Leibniz's Causal Theory of Time Revisited

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Abstract

Following the lead of Hans Reichenbach in the early twentieth century, many authors have attributed a causal theory of time to Leibniz. My exposition of Leibniz's theory of time in a paper of 1985 has been interpreted as a version of such a causal theory, even though I was critical of the idea that Leibniz would have tried to reduce relations among monadic states to causal relations holding only among phenomena. Since that time previously unpublished texts by Leibniz have become available in which he himself explains temporal precedence in terms of causal precedence, and these texts have been given careful scrutiny by other scholars, such as Jan Cover, Stefano Di Bella and Michael Futch. In this paper I respond to their analyses, and try to make precise the way in which Leibniz's views on time and on causality fit together in his metaphysics.

Introduction

On the basis of the account of time given by Leibniz in his *Initia rerum mathematicarum metaphysica* of 1715 several authors have attributed to him a causal theory of time. In the crucial passage of that work Leibniz wrote:

> *If several states of things are supposed to exist, none of which involves the other, they are said to exist* **at the same time**. Thus we deny that those things which happened last year and those happening presently exist at the same time, since they involve opposite states of the same thing.
>
> *If one of two states that are not simultaneous involves the reason for the other,* the *former* is held to be the *earlier,* the *latter* to be the *later.* My earlier state involves the reason for the existence of my later state. (*Initia Rerum*, GM VII 18)

Bas van Fraassen comments: "In other words, according to Leibniz the various circumstances or states of affairs are related to each other as cause to effect, and by definition, the cause is earlier." (Van Fraassen 1970, 38). Here he was following the lead of Hans Reichenbach, who in promoting the causal theory of space and time in his posthumously published *Philosophy of Space and Time* had argued that "it was none other than Leibniz who developed in his *Initia rerum mathematicorum* [sic] *metaphysica* the basic ideas of this conception" (Reichenbach 1958, 269).[1]

Similarly John Winnie, in his seminal article "Causal Theories of Spacetime", wrote that Leibniz "seems to have been the first to conjecture that the structure of time and space might be reducible to causality" (Winnie 1977, 136).

In my paper "Leibniz's Theory of Time" (1985) I was skeptical of attributing a causal theory to Leibniz, especially one that restricted temporal order to an ordering of phenomena. For many commentators have held that monads (like Kant's "things-in themselves") do not exist in time. This implies that his theory of time, again like Kant's, must be a theory of the *temporal order of phenomena*, not of the order of monadic states—a view I held to be mistaken. Although I did not direct my criticisms at anyone in particular, the interpretation of Jacques Jalabert would have served as a case in point. Arguing that Leibniz's use of the term 'phenomenon' should perhaps be interpreted in "an almost Kantian sense", Jalabert argued that "on the plane of veritable reality" of monads and their states, "the substance would deploy, independently of time, the entire series of its virtualities; between the terms of the series there would subsist the priority of nature, …but there would be no chronological priority."[2] In a similar vein Glenn Hartz and Jan Cover have argued in an influential article (Hartz and Cover 1988) that Leibniz's advocacy of the ideality and continuity of time in his mature work precludes its applicability to monads and their states, which are, on the contrary, truly actual and discrete.[3] Against such interpretations, I quoted many passages where Leibniz clearly regards the monadic states as chronologically ordered. For instance, in the course of clarifying the nature of substance to Burchard de Volder in January 1704, he explained:

> The succeeding substance is held to be the same when the same law of the series, or of continuous simple transition, persists; which is what produces our belief that the subject of change, or monad, is the same. That there should be such a persistent law, which involves the future states of that which we conceive to be the same, is exactly what I say constitutes it as the same substance. (to De Volder, 1704/1/21: GP II 264)

Similarly, in his fifth and last letter to Clarke, Leibniz wrote:

> Since the nature of every simple substance, soul, or true monad, is such that its following state is a consequence of the preceding one; it is there that the whole cause of the harmony is to be found. For God has only to make a simple substance be once and from the beginning a representation of the universe, according to its point of view; since from this alone it follows that it will be so perpetually, and that all simple substances will always have a harmony among themselves, because they always represent the same universe. (V §91; GP VII

412)

Some commentators have tried to dismiss Leibniz's letters for Clarke as not representing his "deep and considered metaphysics".[4] But Leibniz was adamant that monadic change is presupposed by phenomenal change: "I also take it for granted that every created thing is subject to change, and therefore the created monad as well; and indeed that such change is continual in every one" (*Monadology* §10; GP VI 608/WFT 269). Accordingly, his justification for applying the same time concept to phenomenal changes as to monadic changes of state is that the former are results of, and are grounded in, the latter. All things change, and composite things (phenomena) change because of the changes in simple things from which they result. Leibniz was perfectly explicit on this point in a previous letter to De Volder (June 1703):

> You doubt, distinguished sir, whether a single simple thing would be subject to changes. But since only simple things are true things, the rest being only beings by aggregation and thus phenomena, and existing, as Democritus put it, nòmw not jusei, it is obvious that unless there is a change in the simple things, there will be no change in things at all. (GP II 252)

Thus, because Leibniz explains phenomenal changes as resulting from monadic changes, it seemed clear to me that his theory of time would primarily be a theory of the ordering of changes in monadic states.[5]

My second and third objections to attributing a causal theory to Leibniz depended on the derivative nature of causation in Leibniz's metaphysics. In his account of causation Leibniz famously does not accept that any one substance has any real influence on any other, construing the phenomenon of causal action of one body on another in terms of the intelligibility of explanatory accounts. It therefore seemed unlikely to me that he would try to explain relations among monadic states by appealing to causal relations among phenomena. Thirdly, I objected that if physical causation is understood in terms of collisions of bodies, this would preclude the possibility of a purely phenomenal theory of time. For according to Leibniz's doctrine of the relativity of motion, it is impossible to determine which of two bodies in relative motion is really the cause (Arthur 1985, 299).

For all these reasons, I thought it best not to attribute a causal theory to Leibniz, and to follow more closely his own account in the *Initia Rerum*, which proceeds in terms of the relations of "compatibility" of states, and of one state "involving the reason for" (or in alternative translation, "contains the ground for") another.

Consequently, in my (1985) I represented the latter relation by *G*, defined on the

aggregate of all the states in a given world, *W*. For any two states *a* and *b*, if they are states in the same monadic series, either *aGb* or *bGa*. "My earlier state involves the reason for the existence of my later state." (*Initia Rerum*, GM VII 18). Using this relation as primitive, I then defined compatibility in terms of it: any two states *x, y* of this aggregate are *compatible* (*xCy*) iff neither contains the ground for the other, ¬*xGy* & ¬*yGx*.

On the assumption that *C* is an equivalence relation, all those states related by *C* will form an equivalence class of *simultaneous* states. That *C* is an equivalence relation is achieved by what Winnie has called Leibniz's *Axiom of Connection*, "the connection of all things":

> since, because of the connection of all things, my earlier state involves the earlier state of the other things as well, it also involves the reason for the later state of these other things so that my earlier state is in fact earlier than their later state as well. (*Initia Rerum*, GM VII 18)

Thus "If *a* is simultaneous with *b*, and *b* involves the reason for *c*, then *a* also involves the reason for *c*". Interpreting the notion of mutual "involvement" underlying simultaneity as the relation of compatibility *C*, I rendered this as:

> For all states *a, b, c, d* ε *W*, if *aCb* and *bGc*, then *aGc*.

With this axiom in place, one can turn the wheels of logic to demonstrate that *C* is an equivalence relation, thus securing a serial ordering of states by *G* which underpins their serial ordering in time.

Some comments about what I took this account to have achieved:

1. It demolished the objection of Bertrand Russell, endorsed in different ways by Nicholas Rescher and J. E. McGuire, that it is necessary to ascribe two time concepts to Leibniz, an "inter-monadic time" in addition to the intra-monadic time series that was presupposed for each monad. Instead there is only one relation, *G*, which orders all monadic states in the same world; and state *a* temporally precedes state *b* precisely if it involves the reason for it.

2. This was achieved by appeal to the Axiom of Connection. But my reading of this was that *a involves the reason* for *c*, but it does not *cause c*, because there is no causal influence of one substance on another. This was one reason I held that Leibniz would not have reduced time to cause: states involve reasons for the future states of other substances, they do not produce them by any causal influence.

3. Contrary to other commentators' readings of Leibniz, I did *not* conceive this as an *eliminative reduction* of temporal succession to succession in the order of reasons (or as giving a "B-theoretic account")[6], precisely because, as I was at pains to stress, for Leibniz there is no time without change, and the tendency to change has to be presupposed as a fact of experience. In the *Monadology* "Leibniz explicitly postulates a principle of becoming for his monads" (1985, 276), namely *appetition*. Cf. also his explanation to De Volder in November of 1703:

> I do not see how you could have doubts about the internal tendency to change in things, since we are taught that there are changes in things by our experience of the phenomena, as well as from the inside, where the operations of the mind themselves exhibit changes. Therefore, I think that the fact is demonstrated *a posteriori*. (GP II 258)[7]

Now let me turn to some criticisms.

2. Jan Cover's criticisms

The principal objection to my reluctance to ascribe a causal theory to Leibniz is that he himself explicitly advocates one in various unpublished manuscripts from the mid-1680s, as I realized while compiling my translation volume in the 1990s. After hearing Jan Cover's critique of my paper in Germany (Cover 1994), I sent him some representative passages, to which I will return presently. He published his subsequent (appreciation of and) critique of my (1985) in a paper (Cover, 1997) dealing with the question of theories of time in the context of reduction.

One of the main objections Cover presents to my treatment of Leibniz's theory of time in that paper is as follows (I'll come to two other criticisms in due course): he takes issue with my defining compatibility of two states in terms of neither containing the ground for the other. The relation of "containing the ground for" he calls "real causality", arguing that for individual series it is clearly *"real causality — the primitive active force given by each substance's law of the series — that orders the monadic states S_m."* (1997, 310). This he contrasts with what he calls "pseudo-causality", the relation ordering states of different monadic series. Consequently, he contends, to portray *G* as a relation ordering states of the same or different series alike "fails at worst, and is unsatisfying at best. For, either it gives the wrong results for simultaneity (states of a single monad are really causally connected and not pseudo-causally connected, yet fail to be simultaneous) or else, being disjunctive

(real cause or reflection of real cause), is awkwardly uneconomical" (312).

To this I would respond as follows. Active force is not a causal action of states upon states. One state of a substance may be said to be a "real cause" of another of its states in the sense that it involves the reason for it; but it does so by virtue of the law of the series of that individual substance, and the substance's appetition towards its future states, not by virtue of the first state's acting on the second.[8] According to Leibniz, as I understand him, the same state of affairs may be expressed in terms of final causation, or equivalently in terms of efficient causation: they are complementary ways of expressing the same phenomenon. Thus a monad in some state *a* inclines towards a state *b* for the sake of some end, without this necessitating *b*. Equivalently, if *a* involves the reason for the existence of *b*, then by virtue of the monad's active force and the law of its series, *b* may be certain to occur; but it is not logically necessary that it should occur, as there is an infinite sequence of intermediate states between *a* and *b* making the link between them a contingent one.[9] The action of the internal principle that brings about change does not always bring about the state to which it tends. Nonetheless, "it always obtains some part of it, and attains new perceptions [states]" (*Monadology*; GP VI 609/WFT 269). A state with a given tendency does not always bring about the result towards which it tends because there are other monads with possibly opposing tendencies, and these manifest as resistances to the monad's actions which become more clearly expressed in its future states.

Second, it is Leibniz (not me!) who introduces the idea of states from differing monadic series involving the reason for each other. Although active force or appetition is the principle by which the states of a given monadic series follow on one another, *G* must be defined on all the states of a given world. There is only one relation *G*; and the relation is not a force. Cover presumably calls *G* "pseudo-causation" when it relates states of different monads because there is no causal action ("real causation") between different substances. But clearly Leibniz did not think that this precluded such states as being *related* by *G*. A substance acts through its changes of state, and its earlier state contains the reason for its future states and those of other monadic series alike.[10] Moreover, if (as is customarily assumed) things that are external to one another are related as cause to effect, then it is not just the prior states of a given monad that cause its future states. This is relevant to the point I made above about contingency. If a state of a monad is the result not only of an earlier state with some tendency in the same monad, but of states with possibly opposing tendencies in all the monads in that world, then perhaps "real

causality" is not simply "intrasubstantial" as Cover contends (1997, 311), but in fact intersubstantial.

Third, we need to be a little more rigorous about how we use language here. *Causality* is the fact that causation occurs, that there is a cause (which we shall treat from now on in terms of efficient cause) and an effect. *Causation* is the action by which a cause brings about or produces an effect: Leibniz was a severe critic of accounts that assumed that this must take place by *influence*, that is, by something going from the cause into the effect to bring about changes in it. And finally, a *causal relation* is the relation between cause and effect. Leibniz did not deny causality. Far from it, his Principle of Equipollence, the principle that the Full Cause is Equipollent to the Entire Effect, was one of his most cherished principles, and it clearly presupposes that causation occurs. But primitive active force is not a force in Newton's sense, existing in one thing and acting on another: it is a dynamic principle by which changes in a substance have the power to spontaneously occur. Denying the possibility of any influence (whether metaphysical or physical) passing from the cause to the effect, Leibniz proposed that all the facts about an instance of causation between thing A and thing B could be treated in terms of the causal relations that obtain between the changes in A and consequent changes in B. And this is all that is necessary to ground a causal theory of temporal precedence: an account of state *a*'s being earlier than *b* in terms of the *relation* of causal precedence between *a* and *b*. This can be achieved even if there is, strictly speaking, no action of one state on another.

Cover is quite right, though, to object to my argument from the relativity of motion among bodies—the second of his criticisms that I will consider. Whether A causes B to move or vice versa, this will not affect the temporal order of any collisions they undergo: the states of motion of two bodies before their collision will constitute the requisites of their colliding irrespective of their velocities relative to some third body, provided their relative motion is the same. Moreover, another consideration is relevant here: as has become evident to me in my recent researches, it is only *motion understood geometrically* that Leibniz considers to be relative.[11] In all his writings on the subject from 1676-1716, Leibniz asserts that the equivalence of hypotheses applies only to motion as change of situation; when *causes of motion* are taken into account, however, it *is* possible to identify the subject of motion. So that objection of mine to the causal theory fails twice over: (i) not being able to identify the subject of motion is irrelevant to the causal ordering of events, and (ii) Leibniz invokes the notion of cause to identify the subject of motion.

But what about my earlier claim that "involving the reason for" is not the same as "causing" in the sense of one state's acting on another? In a recent article, Camilo Silva (2016) builds on this criticism, noting that Leibniz distinguishes the two notions of cause and reason. He quotes a passage from Leibniz's *De rerum origination radicali* of 1697 in support:

> For even though there is no cause for eternal things, we must still understand there to be a reason for them, which in perduring things is necessity or essence itself, whereas in a series of mutable things, if this reason is taken a priori to be eternal, it is a prevailing of inclinations…, where reasons do not necessitate (with absolute or metaphysical necessity, so that the contrary implies a contradiction), but incline. (GP VII 302/L 486)

Even clearer, says Silva, is another passage that Benson Mates found among Leibniz's unedited papers and translated, where Leibniz denies that reasons are to be identified with causes:

> Nothing is without its reason.
>
> Or, what is the same, nothing exists without its being possible (at least for an omniscient being) to give a reason why it exists rather than not, and why it is in this condition rather than in some other. … But, somebody will say, if nothing is without its cause, then there will be no first cause and no ultimate termination. The response is that though indeed nothing is without its reason, it does not follow that nothing is without its cause. For a cause is a reason for the thing that is outside the thing, or a reason for the production of the thing; though it is indeed possible for the reason for a thing to be internal to itself. (LHI, 4, 3 1-4/Mates 1986, 159)

From this Silva concludes that the presupposition of causal theories that the relation of reason inclusion is identical to the causal relation is "not completely justified".[12] It seems to me, however, that this consideration is not fatal to ascribing a causal theory of time to Leibniz, precisely because the very things he mentions here as having a reason but lacking a cause are *eternal* things, and these lie outside of time. The reasons that incline without necessitating in any series of mutable things will still involve the reasons for later states in any such series, and it is among the states of mutable things lying outside one another that causal relations can hold.

Relevant in this connection is a third objection raised by Jan Cover in response to my own skepticism about the prospects for a Leibnizian causal theory. The fact that "Leibniz appeals to deep metaphysical principles primarily because he *denies* causal interaction" would disqualify a causal theory of time "*only if* one adds to

it the falsehoods that: (i) Leibniz is unwilling to take pseudo-causal claims on the phenomenal level as meaningful and sometimes true; that (ii) he can give no account of what makes them true in terms of deep metaphysical principles; and that (iii) we have nothing in Leibniz's own words connecting claims of temporal relation with such deep metaphysical principles." (Cover 1997, 306) And we have precisely such claims in Leibniz's own words connecting temporal precedence to causal precedence in the texts from the mid-1680s. Let us now turn to them before proceeding to further criticisms.

3. Leibniz's causal theory of temporal precedence

In an important manuscript that the Akademie editors have titled *Divisio terminorum ac enumeration attributorum*,[13] which they tentatively date as being composed between summer 1683 and early 1685, Leibniz explicitly adumbrates a species of causal theory of time.

> Next, from two contradictory states of the same thing, that is *earlier in time* which is prior by nature, i.e. which involves the reason for the other, or what amounts to the same thing, which is more easily understood. For example in a clock, in order to understand completely the present state of its hands, it is required that we understand its reason, which is contained in the preceding state; and so on. And it is the same in any other series of things, for there is always a certain connection, even though it is not always a necessary one.
>
> *Simultaneous* things are those that are connected, whether by necessity, or with a certainty for which a reason can be given. But those things which cannot be simultaneous either without qualification [*omnino*] or for a reason, and yet exist, exist at different times; and that is earlier which involves a reason simpler than the other, as I have said. (A VI 4, 563/Ar 269-271)

Michael Futch, in an erudite analysis of Leibniz's studies from the 1680s, relates this notion of *priority by nature* to its Aristotelian origins (Futch 2008, 107-115). I refer the reader to his account, as well as that of Stefano Di Bella (2005). In these texts Leibniz defines a cause as a requisite or "a simpler condition, or as it is commonly called, a prior nature" (A VI 4, 627/Ar 271). This harks back to Aristotle's definition of priority by nature in the *Metaphysics* 1019a3: "those things [are prior by nature] that can be without other things, while the others cannot be without them" (Futch 2008, 109).

The importance of the notion of requisite may also have been brought to

Leibniz's attention by his studies of Hobbes in the early 1670s. At any rate, he does not refrain from acknowledging his debt to Hobbes for a demonstration of the Principle of Sufficient Reason in terms of this notion. Defining a "requisite" as "that which, not being given, the thing does not exist", Leibniz argues (in a paper dating from 1671-72) that whatever exists has all its requisites, since if it lacked any of them it would not exist. Likewise, given all its requisites, the thing must exist, since if it lacked any of its requisites, it would not exist. Now, if a "sufficient reason" is defined as "that which, being given, the thing exists", all the requisites constitute a sufficient reason for the thing's existence. It follows that "whatever exists has a sufficient reason".[14] These definitions are echoed in a wide-ranging table of definitions edited by Couturat, and dated by him as from 1702-04.[15] In this manuscript, as Futch observes, Leibniz defines a necessary condition (*suspendens*) as "that which, unless it is posited, the other thing is not posited", and a requisite as a "*suspendens natura prius*", i.e. a necessary condition that is prior by nature to that for which it is a condition (C 471; Futch 112). Similarly, a producer (*inferens*) is defined as "that which, when posited, the other thing is posited", and a sufficient cause (*causa sufficiens*) as an *inferens natura prius illata*, i.e. a producer that is prior by nature to what is produced. Thus although a requisite constitutes a partial cause, a producer that is prior by nature is a full cause, embodying all the requisites for the production of a thing.[16] If *a* is either a requisite or a producer of *b*, it is prior by nature to it, and thereby also earlier in time than it.

A possible objection to this theory was already recognized by Leibniz himself in a paper of 1679, *Quid sit natura prius*, as noted by Futch (and earlier by Stefano Di Bella in his 2005 book). This is that if priority by nature is understood in terms of one state's involving another, then two things could be prior by nature each to the other, thus undermining the asymmetry of the relation. Leibniz writes:

> There is some difficulty in explaining what 'prior by nature' might be. For, just as the later state of any substance involves the earlier, so in turn the earlier state involves the later, since each can be known from the other. Whence it seems to follow that to be prior is not to be simpler than the later, but both involve the same things, and there is a kind of equivalence between them. (A VI 4, 180)

The solution Leibniz offers is to distinguish simple involvement of A in B from ontological priority, which derives from A being "more easily understood" than B. "There are often many properties of the same subject," he writes, "one of which is more easily discovered and demonstrated, and nonetheless they are all reciprocal, and thereby involve the same things" (A VI 4, 180; Futch 2008, 111). Thus the idea

of priority by nature, like the notion of cause itself, carries an aetiological meaning: A is prior to B if A is more easily understood or more easily demonstrable than B:

> And so prior by nature is that whose possibility is more easily demonstrated; ôr, what is more easily understood. Of two states one of which contradicts the other, that is prior in time which is prior by nature. Two incompatible ôr contradictory existences differ in time, and that is earlier or later in time which is prior or posterior by nature. (A VI 4, 180)

Thus despite having "to abandon the tenet that a concept (or its designatum) is prior by nature only if it has fewer parts", Leibniz is able to preserve the objective asymmetry of precedence in the order of nature by tying ontological priority to what is more easily understood (Futch 2008, 111). "The natural priority of a cause is explained without any reference to temporal priority," Futch concludes, "as must be the case since temporal priority is partially defined by natural priority" (Futch 2008, 115). Similarly Di Bella: "the order of nature … confers its objective order not only on causality, but on time itself" (Di Bella 2005, 247).

Time, on the other hand, depends on change. And here, as Van Fraassen observed long ago, Leibniz avails himself of the Aristotelian dictum that time is nature's way of allowing contradictories to occur. This is confirmed explicitly in an earlier passage of the *Divisio terminorum*,

> Next we observe novelty or *change*, that is, contradictory attributes of the same thing. For example, things that are contiguous are separated from each other when everything else remains the same except contact. And consequently we conceive that the same things that were contiguous have become separated …But since it is impossible for two completely contradictory things to be said about the same thing, it follows that the only difference that occurs when everything else remains the same, and that brings it about that there is no contradiction of any kind when the same thing is said to be both contiguous to another and separate from it, is the difference of *time*. (A VI 4, 562/Ar 267)

as well as in another manuscript also from 1683-1685, *Genera Terminorum. Substantiae*:

> Change occurs if two contradictory propositions are true of the same thing, and then the two propositions are said to differ *in time*. …
> If one thing is the cause of another, and they are not able to exist at the same time, the cause is *earlier,* the effect is *later*. Also earlier is whatever is simultaneous with the earlier. (A VI 4, 568).

Thus, Futch comments, "Leibniz holds that the categories of cause and effect are

logically prior to change, and change in turn is logically prior to time" (Futch 2008, 107-08). Likewise, Stefano Di Bella concludes: "The category of Time is logically dependent on Causality (hence, on Consequence and Natural Order) on one hand, and on Change (hence, on Variety and Contradiction) on the other. In more modern language, Leibniz is putting forward a true causal theory of time." (Di Bella 2005, 248)

4. Futch's objection

At this point, however, Michael Futch raises an objection. He presents it as a "significant problem" for the expositions (based on Winnie's) that Cover and I gave in our papers (Arthur 1985, Cover 1997); if he is right, however, it is also constitutes a serious difficulty for Leibniz's own theory, as we shall see. The objection is that compatibility of states cannot be defined in terms of neither containing the ground for the other ($\neg xGy$ & $\neg yGx$) because *causes can be simultaneous*. "Specifically," he maintains, "Leibniz denies that things prior or posterior by nature or causally related are *ipso facto* incompatible and non-simultaneous" (119). Leibniz's notion of being "prior by nature", he contends, extends even to states existing in the same instant:

> According to Leibniz, for any given instant of time containing an infinite plurality of monadic states, it is in principle possible that some or even all of those states stand in relations of natural priority or posteriority to one another (at the same time). As a result, a straightforward transposition of Winnie's analysis onto Leibniz inevitably leads to a fundamental error. (Futch 2008, 119)

Futch cites several Leibnizian sources in support of this contention. The first is early: the *Theoria motus abstracti* (*TMA*) of 1671-2, in which Leibniz draws on the Scholastic theory of signs to support his idea that an indivisible instant can nevertheless have parts ordered by priority in nature. He argues that this is necessary to explain acceleration, since in order for a motion to be increasing at an instant there would have to be "an earlier and later, and so … one sign prior to another in a given instant". (A VI 2, 489/Ar 341-2). Leibniz will shortly afterwards (1672-3) reject the idea of indivisibles (whether points or instants) as constituents of the continuum, in favour of infinitely small but divisible lines and moments. But he does not thereby abandon the idea of priority in nature within an instant, as evidenced by the passage Futch cites from his *Theodicy* (§388), to which we will return later. Futch also references Leibniz's discussion in *Theodicy*, §66, of "the mutual dependence of soul and body" as evidence that "relations of action

and passion are necessarily reciprocal and pertain to things co-existing".[17] As circumstantial evidence for simultaneous causation in the period he also cites Hobbes, who, having defined a *full cause* (equivalently, entire cause) as one that "is always sufficient to produce its effect", infers that "whensoever the cause is entire, the effect is produced in the same instant" (MW 72; Futch 2008, 120, n. 12). Thus, Futch argues, it is a mistake to interpret Leibniz's notion of priority by nature as applying simply to non-simultaneous states:

> Within a single instant of time, substances can be active and passive with respect to one another, so that within a single temporal instant there can exist a multiplicity of "natural instants", or what Leibniz sometimes terms '*signa rationis*'. Consequently, the fact that one state is prior by nature to, provides a reason for, or is the cause of another state, is not sufficient for making those states incompatible and non-simultaneous. (Futch 2008, 120)

Moreover, as is clear from a closer reading of both the passage in the *Initia Rerum* and the above passage from *Genera Terminorum*, Leibniz defines precedence on *states that are not simultaneous*: "If one thing is the cause of another, *and they are not able to exist at the same time* [my emphasis], the cause is *earlier,* the effect is *later*." So non-simultaneity must be established first, and prior to defining *G*, contrary to my account and Cover's "First Version". If one state's containing the ground for another is only defined on states that are not simultaneous, we cannot define simultaneity in terms of the absence of ground-containing between any two states in a world.

At first sight, though, this seems to throw a wrench into Leibniz's causal theory itself: temporal precedence of states cannot be identified with their precedence in the order of nature, or one state's being a condition of another, since states that mutually condition one another are simultaneous. But if simultaneity has to be defined independently of cause, it seems we are being taken outside the remit of a strictly causal theory of time.[18]

Futch's own suggestion for resolving this difficulty is to abandon a strictly causal theory by bringing *space* into play to define simultaneity. He proposes that "we can simply identify a class of temporally simultaneous events with a class of spatially related events" (Futch 2008, 124). This, he urges, would bring Leibniz's theory into line with modern spatio-causal theories of time, where temporal precedence presupposes intervals in spacetime, and a theory of time cannot be formulated without consideration of space as well. To me, however, it seems that defining simultaneity on spatially related events would be circular in Leibniz's case,

given that he defines space as "the order of existence for those things which are simultaneous" (GM VII 18). Futch sees "The introduction of spatial positions into the construction of time order" as a virtue, since it precludes the events in question from being monadic states or changes, leaving time, like space, a construction from the phenomena. For the reasons given above, though, I do not share this view.

Moreover, I would maintain that there are sufficient resources in Leibniz's own theory to extricate it from this difficulty, and it is to this that I now turn.

5. Leibniz's causal theory reconsidered

This consideration depends on a distinction Leibniz makes in his analysis of conditions between *mediate* and *immediate requisites*, a distinction to which Futch himself draws our attention in his own exposition. As Leibniz states it in the manuscript *Definitiones Notionum Metaphysicarum Atque Logicarum* of mid-1685, "Some requisites of things are mediate, and must be investigated by reasoning, such as causes; others are immediate, such as parts, extrema, and generally things which are in a thing" (A VI 4, 627; Futch 2008, 112). When one thing is a condition of another by an intervening change, the first is precisely a *mediate requisite* for the second (A VI 4, 628), and thus a cause of it. "A cause", he specifies further, "is a requisite according to that means [*modum*] by which the thing is produced. I would prefer to call it an efficient cause." (A VI 4, 629; Futch 2008, 123). This aligns with the definition of a sufficient cause we noted above as an "*inferens natura prius illata*", "a requisite according to which the thing is actually produced" (A VI 4, 563; Futch 2008, 112), "a reason for the production of the thing" (Mates 1986, 159).

A requisite or condition is *immediate*, on the other hand, if it involves no intervening changes. As we saw, the examples Leibniz gives are "parts, extrema, and generally things which are in [*insunt*] a thing" (A VI 4, 627; Futch 2008, 112). The relation of *inesse* ('being in') is of course of very general application in Leibniz's conception. A point may be in a line, and a monad may be in an organic body, in the sense that once the latter is given, the former is immediately understood to be given too; and a concept A may be in a concept B in the sense that B involves or entails A. Some things, however, mutually entail or involve one another. In such cases they are said to be *absolute conditions* of one another: each entails the other without any intermediary. This is of critical relevance to the theory of time, since simultaneous things are understood by Leibniz to be conditions of one another in precisely this absolute sense: each involves the other without there being any

intervening change:

> Those things are simultaneous one of which is the condition of the other absolutely. Whereas, if the first is the condition of the second by an intervening change, then the first is earlier, the second later. Now the earlier is understood to be that which is simultaneous with the cause, the later that which is simultaneous with the effect. Or the earlier is understood to be that which is simpler than or what is the requisite of the second. A requisite I have defined as a condition simpler by nature than that whose condition it is. (mid-1685; A VI 4, 628)

Or, as he expresses it more succinctly in *Genera Terminorum* from 1683-85:

> If B follows from A absolutely, B is *simultaneous* with A. Likewise those things which follow absolutely from the same thing are simultaneous. On the other hand, those things that oppose one another are not simultaneous.
>
> If one thing is the cause of another, and they are not able to exist at the same time, the cause is *earlier,* the effect is *later*. Also earlier is whatever is simultaneous with the earlier. (A VI 4, 568).

Thus those things which condition one another absolutely—that is, follow absolutely from the same thing, or involve all the same things—are simultaneous. If two states A and B are not simultaneous, and A is the requisite of B, then it will be its mediate requisite, which means that there will be intervening changes between A and B.

In fact, this solution tallies with the account already provided by Cover in his "Version 2" of Leibniz's theory of time. There he proposes to begin with the notion of a "state of affairs", and to define a world-state as a maximal state of affairs (Cover 1997, 312). Then one can define simultaneity directly in terms of a monadic state's *containing* a world-state: "two states are simultaneous iff the world-state contained by one is identical with the world-state contained by the other." (312). To put this in slightly more recognizably Leibnizian terms, two states are simultaneous iff they are *representations* of, or *expressions* of, the same state of the universe, albeit confusedly, and from each substance's own point of view. Although such perceptions are not distinct, failing to reveal the rest of the universe in all its detail, they do indeed involve everything else in the universe, according to Leibniz. Now since world-states are maximal, any two such states are identical iff neither involves a state the other does not. Therefore, given the definition of two states as simultaneous iff they involve an identical world-state, the relation of simultaneity is established as reflexive, transitive and symmetric, independently of considerations of cause. Moreover, since by these definitions a world-state is clearly an immediate requisite of all the states involving it—each of these states involves all the same things—all

simultaneous states are conditions of one another absolutely. Thus Cover's Version 2 is in complete conformity with the account Leibniz gave in the preceding texts.

Let me say a little more about the notion in play here of "perceiving the rest of the universe", since talk of a monadic state's "containing a world-state" is apt to sound rather abstract and metaphysical, as if it takes place on some noumenal plane. But Leibniz is explicit that he means something quite concrete: when a state or perception represents the rest of the universe, it represents an aggregate of *external things*, that is, phenomenal bodies and their motions. What are perceived are not pure states, but external phenomena and their changing relations; and this requires the monads in question all to be embodied. As he writes in a manuscript from around 1712 first published by Couturat in 1903, translated by G. H. R. Parkinson as "Metaphysical Consequences of the Principle of Reason":

> every simple substance has an organic body which corresponds to it — otherwise it should have no orderly relation to other things in the universe. … there would be no order among these simple substances, which lack the interchange of mutual influx, unless they at least corresponded to each other mutually. Hence it is necessary that there is between such substances a certain relation of perceptions or phenomena, through which it can be discerned how much their modifications differ from one another in space or time; for in these two, time or place, consists the order of things which exist either simultaneously or successively. From this it follows that every simple substance represents an aggregate of external things, represented in diverse ways. (C 14/MP 175)

Thus such representation requires a mutual relation among coexisting perceptions. Leibniz explains this with his famous image of monads as *living mirrors*, where each one reflects all the rest:

> … Therefore, since every organic body is affected by the entire universe through relations which are determinate with respect to each part of the universe, it is not surprising that the soul, which represents to itself the rest in accordance with the relations of its body, is a kind of mirror of the universe, which represents the rest in accordance with (so to speak) its own point of view. (C 14/MP 175)

Here (as Leibniz also explains elsewhere) this mirroring or representing does not require the presence of an image in the perceiving organs. Rather, "it is sufficient for the expression of one thing in another that there should be a certain constant relational law by which particulars in the one can be referred to corresponding particulars in the other" (C 15/MP 176-177). Perception does not require an action, but a relation of correspondence. This relation, namely that of each state's

"containing" or "involving" the other, is synonymous with that of being its condition absolutely, as we have seen.

Let me now return to Futch's criticisms. First, he charged that since Leibniz defines temporal priority in terms of causal priority only for states that are not simultaneous, simultaneity must be defined first. We have seen that Leibniz did give an account of simultaneity independent of cause, defining it in terms of two states being absolute conditions of one another, or mutually involving one another, or of reflecting the same state of the universe. As Cover observed, this allows a construction of Leibniz's theory of time order that accords well with his own words, and is free of difficulties. As it stands, though, this is not a pure causal theory, as the relation of mutual involvement or reflecting the same state of the universe has to be taken as basic. For if two states involve one another absolutely (are each other's immediate requisites), they are precisely not causally related, since an immediate requisite cannot involve intervening changes.

Ironically, however, this very fact allows for the construction of a causal theory of time order after all—or at least, one given entirely in terms of the notion of requisite. For if a is a requisite of b, it must be either an immediate requisite (involving no intervening changes) or a mediate requisite (involving intervening changes). And we have just acknowledged that if a involves b absolutely, it does not cause b. But now by conversion it follows that if a causes b, it does not involve b absolutely (there are intervening changes), so that a and b are not simultaneous. All we need is an axiom to the effect that given any two states a and b of the same world W, one of them must be a requisite of (i.e. a necessary condition for and prior by nature to) the other, either aRb or bRa (or both). If a is the immediate requisite of b, then a and b involve one another, or reflect the same state of the world. They are thereby compatible, and therefore simultaneous. If a is a mediate requisite of b, then it is the cause of b, and is thereby earlier than b. This rehearses what Cover called his "Version 2" of Leibniz's theory.

Alternatively, though, we can give a theory corresponding to Cover's "Version 1". Again, we will assume that given any two states a and b, either aRb or bRa (or both). But if a is the cause of b, aCb, then it is a mediate requisite of b. It is a mediate requisite of b if and only if it is not an immediate requisite of b, in which case a and b are not simultaneous. And similarly for bCa. This entails that if either aCb or bCa then a and b are not simultaneous; and if it is not the case that either aCb or bCa, but still aRb or bRa (or both), then a and b are immediate requisites of one another, and are therefore simultaneous.

But what, then, are we to make of Futch's claim that "Leibniz denies that things prior or posterior by nature or causally related are *ipso facto* incompatible and non-simultaneous" (Futch 2008, 119), and the textual evidence he gives in support of it? One problem here is his equating of priority by nature with cause. We have seen that it is indeed possible for two states to "stand in relations of natural priority or posteriority to one another (at the same time)", but these states will be ones that condition one another absolutely, with no intervening changes. This precludes one from being the mediate requisite of the other, and therefore from being its cause.[19]

What about the passages Futch cites concerning the doctrine of signs? In the first of these, from the *TMA*, Leibniz attempts to explain acceleration, for example, by appeal to there being an earlier and later within an instant, corresponding to priority and posterity in nature—a theory which he abandons when he abandons the idea of indivisibles constituting the continuum in 1672-3. In the passage from *Theodicy* §388, however, Leibniz grants that "the instant *excludes all priority of time*, being indivisible" (GP VI 345-46/T 367-58, my italics). So in this later text Leibniz is no longer appealing to the theory of signs as grounding temporal precedence within an instant. Here it is a question of "the production or action by which God produces" being "prior by nature to the existence of the creature that is produced" (346/357). In the same way, we attribute to God an understanding of syllogisms, seeing a demonstration in its natural order; "but there is no order of time or interval to cause him to advance in knowledge and pass from the premises to the conclusion" (§389, 346/358). In sum, Leibniz is concerned in this discussion to present divine action and thought in such a way that God is not presented as a temporal being. He is not arguing that there is temporal priority within an instant.

In the other passage from the *Theodicy* cited by Futch, §66, Leibniz is mainly trying to explain how it is that it seems as though the soul is acting on the body. But in fact all we have is a mutual correspondence supported by the pre-established harmony, and not an instance of simultaneous causation of mind on body. Leibniz then extends this explanation of apparent causal action in terms of the pre-established harmony to the apparent "actions of simple substances on one another" (GP VI 139/T159). But, contra Futch, in talking of the reciprocal nature of action and passion he does not claim that action in one substance and passion in the other are simultaneous. Rather, this seems to be an allusion to his account of causation in terms of "the reasons which explain clearly what is done and which have served to bring it into existence" (139/159). It is to this account of causation that I now wish to turn.

6. Leibniz's theory of causation

According to Leibniz, each substance is tightly linked to all coexistent substances by the fact that their states must express the same phenomena from their own point of view. This means that the internal action of change of perceptions must correspond with similar actions in all things that are coexistent with and external to it. This allows Leibniz to give an account of the action of one substance on others external to it, despite the lack of an influence propagating from one to the other. As he explains in the *Monadology,* "This interconnection, or this adapting of all created things to each one, and of each one to all the others, means that each simple substance has relationships which express all the others" (§56, GP VI 616/WFT 275). Thus, although "one created monad could never have a physical influence over the interior of another" (§51, 615/275), a "created thing is said to be active externally insofar as it has perfection, and to be passive towards another insofar as it is imperfect" (§49, 615/274). That is, a created thing can truly be said to be *active externally*, to *cause* something to occur in another, "insofar as what can clearly be understood in it serves to explain what happens in the other" (§52, 615/275).

  As should be evident, this account is consistent with what Leibniz had written in the texts we considered from the 1680s, where a cause is a mediate requisite, a requisite is a condition prior by nature to what it is a condition of, and "prior by nature is that whose possibility is more easily demonstrated; that is, that which is more easily understood" (A VI 4, 180). A's being "more easily understood" than B is explicated in terms of its serving better "to explain what happens in" B. This elucidation also tallies with what Leibniz says elsewhere about identifying the cause of motion in a system of bodies in relative motion. The following passage from *A Specimen of Discoveries* (from about 1686-9) is particularly clear:

  And that thing from whose state a reason for the changes is most readily provided is adjudged to be the cause. Thus if one person supposes that a solid moving in a fluid stirs up various waves, another can understand the same things to occur if, with the solid at rest in the middle of the fluid, one supposes certain equivalent motions of the fluid <in various waves>; indeed, the same phenomena can be explained in infinitely many ways. And granted that motion is really a relative thing [*res respective*], nonetheless that hypothesis which attributes motion to the solid, and from this deduces the waves in the liquid, is infinitely simpler than the others, and for this reason the solid is adjudged to be the cause of the

motion. Causes are not derived from a real influence, but from the providing of a reason. (*Specimen inventorum*, A VI 4, 1620/Ar 311)

The relativity of motion, as I have explained elsewhere (Arthur 2013b and 2015a), applies to motion insofar as it is conceived geometrically, that is, as change of situation. But it is nevertheless possible to identify the cause of motion according to the most intelligible hypothesis. Thus in this case, when a boat, say, moves with respect to the water, by the same token the water is moving with respect to the boat, if that is held to be at rest instead. Still, it is "infinitely simpler" to attribute the motion to the boat than to regard all the waves converging on the boat in just such a way as to cause it to move. So, by appeal to the most intelligible hypothesis, we identify the boat as the cause of the motion. Now, having identified the boat's being set in motion as the cause of the ripples in the water, we know that its states at some earlier time are not only earlier than its own later states, but also contain the reason for the water's later states.

The boat and the water, of course, are not simple substances, but composites or well-founded phenomena. This creates a problem for those accounts of Leibniz's metaphysics which situate monads in an intelligible realm distinct from the realm of phenomena. Why would Leibniz try to explicate the idea of one state involving the reason for another in terms of phenomenal states if that were so? If the relation of involving the reason for is defined only for monadic states, and not for the states of things existing in space and time, this would make little sense. And yet Leibniz typically does explain one state's involving another by reference to phenomenal states. In the passage from the *Divisio terminorum* of 1683-5 it is the state of the hands of a clock whose reason is contained in its preceding state (VI 4, 563/Ar 269).

But, I would insist, this is how it has to be, since the states of monads are perceptions of the rest of the world from different points of view, and, as we have seen, the rest of the world is the "aggregate of external things, represented in diverse ways". It is through its organic body that a monad is situated spatially, and this body is an (infinite) aggregate or composite of simple substances. Each of these represents the rest of the world from the point of view of its own body, from where that body is situated with respect to the other bodies at each given time. Futch himself expresses this well: "The very fact that one monadic state is temporally related at all to another monadic state can be extracted only from an examination of the phenomenal world they represent." (Futch 2008, 170)

Thus if it is indeed the boat that is the cause of its motion relative to the water, then

all the subsequent states of the monads whose aggregates constitute the resulting ripples in the water must be adapted to all the prior states of the monads whose aggregate constitute the boat. So these prior states of the boat-monads contain the reason for not only all the subsequent states of the boat (explaining its motion through space and time), but also the reason for all the subsequent states of the monads in the ripples, to which they are therefore earlier. The causal precedence of one phenomenon to another therefore entails the temporal precedence of the states of the monads in the two phenomena. The causal theory temporally orders the states of composites and of simples alike.

7. Some final reflections

1. On the account I have offered, Leibniz does not reduce time to cause in the sense of an eliminative reduction. Causal precedence entails temporal precedence; but this does not entail that monadic states do not really stand in temporal relations to one another.
2. Both causal precedence and temporal precedence are based on "involving the reason for", which relates states of substances and composites alike. The result is not a pure causal theory, but one in terms of requisites or conditions, including absolute as well as necessary or sufficient conditions.
3. One advantage of the account I offer, I contend, is that it does not presuppose a levels ontology, according to which monads are noumena, existing on a different plane from phenomena. Each monadic state represents the whole world as it appears to that substance from its own point of view—i.e. represents the phenomena external to the monad. So a monadic state is a representation of external phenomena. Moreover, the phenomenal bodies represented are, according to Leibniz, aggregates of monads; their unity is phenomenal, supplied in perception; the monads constituting the aggregate, and their (infinite) multiplicity is not. A division into two distinct planes of existence cannot do justice to these facts, and produces unnecessary difficulties of interpretation.
4. The theory as described is a theory of temporal order, consistent with Leibniz's description of time as the ordering of successives. But it falls short of a full theory of time in two respects. One is that Leibniz assumes that quantity of time is measured by a uniform motion, such as that of a perfect clock's hands. But this means that a full explication of time necessarily involves a consideration of motion, and the providing of a foundation for the congruence of motions

occurring at different times. Insofar as this will involve a consideration of space as well as time, this justifies Futch's claim that a causal theory (in order to be a complete theory of time) requires consideration of space as well as time.

5. A second respect in which this account is incomplete is that it gives no treatment of the continuity of time. Leibniz does offer such an account, I contend. But it involves treating the difficult "problem of monadic states", identified by Whipple: that is, the whole question of how Leibniz is entitled to assume that monadic states are instantaneous, what the status of such states is in relation to monadic durations, and whether such durations are resolvable into discrete states (Whipple 2010, 399-400). This I have treated elsewhere (Arthur, unpublished ms.).

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