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Forces and causes in Kant's early pre-Critical writings

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Abstract

This paper considers Kant's conception of force and causality in his early pre-Critical writings, arguing that this conception is best understood by way of contrast with his immediate predecessors, such as Christian Wolff, Alexander Baumgarten, Georg Friedrich Meier, Martin Knutzen, and Christian August Crusius, and in terms of the scientific context of natural philosophy at the time. Accordingly, in the *True estimation* Kant conceives of force in terms of activity rather than in terms of specific effects, such as motion (as unnamed Wolffians had done). Kant's explicit arguments in the *Nova dilucidatio* for physical influx (in the guise of the principle of succession) are directed primarily against the conception of grounds and existence held by Wolff, Baumgarten, and Meier, and only secondarily against Leibniz (by asserting the priority of bodies over mind rather than vice versa). Finally, Kant's reconciliation of the infinite divisibility of space and the unity of monads in the *Physical monadology* is designed to respond to objections that could be raised naturally by Wolff and Baumgarten.

Keywords: Kant; Pre-Critical; Force, Causality; Wolff; Leibniz

Over thirty years after its initial publication, Gerd Buchdahl's *Metaphysics and the philosophy of science* has not only become a classic in its field by combining comprehensive scope with profound depth, but also paved the way for (or, as a Kantian might say, made possible in the first place) the emergence and growth of the history of philosophy of science as a discipline. While its importance is thus fully secure, I shall argue further that it contains significant insights that have not

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yet been fully appreciated in traditional Kant scholarship. Accordingly, it should continue to be important to us today just as it has been in the past.

In the beginning of his discussion of Kant, Buchdahl makes several historiographical or methodological remarks that provide essential orientation for understanding Kant's philosophy properly. First, in contrast to those who see Kant exclusively as an epistemologist, Buchdahl remarks: 'Despite these cautions [concerning the comprehensiveness of Kant's interests], it remains profoundly true that science provided the basic initial stimulus for the direction of Kant's thought . . . Many of the general questions and assumptions of Kant's epistemological work pervade those earlier scientific writings, if not indeed already setting the tone for later definitions and meanings.'[1] In short, Buchdahl is rightly emphasizing that Kant's philosophy (and his epistemology in particular) cannot be understood properly apart from its connections to science. Second, while Kant's 'Critical turn' is often thought to make him discontinuous with the major figures of earlier modern philosophy (Descartes, Locke, Berkeley, Hume, and Leibniz), Buchdahl, after devoting the first 470 pages of his book to these figures, rightly notes that Kant is 'heir to those basic concepts and problems whose development we have traced. . . All this makes the deepest impact on Kant, during the progress of his early intellectual development.'[2] That is, Kant does not begin his philosophical reflections from scratch, but rather inherits from his predecessors a set of concepts and problems (especially scientific ones) and must be seen as reacting to them in various ways. Third, in a footnote, Buchdahl qualifies the previous quote as follows: 'I say "during the progress", for Kant did not initially come under the *direct* influence of the basic sources of these problems in the great classical writings that are the basis for this book, but received his early instruction at one or two removes. Thus the thought of Leibniz . . . was mediated *via* the teaching of Christian Wolff, which contained vital modifications of the former.'[3] So Kant is reacting not directly to those of his predecessors that we currently consider to be the major figures in early modern philosophy, but rather to his most immediate predecessors.

If we take these three remarks together, we can see that Buchdahl holds that in order to understand Kant's philosophy properly one must (also) consider how he is reacting to the philosophical and scientific views of his immediate predecessors. While Buchdahl discusses Kant's *Universal natural history* (1755) in some detail, I propose to investigate several central aspects of Kant's conception of force and causality in three other early publications, *Thoughts on the true estimation of living forces* (1746/7), *Nova dilucidatio* (1755), and *Physical monadology* (1756). Though each of these works is devoted to a different topic, it will become apparent that they all contribute to the development of a fairly elaborate model of causality that is specifically designed to contrast with the philosophical positions of his immediate predecessors.

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[1] Buchdahl (1969), p. 471.
[2] Buchdahl (1969), p. 471.
[3] Buchdahl (1969), pp. 471–472.

1. Kant's concept of force in the *True estimation*

Though Kant's primary goal in the *True estimation* is to solve the *vis viva* debate, he begins with reflections on the 'metaphysical concept' (1:17) of force and its relationship to motion.[4] In §§ 1–2, Kant agrees with Leibniz that a body has an essential force that can be characterized as active and that inheres in it even prior to extension, and criticizes those Wolffians who would characterize force exclusively as the cause of motion. For explaining motion by means of a *vis motrix*, or moving force, is, Kant thinks, vacuous in just the way that Scholastics invoking *vis calorifica* to explain the presence of heat is. Kant attempts to loosen the connection between force and motion further by arguing (§ 3) that even bodies at rest can be active insofar as they are merely attempting to move (e.g., a ball resting on a table is acting on the table even if it is not moving). But if force is not to be understood in terms of what may be its most common effect, namely motion, how should it be characterized? Kant suggests that a force be understood more generally as essentially active, i.e., as that which acts on substances without specifying either the nature of the substances acted on or the kinds of effects that might be brought about in them.

Despite the fact that the connection between force and motion is not so close that one can immediately (and vacuously) deduce motion (as an effect) from a force's action (as its cause), Kant none the less argues (in § 4) that 'nothing is easier' (1:19) than to explain motion with his concept of an essential active force.

> Substance A, whose force is determined to act externally (that is, to change the internal state of other substances), either immediately encounters an object which receives its entire force at the first moment of its endeavor, or it does not encounter such an object. If the former took place with all substances, then we would not become acquainted with any motion whatsoever, nor, in consequence, would we name the force of bodies after it. But if substance A cannot exert its entire force at the moment of its endeavor, then it will exert only part of it. But the substance cannot remain inactive with the remaining part of its force. Rather, it must act with its entire force, for otherwise it would cease to go by the name of force when not exerted in its entirety. Because the consequences of this exertion cannot be found in the coexistent state of the world, one must therefore locate them in the world's second dimension, namely, in the succession of things. That is why the body will not exert its force all at once, but will do so only gradually. However, in the succeeding moments it cannot act upon the very same substances on which it acted right at the start, for these receive only the first part of its force and are incapable of receiving the rest. Thus, body A gradually acts on ever different substances. Substance C, however, on which A acts at the second moment, must have an entirely different relation of location and position with respect to A than B does, the substance on which A acted initially. For otherwise there would be

[4] Translations of Kant are either from Kant (1992) or Kant (1998). Translations of all other texts are the author's.

> no reason why A should not initially have acted all at once on both substance C and substance B. In the same way, each of the substances on which A acts in subsequent moments has a different position with respect to the initial location of body A. That is, A changes its location in acting successively. (1:19)

Kant's basic idea here is that if a substance were to act (or exert its force) all at once, then there would be no motion at all.[5] Since there is motion, it is clear that a substance must act on other substances in succession, that is, it must exert only part of its force on any given substance at any given moment, leaving another part of its force for another substance at the next moment. It is not enough, however, for one substance to act on others in succession. The other substances must have changed their positions with respect to that substance, for, so Kant thinks, if the substances had not changed their position, there would be no reason why the first substance did not act on them with all its force in the first instance.

This argument is problematic in several respects. For example, even if one grants that substance A must exert its force on another substance and over time, it is unclear why it must act on different substances and cannot simply act on the same substance at different times. His explicit justification is that the second substance, substance B, would be 'incapable of receiving the rest' of substance A's force, but no reason is given for this claim. The fact that B was incapable of receiving it at the first moment in time does not obviously and immediately imply that it would be incapable of receiving it at a later moment in time. Also, it is unclear why substances B and C must change their positions in order for substance A to act on them. Kant attempts to support the claim by arguing that if B and C had not changed their positions, then A could have acted on both of them at the first moment of time. But it is difficult to see that this point is at all relevant to his argument insofar as he does not explicitly state that the activity of a substance is subject to any location conditions.[6]

Whether or not the argument can be defended on its own terms, it is helpful to understand it in terms of motion initiated in collisions between impenetrable bodies (although it must also be applicable to the other kind of motion Kant countenances in the *True estimation*, namely bodies moving of their own accord). Accordingly, if substance A is an impenetrable substance, it would first exert part of its force on substance B by pushing it away, and then exert another part of its force by pushing C away, thereby generating motion. Because A pushes B away, it would be incapable

[5] As we shall see below, in the *Nova dilucidatio* Kant provides the following explicit justification for this claim: if a substance exerted its force all at once, it would thereby have posited all of the properties that it would ever be capable of positing in other substances and thus be unable to posit any new ones, which, however, is what is required in order to cause a change in location.

[6] There are many other worries that one might have about this argument. For example, is it appropriate to think of bodies as having forces that they can use up (as is implied by expressions such as 'receiving its entire force')? Also, how does the argument establish that substance A must move, rather than that substances B and C must move?

of acting on it any more and would thus have to act on C in order to continue acting (as it must if active force is to be essential to it). This would solve the first problem. Moreover, because impenetrability is a contact force, it becomes more plausible to think that B and C would have to change their locations in order for A to act on them successively, which solves the second difficulty. By interpreting the argument as applying to a case of interest in physics, namely that of impenetrable bodies, the argument thus appears somewhat more intelligible.

In the *True estimation*, Kant next turns (in §§ 5–6) to the mind-body problem, suggesting that his new conception of force can explain how matter produces representations in the mind and vice versa. As he puts it, his new metaphysical concept of force will allow the mind-body problem to

> disappear . . . and more than a little light is shed upon physical influx, when the force of matter is ascribed not to motion, but rather to its actions upon other substances that need not be defined further. For the question of whether the soul can cause motions—that is, whether it has motive force—is transformed into the question of whether its essential force be directed to act externally, that is, whether it is capable of acting outside itself on other entities and of producing changes. One can answer this question quite decisively by saying that the soul must be able to act externally by reason of the fact that it is in a specific location. For when we analyze the concept of what we call location, we find that it suggests the actions of substances upon each other. All that kept a certain acute author from making the triumph of physical influx over pre-established harmony complete was nothing more than this little confusion of concepts, a confusion that is easily overcome as soon as one's attention is turned to it. (1:20–21)

Kant thus thinks that the mind-body problem can be solved by accepting the notion of active force that he has just introduced and by making the further assumption that having a spatial location is derivative from the 'physical influx' or causal interaction between substances endowed with such forces (an assumption he supports with arguments in § 7 and § 9 of the *True estimation*). The problem Kant is addressing here is that the mind and the body would appear to be so heterogeneous that the kind of intelligible connection required by their causal interaction is impossible for them. The primary basis for the heterogeneity claim lies in the difference between the mind's and the body's powers: The mind has the power to think, whereas the body has the power to move. Kant holds that characterizing force more abstractly as active rather than in terms of motion solves the problem because it removes the heterogeneity between the two. The soul must exercise its active power because it is in a location and locations are possible only due to the interaction of forces that creates space in the first place. Likewise, the body can act on the mind insofar as it 'acts on everything which is spatially connected with it, and hence also on the soul; that is, it changes the internal state of the soul insofar as this state is related to what is external to it . . . [which] goes by the name of *status representativus universi*' (1:21). As a result, the body can act on the soul so as to change its internal (representational)

state just as the soul can act on bodies and therefore both are able to act externally on each other.[7]

Kant's solution to the problem of the heterogeneity of mind and body is interestingly different from the views of both Christian August Crusius and Martin Knutzen. Crusius solves the heterogeneity problem by identifying a specific force that both minds and bodies have, namely the force to move.[8] Similarly, Knutzen starts with the idea that a simple substance, such as the soul, must have the power to move itself (or its body) and then argues that it must therefore also have the power to move other simple substances (or the bodies they result in), though he also expresses a certain degree of skepticism about our ability to understand the specific causal mechanisms that pertain to mind-body interaction in particular and thus about a *detailed* solution to the heterogeneity problem.[9] Kant, by contrast, defines force more generally so that he need not attribute the same particular forces to the mind and the body. Rather, it is enough if whatever particular forces that the mind and the body might have are still forces in the general sense of being able to act on others. As a result, Kant can 'solve' the mind-body problem by being committed merely to souls having the power to interact with bodily substances, which he thinks is justified insofar as that is required for the soul to *have a location*, which may still fall short of the power to *move bodies*.[10]

While Kant pursues the official aim of the *True estimation*, namely solving the *vis viva* debate, at length (and quite unsuccessfully) in its second and third sections, he clearly thinks that the foundation necessary to attain that aim lies in his clarification of a 'metaphysical concept' of force so that he can draw out its logical implications, such as solve the mind-body problem, among other things. But clarifying a metaphysical conception of force means explaining how various predecessors have misunderstood the proper conception of force. Specifically, certain unnamed Wolffians thought that force should be characterized in terms of its primary effect, namely motion, while Knutzen and Crusius emphasize that all finite substances, including the soul, must have the power to move. Kant disagrees with both, suggesting that what is truly essential to the metaphysical concept of force that underlies its specific applications in natural philosophy (whether to explaining the motion of bodies in impact or to solving the mind-body problem) is a notion of activity.[11]

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[7] For an interesting discussion of the context of Kant's *True estimation*, see Kuehn (2000), pp. 21–27. Kuehn argues that while Kant is referring to Knutzen in this passage, the reference is to be understood as a sarcastic put-down, not as a compliment.

[8] Crusius (1745), p. 680.

[9] In § 42 of the *Systema causarum efficientium*, Knutzen (1745) argues for the following claim: '*The very specific mode of physical influx or action by which the mind influences its body and the body in turn influences the mind, cannot be distinctly understood by us on account of the nature of the thing*.'

[10] See Nierhaus (1962), and Carpenter (2001), pp. 3–12, for discussions of the issue.

[11] For a discussion of different aspects of Kant's notion of force in the *True estimation*, see Watkins (2001).

2. The *Nova dilucidatio*'s principle of succession

Kant takes up this notion of force in the course of developing his most detailed metaphysical account of causality in the pre-Critical period in the *Nova dilucidatio*. For one, he provides an explicit argument for physical influx, where the *True estimation* had simply presupposed its truth in the form of his particular conception of force. Yet he also develops more clearly the metaphysical framework that underlies this notion of force and the model of causality it is part of by explaining how change is possible, by exploiting a certain notion of what a ground is and how it posits determinations, and by examining what does and does not follow from the 'mere existence' of a substance. Accordingly, the *Nova dilucidatio* deserves sustained attention. What is of particular note for present purposes, however, is the way in which its central arguments are intelligible first and foremost against his immediate predecessors (Wolff, Baumgarten, and Meier, in particular) and in the context of providing an explanation of bodies that would cohere with scientific accounts at the time.

While the bulk of Kant's argument in the *Nova dilucidatio* is devoted to clarifying the status and various consequences of the principles of contradiction and sufficient reason or, as he prefers, 'determining ground,' in the third section Kant turns to presenting two causal principles that are 'extremely rich in consequences and derive from the principle of the determining ground' (1:410), namely the principles of succession and coexistence. Here we shall be concerned only with the principle of succession. The principle of succession explicitly aims to establish physical influx by refuting pre-established harmony, a doctrine, made famous by Leibniz, which holds that finite substances cannot act on each other (as physical influx maintains), but rather only on themselves. The principle of succession states: 'Substances can change only insofar as they are connected with other substances; their reciprocal dependence determines the mutual change of state' (1:410). Kant provides three arguments for this principle, all based on the idea that the kind of causally isolated substances invoked in pre-established harmony are incapable of undergoing change given the way in which determinations are posited by grounds in a substance.

2.1. Three arguments

Kant states his first argument as follows:

> Suppose that some simple substance . . . were to exist in isolation. I maintain that it could undergo no change of its inner state. The inner determinations, which already belong to the substance, are posited in virtue of inner grounds, which exclude the opposite. Accordingly, if you want another determination to follow, you must also posit another ground. But since . . . no external ground is added to it, it is patently obvious that the new determination cannot be introduced. (1:410)

The main thrust of this argument is that a causally isolated substance cannot change because change would require a new determination and thus a new ground, but such a new ground is nowhere to be found, given that the isolation of the substance rules

out external grounds and all of its internal grounds have already been posited.[12] Kant's argument proceeds from what he takes to be an analytic claim about change along with the principle of sufficient or determining reason. In order for a substance to change, it must lose one of its determinations and gain another that is incompatible with the first determination. That is the analytic truth about change.[13] If the principle of determining reason states that there must be a reason or ground for positing any determination, then it follows that there must be one ground for the initial determination of a substance and another ground for its later determination. The ground for the initial determination must be internal to the substance since positing a substance entails positing the grounds that compose it. That is, one cannot posit a substance without also positing the grounds that are essential to it. What, then, is the ground of the later determination? Once again, it cannot be found in any other substance, since the substance is causally isolated. Nor can it be found within that very substance, since that substance already contains the opposite ground (that is, a ground that posits a predicate that excludes this determination). Thus, there can be no new ground and thus no new determination, which implies that no change is possible.[14]

Kant develops a second argument as follows:

> It is necessary that whatever is posited by a determining ground be posited simultaneously with that determining ground. For, having posited the determining ground, it would be absurd if that which was determined by the determining ground were not posited as well. Thus, whatever determining factors exist in some state of a simple substance, it is necessary that all factors whatever which are determined should exist simultaneously with those determining factors. But since a change is the succession of determinations . . . , it follows that the change cannot take place by means of those factors that are to be found within the substance.

[12] While a ground in general establishes 'a connection and a conjunction between the subject and some predicate or other' (1:392), Kant's basic definition of a determining ground is as follows: 'A ground, therefore, converts things which are indeterminate into things which are determinate' (1:392). Thus, a determining ground posits that a determination, predicate, or property inheres in a subject or substance.

[13] The argument presupposes the traditional idea that change cannot be understood as simply the addition or subtraction of a determination, but rather must be conceived of as the replacement of one determination by a contradictory determination.

[14] Langton (1998) discusses only the first argument and suggests that it 'presents many causes for philosophical disquiet' (p. 105). In particular, she objects: 'The assumption that for every intrinsic property there is another intrinsic property that is the 'reason' for the first seems to imply an infinite regress. And what of the apparent counterexamples? An alarm clock can be set (at its creation if need be) to ring at six, with no outside interference' (ibid.). The question of counterexamples is not easily settled, as Langton herself notes, because of ambiguity about what a single substance would be. As for the first objection, it would be beside the point if Kant denies that a ground is an intrinsic property since that would block the threat of an infinite regress. Thus, Langton's objections to the argument may not be as serious as she seems to think. At the same time, Langton quite intentionally does not focus on the argument ('I leave these causes for disquiet, for the chief interest of the argument lies elsewhere.'). Yet given that Langton wants to focus on what follows from the principle (namely that knowledge must be receptive), it is difficult to see that the principle and the arguments Kant develops to support it would not be crucial to her own interests.

> If, therefore, a change occurs, it must be the case that it arises from an external connection. (1:411)

This argument attempts to refute the possibility that change in a causally isolated substance's determinations could be due to a change in its grounds. What motivates the possibility Kant is attempting to refute is the idea that one must be able to apply the principle of determining reason to each and every determination that a substance has. Accordingly, if a substance has determination F at t_1 and determination G at t_2, then there must be a ground, a, for F as well as a ground, b, for G. Moreover, because Kant explicitly asserts that grounds and the determinations they posit must be simultaneous (on pain of absurdity), grounds a and b are such that at t_1 a grounds F and at t_2 b grounds G. If one accepts the principle of determining reason in this form, then it follows that a change in determinations would have to be due to a change in grounds.

Kant, however, thinks that explaining a change in determinations by means of a change in grounds is inadequate. Kant identifies the essence of a thing with its necessary grounds. Accordingly, if the essence of a thing is immutable, then its grounds will be immutable as well. But if a ground is necessarily simultaneous with its determinations, then whatever determinations follow from the immutable grounds of a thing's essence will be immutable as well. As a result, if a causally isolated substance exists, it must do so with the immutable grounds that constitute its essence, but they, in turn, must simultaneously posit their determinations, which precludes the possibility that those determinations could change. While one might try to distinguish between essential and inessential grounds such that the latter might change while the former remain constant, Kant thinks that no explanation of the addition of inessential grounds to the essential grounds of the substance will be available. What could the source of such grounds be? The essential grounds are immutable and thus would be incapable of adding anything that would not be immutable, and, given the isolation dictated by pre-established harmony, no external substance could add any grounds. There is thus nothing else to the substance beyond its essential grounds and the determinations that follow from them that could explain change.

Kant's third argument for the principle of succession asserts that it is equally absurd to think that *unchanging* grounds within a causally isolated substance could be responsible for change. As Kant explains: 'Suppose that a change takes place under the conditions specified. Since . . . no grounds, apart from those which are internal, are supposed to be involved in determining the substance from any other source, it follows that the same grounds, by which the substance is supposed to be determined in a certain way, will determine it to the opposite, and that is absurd' (1:411). In short, Kant's idea is that one and the same set of grounds cannot posit first one and then a contrary set of determinations.

Consider two possible ways of attempting to explain changing determinations within an isolated substance on the basis of one and the same set of grounds. One might first suggest that ground a posits first determination F and then determination G (which is incompatible with F). However, it is unclear in this scenario that an intelligible explanation can be provided for the change in determinations. After all,

no change has occurred in ground a that would explain the change in determinations and any change external to the substance is necessarily irrelevant, given that the substance in question is supposed to be causally isolated. Moreover, if one accepts the principle that a ground is simultaneous with whatever determinations it posits, then ground a would have to posit F and G simultaneously, which is clearly contradictory.

Alternately, one might suggest that there are two grounds, ground a and ground b such that ground a posits determination F and then ground b posits determination G. However, Kant can, once again, argue that no intelligible explanation of the change has been provided, because the change in determinations would be due not to changing grounds, but rather to the fact that first one ground posits one determination and then a second ground posits another, and no explanation of why the grounds alternate in being effective is available. External grounds are irrelevant by stipulation and positing an internal ground to explain the change in the efficacy of grounds simply pushes the problem back one stage. For in that case one is faced with explaining a change (now in the efficacy of grounds rather than grounds or determinations) on the basis of either an unchanging ground (which was the task originally posed) or changing grounds (which would require further explanation). Moreover, if grounds are simultaneous with their determinations, it would be impossible for the second ground to 'wait' until the first ground is done in order to posit its 'new' determination. Since neither of these ways of attempting to explain a change of properties within an isolated substance on the basis of one and the same set of grounds seems tenable to Kant, he infers that change within a causally isolated substance is impossible, that is, that pre-established harmony is false and that there must be causal connections between substances (physical influx) in order for change to be possible.

After presenting these arguments, Kant makes several remarks that are most naturally understood as rejoinders to replies that one might make to his arguments. 'This truth [the principle of succession] depends on an easily understood and infallible chain of grounds. Nonetheless, those who give to the Wolffian philosophy its renown, have paid so little attention to this truth that they maintain, on the contrary, that a simple substance is subject to constant change in virtue of an inner principle of activity' (1:411). His response: 'Although I for my part am thoroughly familiar with their arguments, I am, nonetheless, convinced of their sterility [*ficulnea*]' (1:411). Unfortunately, Kant does not describe the grounds of his conviction, nor, for that matter, even give a hint as to why such arguments are supposed to be like a fig tree in isolation, namely 'sterile'. Moreover, as we saw above, Kant himself requires activity in his own account of causality in the *True estimation*. So his objection cannot be based on the fact that substances are active. As a result, taken in isolation, these remarks turn out to be puzzling, rather than helpful in coming to understand Kant's ultimate view.

The only other passage in the *Nova dilucidatio* that is directly relevant here is the following: 'once they [i.e., supporters of Wolff] have constructed an arbitrary definition of force so that it means that which contains the ground *of changes*, when one ought to declare that it contains the ground *of determinations*, they were bound

to fall headlong into error' (1:411). Once again, Kant does not explicitly state what 'error' Wolffians thus fall headlong into or what is inappropriate about grounds of change as opposed to grounds of determinations.

2.2. Kant and Wolff on the nature of grounds

To make progress in sorting out Kant's ultimate reasons for asserting the impossibility of change within a causally isolated substance, we must understand more clearly both how he thinks of grounds and why he might have come to think of them in this way. Let us begin by considering two distinctive aspects of grounds as they were understood in early to mid-18th century Germany. First, both Christian Wolff and Georg Friedrich Meier explicitly assert that a determination must be posited simultaneously with its ground. Wolff, for example, asserts that 'what is grounded in another subsists as long as its ground subsists and for that reason cannot be changed as long as its ground is not changed.'[15] In short, if ground, a, exists at t_1, then the determination it posits, F, must also exist at t_1. While one might attempt to support the simultaneity of grounds and determinations directly by means of a logical interpretation of the principle of sufficient reason, it can also be motivated by purely ontological considerations. For example, just as objects that never existed cannot bring anything about now, so too, one might think, objects that no longer exist cannot bring anything about now either. For, so the reasoning might go, the existence of something in the past does not necessarily entail anything about the future, since it is both logically and metaphysically possible that the world cease to exist after what would be the cause goes out of existence yet before its putative effect begins to exist. In order to guarantee that causes or grounds necessarily bring about their effects or determinations, they cannot stand at a temporal distance from each other, i.e., they must be simultaneous. Alternately, one might attempt to develop an argument based on an explanation of the temporal gap between a ground and its determination. That is, if a ground is posited (say, at t_1) and its determination is not posited at the same time, then, so the argument might go, something else in addition to (the positing of) the ground must occur for its determination to arise and, in particular, for it to arise at precisely the time it does (namely at t_1 and not at t_2). But if something other than the ground is necessary for its determination to occur (at that time rather than any other), then one might have grounds for calling into question whether the ground is truly a ground, that is, a ground in a sufficiently robust sense.

Second, Wolff's conception of what an essence is entails that the grounds that constitute an essence must be necessary and thus immutable. In § 32 of his *Rational thoughts on God, the world and the soul of human beings, and all things in general*, Wolff argues that every thing must have a necessary ground or set of necessary grounds that are responsible for its determinations.

[15] See Wolff (1719), § 176 as well as Meier (1743), pp. 88–90.

> If one can distinguish various [determinations] in a thing from each other, one of them must contain the ground within itself for why the rest are attributed to it, and because this cannot in turn have its ground for why they are attributed to it in one of the rest, as can easily be comprehended through the principle of contradiction (§ 10), they must necessarily be attributed to it. For what necessarily exists in this way requires no further ground for why it exists in this way.

In other words, in order to stop a regress of grounds within a thing Wolff posits a necessary ground or set of necessary grounds within that thing and identifies it with the thing's essence. In § 42, Wolff then infers the immutability of a thing's essence from its necessity: 'Since the essence of a thing is thus necessary (§ 38), it is also immutable.' In § 176 of his *Rational thoughts* Wolff even extends the connection between necessity and immutability from essential grounds to determinations by means of the simultaneity of determinations and grounds:

> Since the essence of a thing is necessary (§ 38), everything that is grounded in it alone must also be necessary. For what is grounded in another subsists as long as its ground subsists and for that reason cannot be changed as long as its ground is not changed. Now the essence of things is immutable (§ 42). Therefore, whatever is grounded in the essence of things alone must also be immutable.[16]

Accordingly, Wolff thinks that since the essential grounds of a substance are necessary and immutable, the determinations they posit must be so as well in light of the simultaneity of grounds and their determinations.

However, Wolff thinks of these eternal grounds as grounds merely of the possibilities that are inherent in things. He thus recognizes the need for something in addition to essential grounds that would make the states of things actual.[17] Later in his *Rational thoughts* (§ 628) Wolff distinguishes between a thing's essence and its nature by means of the notion of an active force: 'And insofar as it is an active

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[16] §176 of Wolff (1719). §§ 38 and 41 provide arguments for the main premises of this argument. § 38 states: '*The essence of things is necessary*. What is possible cannot be impossible at the same time (§ 10), and if something is possible in a certain way, it cannot be impossible in that way at the same time, and is therefore necessarily possible (§ 36). Now since possibility is intrinsically [an sich] something necessary, but the essence of a thing consists in it being possible in a certain way (§ 35), its essence is necessary.' § 41 states: 'Whatever is necessary is also immutable. For if it could be changed, then it could also not be, which runs contrary to its necessity (§ 36).'

[17] In his *Prima philosophiae sive ontologia* Wolff (1736) elaborates on his position as follows. First, he distinguishes between the reason for the possibility of another and the reason for the actuality of the other (§ 874), calling the former a *principium essendi* and the latter a *principium fiendi*. He then suggests (§ 875) that the essential grounds of a thing are the essential grounds of the essence of the modes, whereas the grounds of the actuality of these modes are either in antecedent modes of that thing or in other things (or in some combination thereof). Baumgarten's take on the issue in his *Metaphysica* (1749) is comparable. For while he agrees with Wolff (in § 106 and § 132) that essences are necessary and immutable, he argues (§§ 104–105, 108, and 133) that modes are contingent and can therefore change. Thus, both Wolff's later treatment of the issue and Baumgarten's position depart from Wolff's initial position that the essence contains the grounds of all of a thing's modes.

thing, one attributes a nature to it: accordingly, nothing else is understood by *nature* than an active force insofar as it is determined in its mode [Art] by the essence of a thing.' A nature is thus an active force, that is, a force acting in accordance with the thing's essence. Accordingly, Wolff introduces the notion of an active force as what makes a thing (or its states) actual. By appealing to active force in this way, he can be read as giving content to his earlier description of force or power as 'the source of changes' (§ 115), since active force is what actualizes the successive states of a thing. What ends up being the crucial move, however, occurs in Wolff's Latin ontology, where he describes force as 'that which contains in itself the sufficient reason of the actuality of an action.'[18] In other words, he explicitly views active force not only as what actualizes a thing's states, but also as the *ground* of the *existence* of a thing's states. As a result, Wolff ultimately accepts two kinds of grounds: (i) immutable grounds that explain the possibility of all states of a substance and (ii) an active force that functions as the sufficient reason of the existence or actuality of these states.

If one assumes that Kant adopts such a conception of essential grounds in the *Nova dilucidatio*, then one can see quite clearly both what the fundamental premises of his three arguments for the principle of succession are and why he would think that they represent a serious challenge to the Wolffian position. Concerning the first argument, if (i) all of a substance's grounds must be posited in order for it to exist and if (ii) grounds must posit their determinations as soon as they exist, then it follows that all of a substance's determinations are posited as soon as it exists. While the second assumption is identical to one of the aspects of Wolff's notion of ground described above, the first assumption might appear to be original, since it seems to rest on the idea that all of a substance's grounds must be posited at the same time in order for it to exist. While this idea is not exactly identical to any of the features of Wolffian grounds described above, it none the less follows from the familiar idea that a substance's grounds are immutable components of its essence. For insofar as positing the existence of a substance implies positing its essence, positing the essence of a substance entails that all of its immutable grounds are posited as well, since these grounds constitute that essence. The point is not simply that *all* of its grounds must be posited. Rather, it is that they must all be posited *at the same time*, since they are immutable and thus could not come about at a certain point in the course of a substance's history. As Wolff recognizes in the *Rational thoughts* (§ 42): 'But if I can think of a possible change in the essence of a thing, the essence of the thing is not thereby changed; rather, by cognizing it I have attained cognition of the essence of another thing.' Accordingly, both assumptions of Kant's first argument for the principle of succession derive either directly or indirectly from Wolff's conception of essential grounds.

Kant's second argument for the principle of succession depends even more clearly on Wolff's conception of grounds. The argument is that a change in a causally isolated substance's determinations requires a change in its grounds, but changing

[18] § 722, though he immediately admits that this is only a nominal definition.

grounds within a substance are impossible. Since Wolff admits that grounds and any determinations they might posit must be simultaneous, he is committed to the idea that a change in determinations requires a change in grounds. However, he also admits that grounds cannot change within a substance, since the grounds that make up the essence of a substance are immutable. Therefore, a causally isolated substance cannot undergo change. Moreover, Wolff's statement at § 176 of the *Rational thoughts* quoted above develops precisely this argument (though he does not explicitly draw this conclusion).

Kant's third argument attacks the possibility that unchanging grounds within a causally isolated substance could be responsible for change. The main point Kant wants to press against this possibility is that regardless of how it is cashed out, it violates Wolff's principle that determinations must be simultaneous with the grounds responsible for them. If a single ground is supposed to be responsible for two mutually incompatible, successive determinations, F and G, then F and G would not always be simultaneous with their ground, since G would not be actual when the ground was positing F and F would no longer be actual after the ground had posited G. If two separate grounds are supposed to be responsible for the two successive determinations that constitute change, then insofar as the grounds are immutable, the changing determinations would not always be simultaneous with the grounds that posit them, since the ground that posits determination G could not be positing it when the ground that posits determination F was positing it (on pain of contradiction). Again, Kant's third argument for the principle of succession directly draws on Wolff's conception of essential grounds.

At the same time, one could object that all three of Kant's arguments are based on Wolff's conception of *essential* grounds. If Wolff's active forces are invoked instead as the grounds that posit the actuality of the states that are otherwise merely possible, it is no longer immediately clear that Kant's arguments have the same force. Kant's response to this objection is to deny that active forces can be identified with (non-essential) grounds of change. As we saw above, after presenting his three arguments Kant emphatically objects to the idea that grounds could be understood as grounds of *changes* rather than as grounds of *determinations*. Thus, the point of Kant's objection is not to grounds of changes per se but rather to the idea that active forces could be understood as grounds of changes.

But why might Kant reject such grounds? If an essence is a set of merely possible grounds, or a merely possible being, is Wolff not right to think that some further ground must be added in order for that essence to exist or be actualized? What Kant wants to reject is of course not the idea that there is an important difference between actuality and possibility, but rather the idea that the ground of actuality or existence could lie within the substance whose states are to become actual. Stimulated into thinking about the nature of existence by Crusius's novel arguments in the *Sketch of the necessary truths of reason*, Kant discusses the topic in several of his early pre-Critical works. In *The only possible argument*, for example, Kant is explicitly critical of both Wolff's and Baumgarten's accounts of existence (2:76) and develops his own account in terms of a distinction between *what* is posited and *how* it is posited, arguing that existence is not the relative positing of one determination with

respect to another—e.g., omnipotence is posited relative to God as an infinitely perfect being—but rather an absolute positing.[19] Accordingly, it is a mistake, Kant holds, to think that one kind of ground within a substance posits its merely potential determinations with a second kind of ground positing existence as a predicate. Rather, however the essential grounds are posited, that is, whether posited as merely possible or as fully actual, they must posit their determinations accordingly.

If this critique of Wolff's conception of existence were not enough, in a passage in the *Nova dilucidatio* that precedes the principle of succession, Kant also explicitly argues that it is absurd 'to say that something has the ground of its existence within itself' (1:394). Kant's argument proceeds as a *reductio*. Assume that something contains the ground of its existence within itself, that is, is the cause of itself. Since the concept of a cause is prior to the concept of its effect, something would be both prior and posterior to itself, which is absurd. In this context, Kant is objecting to Wolff's characterization of what it is for something to be a necessary being, arguing that one should not say of God that he contains within himself (or within his essence) the sufficient reason of his existence.[20] But Kant's argument can be generalized to hold for any being; in no case should one say that something contains the sufficient reason of its existence within itself. Yet this is precisely what Wolff would be committed to when he claims that a substance is to have an active force or ground that actualizes or brings into existence its successive determinations. Kant thus rejects the notion of an active force or ground as what brings the successive states of a substance into existence and therefore the Wolffian cannot legitimately appeal to such a notion to explain change. But since the Wolffian concedes that essential grounds cannot explain change, Kant's arguments for the principle of succession would seem to be quite effective.

2.3. Kant and Leibniz on grounds and explaining change

At the same time, even if Kant's argument for the principle of succession can be understood against the background of how grounds and existence were conceived at the time in Germany by Wolff, Baumgarten, and Meier—that is, as based on a conception of immutable grounds that posit their determinations as soon as they exist, and on the rejection of active forces as grounds of change, since they involve in an illegitimate way grounds of the existence of things that would have to be internal to those very things, something that is impossible even for necessary beings—it is natural to wonder how his argument relates to Leibniz's view. In order to address this question, it is necessary to consider first the differences between Leibniz's con-

[19] 'Existence is the absolute positing of a thing. Existence is thereby also distinguished from any predicate; the latter is, as such, always posited only relative to some other thing' (2:73).

[20] In § 308 of *Philosophiae prima, sive ontologia* Wolff (1736) explicitly asserts: 'A being exists necessarily if it contains the sufficient reason of its existence in its essence.' One might argue that a being could contain the sufficient reason of its existence within itself, but not by containing it within its essence. Kant does not attend to such a distinction, but he might think that there is no need if his argument holds against both positions.

ception of ground and the Wolffian conception that Kant is, in certain respects, adopting at this point.

One immediate difference is that Leibniz rejects the idea that a ground must be simultaneous with its determination(s), since he thinks that the determinate state of a substance at one moment is the cause of its state at the next moment in time. While such a difference about whether or not grounds must be simultaneous with their determinations might seem to be a minor, technical issue, it reveals significant differences between Leibniz's position and that of Wolff and his followers. For one, Leibniz's denial that grounds must be simultaneous with their determinations makes it possible for him to explain change at the level of derivative rather than primitive forces. That is, Leibniz's denial of the simultaneity of grounds and determinations allows him to say that the previous state of a substance is the cause of its subsequent state. Thus, in a sense one can say that for Leibniz explanation of change runs 'horizontally' from one determinate state to another rather than 'vertically' from one determinate state down to the primitive force that constitutes a monad. It is true that derivative force depends on primitive force for Leibniz, but the dependence relationship is not immediately relevant to explaining any specific features of the change. Rather, primitive forces, which endure throughout change, are required primarily as a metaphysical unity against which change takes place; they do not explain why one state is determinate in the way that it is rather than in some other way or at that time rather than at some other. Because Wolff and his followers, including Kant in this case, are committed to the simultaneity of grounds and determinations, they cannot explain change in terms of derivative forces, but rather must do so in terms of the primitive forces or essential grounds that constitute a substance.

Since these differences between Leibniz's conception of grounds, and explanations of change, on the one hand, and Wolff's and Kant's, on the other, are significant, Kant's explicit arguments for the principle of succession are not aimed directly at Leibniz and might seem to be moot.[21] However, even if Kant's explicit arguments do not directly target Leibniz's position, it is still possible to see how their views could engage, rather than simply talk past, each other. The issue could be decided by settling such thorny issues as whether a cause or ground must be simultaneous with its effects or determinations in order to produce them. While Kant accepts such a simultaneity principle, he does not present any explicit arguments that Leibniz might find decisive. Rather than tackling particular philosophical claims directly, it might be more profitable to consider first differences in what Leibniz and Kant aim

[21] This would be the case, especially if Leibniz were to admit that monads are not ultimately temporal. While it is unlikely that such an admission reflects Leibniz's considered view, it is worth noting that both textual and philosophical motivation can be found for it. Leibniz seems to develop an argument quite similar to Kant's in a letter to Foucher from 1675. As Leibniz puts it: 'Now, this variety [in our thoughts] cannot come from that which thinks, since a single thing by itself cannot be the cause of the changes in itself. For everything would remain in the state in which it is, if there is nothing that changes it; and since it did not determine itself to have these changes rather than others, one cannot begin to attribute any variety to it without saying something which, we must admit, has no reason—which is absurd' (Leibniz, 1989, p. 3). See McRae (1979), pp. 103–109, for a rational reconstruction of an argument, based on principles that Leibniz explicitly accepts, showing that temporal notions and thus change are not real.

to explain and then what instances of change their accounts are designed to render intelligible in the first place.

From this perspective, there is one general feature of Leibniz's view that Kant would find clearly lacking. By explaining change at the level of derivative forces, there is a genuine sense (or set of senses) in which Leibniz fails to deliver (or even expect as possible) an ultimate explanation of change. One way of putting this point is to note that Leibniz himself concedes that one should not invoke primitive forces in explaining particular states.[22] Leibniz invokes primitive forces not to explain any specific features of change, but rather to satisfy metaphysical demands (such as that only what is truly one is real, that substantiality necessarily requires activity, or that a derivative force must be determination of a more fundamental, determinable entity). What, one might ask, has Leibniz omitted in explaining change at the level of derivative rather than primitive forces? The problem is that explanations of change in terms of derivative forces cannot be satisfying insofar as derivative forces themselves seem to stand in need of explanation and not just in terms of other derivative forces, but rather in terms of primitive forces. While this objection can seem weak, especially when stated in such abstract terms, there is a real point to it, since it is based on the idea that any satisfying explanation of change ought to involve in specific and intelligible ways not just the changing circumstances in which the change occurs (its derivative forces), but also the nature of the thing that is changed (its primitive forces). Without a close connection between the ultimate metaphysical nature of a thing and its particular states, there is only a nominal sense in which change is change of the thing and, what's more, the benefit of positing primitive forces at all can become attenuated. For example, if Leibniz refuses to draw a specific connection between the unity and activity of primitive forces and the particular determinations of bodies, then he cannot easily rule out the possibility that there is a single soul for the entire corporeal world. If extension, in any amount, requires unity and activity and nothing more, then a single monad would suffice.

Another way of pointing out that any explanation of change that invokes derivative forces alone falls short is to note first that even the most successful explanation of change in terms of derivative forces is necessarily interminable, i.e., leads to an infinite regress, and second that such an interminable explanation or infinite regress cannot be desirable at a purely metaphysical level.[23] It is clear enough that explanations of change in terms of derivative forces will be interminable, since the state of a substance is causally connected to all of its infinitely many past and future states. While one might think (with Hume) that explaining each and every state by a previous state leaves nothing unexplained, Kant explicitly argues against this idea later in the first *Critique*. In the Thesis of the Third Antinomy he argues that explaining change in terms of previous change, 'when taken in its unlimited univer-

[22] See, e.g., his A new system of nature, in Leibniz (1989), p. 139.

[23] Leibniz might counter that Kant is conflating the different explanatory roles that forces can play by suggesting that primitive forces ought to play a central part in bringing about particular changes. From Kant's perspective, however, Leibniz is placing restrictions on what primitive forces can explain that are unnecessary.

sality, contradicts itself,' since 'nothing happens without a cause sufficiently determined' and 'at every time there is only a subordinate but never a first beginning, and thus no completeness of the series on the side of the causes descending from one another' (A446/B474). In short, the sufficiency that is required for the actuality of a change conflicts with the incompleteness generated by an infinite causal regress. As Kant points out in his 'Critical decision of the cosmological conflict of reason with itself' (A497/B525), when it comes to how things really are (as opposed to how things appear to us), reason cannot be satisfied with anything less than the unconditioned condition of all conditioned states, which is precisely what is absent from explanations of change in terms of derivative forces.[24]

Another aspect that is relevant to assessing the comparative strengths of Leibniz's and Kant's conceptions of grounds and their corresponding explanations of change concerns what they take as the primary instance of change that stands in need of explanation. Leibniz, as an idealist, thinks that the apparent interaction among bodies need not be taken to imply actual interaction between substances (at least not at the ultimate level of metaphysics) since bodies are merely well-founded phenomena and apparent interaction can be seen to be just that, namely apparent. What does require serious explanation are perceptions (as mental states) and his conception of grounds, according to which one of my perceptions leads to the next, can provide a much more intuitive explanation of such changes than would be given by claiming that some other mind acts on me so as to cause my current perception. But if Leibniz's conception of grounds and explanation stands and falls with his idealism, then Kant's account could easily appear more attractive. For if Kant is not committed to Leibniz's idealism, but is rather open to a physical monadology—as he obviously is, given his explicit rejection of Leibnizian idealism in the *Nova dilucidatio* in favor of 'the real existence of bodies' (1:411) as well as his position in the *Physical monadology*—then it can be tempting to assert that reality is ultimately constituted not by metaphysical points alone (which Leibniz identifies with minds), but also by physical points endowed with physical forces that generate causal interaction between each other so as to explain the physical states of bodies. That is, physical points could be the seats of primitive, physical forces.

However, for physical forces to be primitive forces, they can no longer be identified with particular, observable, and determinate bodily states that might change when bodies communicate their motion to each other in collisions. Rather, physical forces would need to be understood as enduring, essential aspects of substances that are not only not directly observable (insofar as everything we observe undergoes change), but also both underlie and explain the determinate states we do see. That

[24] The Critical Kant will concede that not all of reason's demands can be satisfied in the world of appearances, but such a concession is of no use to Leibniz at the level of metaphysics, since even the Critical Kant continues to hold that an infinite regress is unacceptable to reason. '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 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' (A498/B526).

Kant makes this connection is clear from his position in the *Physical monadology*, where attractive and repulsive forces are used to explain the particular bodily states we observe and are understood in terms of the unobservable activities that occur in accordance with the unchanging masses of bodies. Accordingly, accepting this model puts Kant in a position to provide precisely the stronger, more satisfying explanation of (changes in) the determinate states than Leibniz thinks can be had.[25]

In sum, Kant's arguments for the principle of succession are intelligible first and foremost against a conception of grounds and existence that is not Leibniz's, but rather Wolff's, Baumgarten's, and Meier's. Kant's rejection of Leibniz's position seems to be based not on arguments that are explicitly developed, but rather to a great extent on the fact that Kant is focusing on providing the most intuitive explanation of bodies and an explanation of minds that is derivative upon that, rather than vice versa (as Leibniz does). Thus, just as was the case for the *True estimation*, Kant's account in the *Nova dilucidatio* is aimed primarily at his immediate predecessors and at foundational issues in physics (as the science of bodies).

3. Kant's *Physical monadology*

Kant's main aim in the *Physical monadology* is to reconcile the unity demanded in metaphysics with the infinite divisibility of space required by geometry. Like Knutzen, he starts with physical monads, that is, with simple substances that are in a place and compose extended bodies without being themselves extended and then proceeds to argue for the necessity of Newtonian forces of attraction and repulsion (in addition to a force of inertia that he identifies with mass) in order to make sense of various properties of bodies (e.g., contact, density, determinate volume, and elasticity). The issue Kant perceives to be most pressing, however, lies in understanding how extended bodies could be composed of unextended monads without the divisibility of the former threatening the destruction of the latter's essential unity. Kant's solution invokes a metaphysical concept of active force that is continuous with the one he had introduced earlier in the *True estimation* and developed in greater detail in the *Nova dilucidatio*. In particular, he argues that a monad fills a determinate space due to 'the sphere of the activity, by means of which it hinders the things that are external to it and present to it on both sides from drawing any closer to each other' (1:480). One substance can thus act on another that is external to it by resisting it, or by keeping it from coming any closer to the substance that is on its other side. Accordingly, although a physical monad is an unextended point in space, through

[25] It should be noted that I am not claiming that adopting a physical (rather than idealistic) monadology immediately entails the impossibility of pre-established harmony. One could accept physical points that God has set up with such great harmony that their self-caused changes coincide. (I should like to thank Robert Adams for pointing out this kind of possibility.) Rather, the point is simply that, barring strong philosophical reasons to the contrary, it would be more in line with common sense and more natural to assume causal interaction between bodies.

its activity it can be present in an extended region by keeping out other monads (or the presence they have by means of their sphere of activity).

How is it that this notion of a sphere of activity can allow for the divisibility of space while retaining the indivisibility of the point that is present throughout a given space? Kant explicitly addresses this question as follows:

> But, you say, substance is to be found in this little space and is everywhere present within it; so, if one divides space, does not one divide substance? I answer: this space itself is the orbit of the external presence of its element. Accordingly, if one divides space, one divides the extensive quantity of its presence. But, in addition to external presence, that is to say, in addition to the relational determinations of substance, there are other, internal determinations. If the latter did not exist, the former would have no subject in which to inhere. But the internal determinations are not in space, precisely because they are internal. Accordingly, they are not themselves divided by the division of the external determinations. (1:481)

Perhaps surprisingly, what is crucial to Kant's official answer is not so much his notion of activity per se, but rather the way in which it is combined with a claim about connections between intrinsic and relational properties. According to Kant, the division of space does not imply the division of the monad that fills that space, because the division of space is the division of a relational property, which need not affect the intrinsic properties of a monad. For at this point in his career Kant holds that while relational properties require intrinsic properties (because relational properties stand in need of subjects to serve as their relata), changes in relational properties do not necessarily imply any changes in a monad's intrinsic properties.[26] In this way, the relational properties that constitute the 'external sphere' of a monad's activity can be divided without the monad's intrinsic properties being changed in any way.

There is, however, more to Kant's official solution than meets the eye. In the course of his discussion, Kant raises an objection that 'derives from the positing outside each other of the determinations of one and the same substance. For the action of the monad which is in space BCD [one half of the sphere carved out by a monad's activity] is external to the action which is in space BDA [the other half of its sphere of activity]. They thus seem to be really different from each other and to be found outside the substance' (1:482). Kant's succinct reply—'But relations are always both outside each other and outside substance'—merely reiterates his original solution and thus fails to address what really motivates the objection.

To understand the real point of the objection and what aspect of Kant's position is crucial to addressing it, consider Wolff's and Baumgarten's position on substance. They explicitly equate substance with activity so that if one can distinguish two activities at a time, then there must be two substances, not one. But since the space that a physical monad is supposed be present in by virtue of its sphere of activity can be divided, it would seem that two separate activities must be ascribed to a

[26] Langton (1998), p. 102, notes this point as well.

single monad, with one activity per region of space. The fact that Kant distinguishes between relational and internal determinations and requires the latter for the former cannot be used to reply to the objection because the activities or determinations that are internal to substances and thus indivisible are irrelevant as long as the relational determinations that generate space are divisible. Finally, it is really beside the point for Kant to insist that relations are outside substances. Wolff and Baumgarten can agree with this claim. The real disagreement, which Kant does not explicitly acknowledge here as such, concerns whether the activity that is to account for the spatial presence of a monad should be understood in terms of extrinsic relations or internal/intrinsic properties. Wolff and Baumgarten, as proponents of intra-substantial causation, i.e., pre-established harmony, must hold that (causal) activities are intrinsic, whereas Kant, as a proponent of inter-substantial causation, i.e., physical influx, thinks that they must be extrinsic relations.

Accordingly, one can see the point of the *Physical monadology* as follows. In attempting to explain how monads constitute, contribute to, or 'result in' the properties of extended bodies, Kant follows Knutzen's general strategy of arguing that accepting physical influx makes this task much easier (or perhaps possible at all). For if one accepts pre-established harmony and thus the claim that a monad's activities are internal/intrinsic rather than external/extrinsic (or relational), then one cannot straightforwardly appeal to these activities to explain the spatiality of bodies. For spatiality implies divisibility and if the activities constituted spatiality, then they, too, would be divisible, which is impossible if the activities are intrinsic to the substance. As a result, the point of the *Physical monadology* is to establish that one must accept causal relations between substances, that is, physical influx, in order to explain with any detail the relationship between monads (which, according to agreed upon metaphysical principles, possess unity essentially) and the spatiality of bodies (which necessarily entail infinite divisibility, according to the laws of geometry) in terms of activities.

Once again, whether or not Leibniz can provide an adequate explanation of the infinite divisibility of space in terms of a distinction between activities and their effects or on the basis of the confusion inherent in the representations of finite monads, it should be clear that Kant's *primary* interest lies elsewhere. His main goal is to explain the properties of bodies that science investigates (such as infinite divisibility, a property of interest to geometers and mechanists alike) through recourse to notions that are part of a satisfactory metaphysical account (which would include, for example, principles of unity). It turns out that certain metaphysical accounts, namely those provided by Wolff and Baumgarten, are inadequate to the task and are therefore to be rejected in favor of an account that Kant happens to have ready at hand from the *True estimation* and *Nova dilucidatio*.

4. Conclusion

What if I am correct in showing that Kant is interested primarily in his immediate predecessors and in the way in which scientific issues should be incorporated into

metaphysical principles in his early pre-Critical publications? Again, the traditional line, encouraged by some remarks Kant himself made late in his life, is to dismiss his pre-Critical writings as pre-Critical, that is, as not reflecting his Critical position, which alone are of interest. Whether or not Kant's Critical reflections alone are of lasting value in their own right, we can turn to yet another of Buchdahl's sage observations: 'If Kant's thought developed, and changed radically, one is apt to exaggerate the extent of these changes. More often than not traditional attitudes are merely integrated into new vistas; and the latter may even be subtly modified to accord with the earlier and older framework.'[27] If Buchdahl is, again, right (as I am convinced that he is), that leaves us with the interesting project, hardly begun, of considering in detailed ways the continuities and breaks, the shifts and the transformations of Kant's position on particular issues from his pre-Critical to his Critical period.[28]

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[27] Buchdahl (1969), pp. 471.
[28] For the start of such an attempt, see Watkins (1998).

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