concept of reality is precariously close to the edge of what can be meaningfully said or even entertained in thought: on the one hand, it is a *category* – a transcendental concept of the understanding – and as such it is guaranteed to be objectively valid, and represent something we can actually experience. But, on the other hand, as the concept of the *matter* of appearance, it represents something in abstraction of the form it must take in order to be part of our experience, and so it seems closer to such abstract concepts as "the systematic order of nature," or "thing in itself," which, for

Kant, represent rational presuppositions that are not applicable to objects since they lie entirely beyond possible experience. A sign of reality's delicate situation within Kant's systematic framework is raised by another of his descriptions of the category: while it is constitutive of *appearances*, i.e. of things as they appear to us, it is also the concept of "the transcendental matter of all objects, *as things in themselves*" (A143/B182, *my emphasis*).

Any comprehensive reading of Kant's Critical philosophy must therefore present the category of reality in a way that overcomes this seemingly inherent tension. This requirement is plainly related to the great philosophical task of explaining how something separate from experience could nevertheless give rise to objects of experience, while avoiding the pitfalls of dogmatic idealism and transcendental realism. For Kant, the absence of such an explanation has been a perennial "scandal of philosophy" (Bxxxix), and to resolve this scandal is a central ambition of the *Critique of Pure Reason*. It is curious, therefore, that the category of reality has not figured more prominently in the sprawling literature surrounding this basic philosophical and exegetical issue, vexed as it is.

The present study is a measure to correct this lapse, and reassert reality's place at the core of the Critical project. What I take this core to be, for the purposes of this study at least, is defined on one side by a historical reconstruction of a problem posed by Kant's Early Modern predecessors, which led him to frame his Critical system in the first place; on another side, it is defined by a systematic reconstruction of Kant's attempt to address this problem in the context of the Critical system itself, which ultimately leads to his account of how natural science is possible. Accordingly, the scope of this study, both historically and systematically, stretches from certain Early Modern debates wherein the problem begins to take shape, through the problem's gradual refinement in Kant's early, pre-Critical writings, to the systematic unfolding of its solution in his *CPR* and *Metaphysical Foundations of Natural Science*. Through these reconstructions, it will become evident that a single concept recurs again and again, in several guises, at or near the focus of Kant's attention: the concept variously identified as "substantial form," "*quidditas*," "*realitas*," "thinghood," or, in Kant's Critical writings, as the category of reality.

I argue that in order to understand the category of reality as Kant came to understand it in his mature, Critical period, we must begin by taking it to be the rudimentary notion of an independent ground of experience. Kant seeks to prove that such a notion can be made intelligible or meaningful, and thereby to allow that experience could indeed be so grounded. Since, for Kant, a notion is meaningful only if there is a way to incorporate

it into experience, he must show that what the category of reality represents conforms with the conditions of experience. In particular, he must show that it conforms with space and time, which are the sensible conditions of experience, by showing how reality can be measured, or treated as a *magnitude*.

However, insofar as reality is taken in the rudimentary sense of an independent ground of experience, it seems essentially incapable of measurement: as such, it does not consist of mutually external parts that can be gone through successively, as the process of measurement requires. To overcome this predicament, then, Kant must offer a principled manner in which reality can be associated with something *extended* – something whose parts are external to one another – by which it may be measured.

A central thesis of this study is that the Kantian concepts of causal power in general, and of physical moving force in particular, are ancillary to this association, and that they have their place in Kant's Critical system only insofar as they serve the purpose of measuring reality; from a systematic (or, to use the Kantian term, *architectonic*) point of view, they are upshots or corollaries of the articulation of the category of reality into a valid, meaningful concept. Indeed, some of the darker details of Kant's expositions of these concepts can only be fully appreciated when considered under this overarching purpose.

Finally, and importantly, this association with extension cannot allow reality to be thoroughly determined as a measurable magnitude *within* experience, because it would thereby forfeit its role in representing the independent *ground* of experience. Therefore, Kant construes the association of extension with reality, through the concepts of cause and force, as an interminable procedure of approximation, whose conclusion is a mere regulative idea of reason.

This course through the Critical system is not everywhere easy to navigate, but when viewed in the proper historical perspective, its main landmarks heave into view. In Part I of this study, therefore, I identify the historical sources for Kant's concept of reality, claiming that it descends from Early Modern – especially, Leibnizian – versions of the Scholastic concept of *realitas*, often identified with that of *substantial form*. Drawing on this identification, I am able to show in subsequent chapters that reality's central role in Kant's thought is analogous to the central role of substantial forms in seventeenth-century debates over the nature of physical bodies and physical explanation.

In the Early Modern Scholasticism of Francisco Suárez, substantial forms were summoned to serve as explanatory principles in natural

philosophy. Adjusting elements of Aristotelian metaphysics to fit recent strides in experimental science, Suárez claimed that bodies have individual essences, or substantial forms, that are responsible for their causal dispositions. Partly in reaction to this version of Scholasticism, Descartes devised a revolutionary approach to the metaphysics of matter: he repudiated substantial forms as *unintelligible*, since they could not be treated with the apodictic certainty he took to be the standard of intelligibility; and since this standard is paradigmatically attained in mathematics, Descartes sought instead to reduce all material properties to extensional properties, and all explanatory terms to mathematical terms. In his natural philosophy, matter is nothing but its shape, size, and motion.

Descartes's radical program bred a generation of Cartesians, among them the very young Leibniz. However, early in his intellectual life Leibniz took up the cause of reintroducing a fundamentally non-Cartesian mode of explanation into natural philosophy, arguing that the essence of matter is not exhausted by its extensional, geometrical properties. Instead, he endorsed an alternative, *dynamic* conception of matter, by which all the properties of a body are due to its inherent "forces," rather than to its extension. Now, Leibnizian "forces" must be understood differently from Newtonian forces (such as those that later figure in Kant's own dynamic theories of matter): Leibniz's distinctive idea of force is entrenched in a metaphysical picture by which forces are expressions of underlying metaphysical *substantial forms*, the very same entities that Descartes tried to abolish from natural philosophy. Material bodies, in this picture, are not themselves substances, but merely phenomenal objects entirely dependent on nonextended – and hence nonmeasurable – substances.

Leibniz's reaction to Descartes grew more elaborate the more he struggled to explain how nonmeasurable metaphysical tendencies could "add up" to measurable, extended phenomena. To put it in terms of his *Specimen Dynamicum* (1695), he struggled to explain how physical "derivative forces" are derived from metaphysical "primitive forces," and how appreciable "living forces" are aggregates of infinitesimal "dead forces." The problem of metaphysically grounding phenomena, encapsulated for Leibniz in the concept of force or substantial form, is thus transformed in his natural philosophy into a problem of applying mathematics: how can quantifiable, material properties be grounded in nonextended, substantial forms?

Keeping in mind this Leibnizian construal of the problem of metaphysical grounding makes it easier to detect a similar theme in Kant's early writings (very plausibly due to Leibniz's influence). Following Leibniz, Kant construed certain metaphysical issues as problems of determining

the extent to which mathematical concepts can reach toward the foundations of physical objects. Against Leibniz, however, his inclination in the 1750s and 1760s was to resist curtailing the reach of mathematics, and argue instead that mathematical concepts can – and even must – be applied to the very grounds of phenomena. A notable example is *The Physical Monadology* (1756), which attempts to reconcile the multiplicity of parts essential to material bodies with the simplicity essential to substances: there, he envisaged dimensionless, point-like substances that generate spatial spheres of influence by the (broadly, Newtonian) forces they emit. For my purposes, however, I chose to open Part II of this study with an examination of Kant's essay *Attempt to Introduce the Concept of Negative Magnitudes into Philosophy* (1763), a different attempt to establish that the mathematical concept of magnitude or measure is valid not only in physics but also in metaphysics.

The central argument of *Negative Magnitudes* is to the effect that the ground of change is always measurable, and it proceeds along the following lines: since change always involves two opposing states, something can change only if it can be opposed without contradiction. Kant contends that, whereas logical opposition (expressed by *negation*) amounts to contradiction, "real" opposition (expressed by *subtraction* or *negative magnitude*) does not. Therefore, the ground of anything changeable must have a measurable magnitude that can be subtracted, and thus really opposed. Now, since Kant intends this line of reasoning to apply to grounding in general, he thinks it expands the domain of the concept of magnitude to include metaphysical grounds, *pace* Leibniz. One of the themes I wish to highlight by focusing on *Negative Magnitudes* is the fact that Kant's exposition of real opposition and negative magnitude closely ties them with the classical problem of coherently representing the moment of change. Significantly, this theme reappears in connection with the category of reality at later junctures in Kant's intellectual career.

Although in the 1760s Kant resisted the Leibnizian demarcation between extended phenomenal objects and nonextended intelligible substances by expanding the realm of mathematical representation, he seems to have reverted to such a demarcation himself in his *Inaugural Dissertation* (1770), the work that marks the end of his pre-Critical period. There, he agrees with Leibniz that certain essential constraints on our cognition are responsible for the spatio-temporal, mathematical properties of the objects of our experience (although, unlike Leibniz, he associates these constraints with a distinct cognitive faculty of *sensibility*). These objects are, in some sense, grounded in things as they are in themselves, whose properties we

can describe only as far as certain fundamental rational concepts reach (again, unlike Leibniz, these are associated with a distinct faculty of *intelligence*). Kant's position in the *Inaugural Dissertation*, I believe, is that everything we can know of things in themselves – i.e. that they fall under such rational concepts as "substance," "existence," and "cause" – follows directly from the basic supposition that they are such things that *ground* phenomena.

The concept of ground is the article, so to speak, of which all the other rational concepts are clauses; therefore, when Kant realized that the concept of ground, as it would apply to things in themselves, lacks *warrant*, he also realized that no rational concepts at all could apply to things in themselves. The demand that concepts be warranted, i.e. that their applicability in experience be justified, constitutes Kant's crucial shift toward the Critical period, and it is ushered with a famous letter to Marcus Herz (1772). In this letter, Kant contrasts the a priori concept of magnitude with that of ground. He explains that the prospects of finding warrant for (or justifying the applicability of) the concept of magnitude seem, at least prima facie, rather bright despite its apriority: we know that our objects have magnitudes since magnitude is a property they must borrow from our own faculty of sensibility. But it is difficult to see how comparable warrant could be found for the concept of the ground of experience, since – by definition – such grounds, if we could conceive of them, would not themselves depend on our faculties for their properties. Thus, the grounding relation is invalidated, undoing all the other rational concepts Kant thought could apply to things in themselves, and unraveling the sense of objectivity he hoped to maintain in the *Inaugural Dissertation*.

In the *CPR* (1781, 1787), this very concept of the ground of experience evolves into the concept or category of *reality*. To produce the warrant that was missing in the *Inaugural Dissertation*'s picture, Kant must find a way to apply reality in experience. And, since conformity with space and time is a condition for a concept's applicability, this amounts to treating reality as a magnitude. And indeed, when we look for a succinct statement of what we learn about the world when we learn that the category of reality is applicable in it, we find it summed up in the *CPR*'s Anticipations of Perception as the principle that reality is measurable, or, in Kant's words, that "the real … has intensive magnitude" (B208). By noting the similarity between Kant and Leibniz in their construals of this issue, we can better appreciate the full import of this principle, which may otherwise seem, at first, surprisingly thin.

Most of Part II reconstructs the steps of Kant's procedure for ascribing magnitude to reality, moving through the *CPR*'s Anticipations of Perception, the Second Analogy of Experience, and parts of the *MFNS* (1786). In this Introduction, I sketch this procedure by dividing it into three parts, matched with the constituents of Kant's definition of magnitude as "the consciousness of the homogeneous manifold" (A161/B203). I take this definition to list three desiderata for anything purporting to be a magnitude, which, on my reading, Kant addresses in the following order: first, indicating that reality involves a *manifold*, then that it is *conscious*, and finally, *homogeneous*.

The Anticipations of Perception contains what appears at first to be a consideration – albeit not a very compelling one – to the effect that reality must have a magnitude because the sensible state to which it corresponds has a magnitude: presumably, it is a magnitude reflecting the time it takes for us to imagine the sensation gradually diminishing to nothing. But if this were indeed the consideration Kant put forward, it would have failed in several respects; for example, in attempting to base an a priori principle on a claim that – even if true – relies on matters of empirical psychology. Even more egregiously, such a consideration would fail to establish one of the essential features of magnitudes in general, namely, the formal relations among its parts: it invites us to envisage a manifold of states constituting a series of diminishing gradations, but offers no way to determine which states belong in that manifold, how they are ordered, and what are the ratios among them.

I believe Kant's argument is not deficient in this way, because he does not aim to address these issues in the Anticipations at all, and in fact addresses them elsewhere. Rather than aiming at a comprehensive proof that reality has a magnitude, the Anticipations' aim is limited to providing an inkling of how reality could be associated with a *manifold*. The gist of the argument is as follows: if we are to treat a sensible state at a spatiotemporal point as having a reality, i.e. as having a ground for being, we must represent it as capable of coming into being from its complete lack. Now, in order to avoid incoherence at the moment of its coming into being, we must represent it as changing gradually; in other words, the opposition between that state and its absence must be mitigated by a *manifold* of intermediate states. Thus, we associate the reality of a state obtaining at a single point with a *manifold*, even though the state has no mutually external parts, thereby taking the first step in forming an intelligible notion of intensive magnitude.

For this manifold to amount to a *magnitude*, however, it must be bolstered with a principle or law that unifies it by imposing an order on its constituents: to represent a gradual change, we must be able to identify the states of the manifold as grades or degrees of one and the same quality, and say which is the greater and which is the lesser degree, i.e. which is earlier and which is later in the course of an alteration. Formally, this is an issue of *time-determination*, and the principle by which such determinations are made is a *cause*. It is in this spirit that Kant remarks in the Anticipations that one may regard reality as a cause (A168/B210).

Since the central discussion of time-determination and causation in the *CPR* occurs in the Second Analogy, I claim that this chapter should be approached as an elaboration of the theme introduced in the Anticipations, a claim supported by the extensive parallels between the two chapters. This is especially evident in the fact that, according to the Second Analogy, a cause has an intensive magnitude entirely contained in a single instant, but giving rise to a manifold of states throughout an extended alteration. Now, Kant's conception of a cause is as a concept or law that governs the alteration from one state to another: a cause determines, for every instant during the alteration, which state it contains. With respect to Kant's definition of magnitude, such a causal law counts toward the desideratum of *consciousness*, insofar as we take "consciousness" in its peculiar, somewhat technical Kantian sense, as the act of cognizing a manifold synthesized in intuition, by unifying it under one concept or law.

Now, as far as the Second Analogy goes, a causal law may determine which of any two states in a manifold is the more intense, but not *how much* more so. But this further determination is required if we are to treat the manifold as a magnitude, since a magnitude must have a mathematical structure amenable to algebraic operations. Adding and subtracting states of heat and cold, or states of red and blue, for instance, are incomprehensible unless we find a way to represent the states as commensurable. Anachronistically, but helpfully, we may say that various states of heat can be made commensurable with one another by representing them in terms of average kinetic energy, and similarly varieties of color in terms of the frequency of electromagnetic radiation.

For Kant, this property of a manifold – that its parts are commensurable, or *homogeneous* – requires that the parts be stripped of their differentiating marks. Thus, homogeneity is fundamentally a property of the manifold of pure space and time, of which all parts are the same. The only state that can be expressed in such abstract terms is a state of motion, and so reality must be fundamentally regarded not generally as a cause for change, but

specifically as a cause for change of motion. In other words, reality must be fundamentally represented as a moving force in order to fulfill the third desideratum of *homogeneity*, and, finally, be considered as a magnitude.

Kant's most sustained investigation of motion and force is found in the *MFNS*. In my view, this is where the endeavor to treat reality as a magnitude culminates, since it contains an analysis of motion both as a magnitude and as an expression of reality, and shows that these two issues are inextricable. Kant approaches the former issue – of treating motion as a magnitude – as that of adding and subtracting motions, because showing motion to be a magnitude is the same as demonstrating how it can be subjected to algebraic operations. Toward such a demonstration, he offers a method by which to identify basic algebraic operations on motions with constructions of relatively moving spatial reference frames: to add together two motions *a* and *b*, for example, Kant represents motion *a* relative to a reference frame whose motion is *b*.

This solution, however, leaves moot the distinction between apparent and real motion: because such reference frames are constructed in pure intuition, as mathematical constructions, they offer no basis to prefer any one construction over indefinitely many mathematically equivalent alternatives. A related problem is that, being pure a priori constructions, these reference frames yield a conception of motion that seems to belong entirely with the *form* of appearances rather than their *matter*, and so seems ill suited to express reality (viz. the matter of appearances) as a magnitude. To address this further issue of treating motion as the expression of reality – the latter of the two mentioned earlier – Kant argues that this method of pure construction is, formally, insufficient to represent *change* of motion, and must be enhanced with a notion of grounding.

His argument revolves, once again, around a version of the problem of the moment of change. In this version, Kant claims that motion at the moment of change must be represented as the combination of two motions within one and the same space (rather than relative to two different reference frames). He then shows that this necessarily involves representing them as infinitesimal motions, which in turn involves an appeal to a general rule or law of motion of a certain appropriate form. For Kant, laws of this form are concepts of moving forces, and constitute the manner in which reality can finally be incorporated into experience according to the conditions of sensibility.

This observation concludes Part II of this study, but has further implications that I begin to explore in Part III. Most importantly, it reveals a sense in which the perpetual pursuit of natural science by formulating and

confirming empirical laws of motion is in fact the pursuit of the thoroughgoing incorporation of reality into experience. When we shift the weight of the *CPR* to accommodate the true significance of the category of reality, we can gain new insight into the indispensable, transcendental role of natural science; a fuller understanding of how scientific inquiry is a condition for the possibility of experience. Specifically, we can see why scientific progress moves us ever closer to grasping the grounds of experience that the category of reality represents.

Kant is deeply committed to a view of scientific progress by which scientific inquiry proceeds toward some ultimate goal. Various elements of this view – not easily made to cohere – are strewn throughout his theoretical works. Thus, the *MFNS*'s Phenomenology chapter (4:554) contains an account of how concepts of moving forces are scientifically formed; the *CPR*'s Appendix to the Dialectic (A642/B670) offers a set of principles to guide the formation of such force-concepts toward an ultimate goal, depicted as a comprehensive *genus–species* hierarchy; the *CPR*'s Transcendental Ideal (A571/B579) justifies this commitment to scientific progress by fixing it in the transcendental idea Kant terms "the All of reality," which is the concept of the ideal collection of the reality associated with each possible empirical concept. Part III of this study relies on the interpretation developed in Part II in an attempt to fit these elements together, starting with the latter element.

The so-called All of reality is an *idea of reason*: a concept that does not represent a possible object, but rather a direction in which our array of objectively valid concepts can always be expanded. Unlike some other ideas of reason that occur in the *CPR*, the All of reality is a *transcendental* idea – it has an indispensable function in making cognition possible, and is part of what defines the proper use of our faculties. This cryptic idea, with its ancient provenance and echoes of high metaphysical speculation, is yet to receive all the scholarly attention it deserves, despite its importance – perhaps because it is sometimes mistaken to be an unfortunate vestige of Kant's pre-Critical views. The All of reality, however, is especially pertinent to this study, because, as its name suggests, it sheds light on the relationship between the category of reality and the definitive goal of scientific inquiry.

Roughly, the All of reality is based on the notion that reality constitutes the content of empirical concepts; the *All* of reality, then, is the idea of the *collective* contents of all possible empirical concepts. It is difficult, however, to see exactly what it means for the contents (or, in Kant's term, "realities") of different empirical concepts to be collected together. This