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Michael J. Futch, Ph.D
University of Tulsa
USA

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For Catherine

Preface

The writing of this book was facilitated by the assistance of many facets of the University of Tulsa. I would like to express my gratitude to the Henry Kendall College of Arts and Sciences for providing me with a sabbatical during the Spring term of 2007, and to the Office of Research and Sponsored Programs for three grants to fund summer research. The importance of supportive departmental chairs to junior faculty members cannot be overstated, and I have had the good fortune of having had two such individuals, F. Russell Hittinger and Jacob A Howland, encourage me in the completion of this book. My interest in Leibniz was first kindled by Donald Rutherford, who, since my days as a graduate student, has provided guidance and insight that has been invaluable to my understanding of Leibniz. My debt to other Leibniz scholars, including, and sometimes even especially, to those with whom I disagree, is apparent throughout the book. Two, however, merit special mention: the work of Richard Arthur and Jan Cover on Leibniz's philosophy of time serves as a benchmark in this field, and I never find myself differing from them with much confidence.

I would also like to thank the editors of the *British Journal for the History of Philosophy*, *International Studies in the Philosophy of Science*, and *International Philosophical Quarterly* for allowing me to include in the following pages portions of previously published articles.

Contents

Introduction

In Leibniz's philosophy of space and time converge the central elements of his metaphysics and natural philosophy. Consistent with an austere ontology according to which "there is nothing in things except simple substances, and in them perception and appetite" (G 2.270/L 537), Leibniz denies that space and time are to be included among the worlds' most basic constituents: time and space as such are not things or substances or accidents, but merely beings of reason whose reality is grounded in the mind. Similarly, in line with a metaphysics guided by the Principle of Sufficient Reason and the Principle of the Identity of Indiscernibles, Leibniz gainsays the philosophical and theological cogency of absolute space and time. Temporal and spatial facts about bodies are not grounded on facts about a substantival space or time existing in their own right, but are simply facts about the relatedness of those bodies.

The importance of Leibniz's views on space and time, both to his own philosophy and to philosophy more generally, have not been lost on his more recent counterparts. In Leibniz they see a philosophical, mathematical, and scientific adversary worthy of Isaac Newton, and in his views on space and time they find the first profound and comprehensive instance of relationalism. For these reasons, Leibniz's varied contributions to the philosophy of space and time have long been recognized as one of the hallmark achievements of early modern natural philosophy. Hans Reichenbach is only one of the many who lauds Leibniz for advancing ideas that exceeded the prevailing doctrines of his era:

> Only today, when physics has finally abandoned Newton's point of view in optics and mechanics, can we do justice to [Leibniz and Huygens] whose fate it was to have possessed insights that were too sophisticated for the intellectual climate of their times (1959, 46).

The "too sophisticated insights" possessed by Leibniz consisted primarily of his disavowal of absolutism and his espousal of relationalism, and it is first and foremost as a form of relationalism that Leibniz's philosophy of time "finally triumphed" (ibid., 49). Reichenbach's approbation has set the tone for several others, who similarly extol Leibniz's virtues as a philosopher of space and time. Lawrence Sklar has gone so far as to suggest that "one can extract all of the standard justifications of relationism from a careful consideration of Leibniz" (173). Similarly, Bas Van Fraassen applauds Leibniz as the "first major philosopher to grasp the importance of

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the subject of order to the theory of time" (35), and John Earman declares that "some of the very concerns raised by Leibniz… form the core of ongoing foundation problems in the general theory of relativity" (3). That Leibniz's theory of space and time would be admired, if not always endorsed, by such thinkers shows that it is no mere historical curiosity, but continues to be of intrinsic philosophical interest. In short, Leibniz's stock as a philosopher of space and time has never been higher, and in the chapters that follow I hope to vindicate this judgment.

Though Leibniz's views have received considerable attention from diverse philosophical corners, this scholarship has focused almost exclusively on his relationalism. To be sure, Leibniz's defense of relationalism is important for later theorists, but it is only a small part of a much broader and more encompassing philosophy of space and time. This undue emphasis has resulted in an understanding of Leibniz's views that is incomplete and, worse still, distorted. As much insight as has been gained into the basis and nature of Leibniz's relationalism, far too many questions about other facets of his views on space and time remain unanswered (and unasked): What kind of analysis does Leibniz provide of temporal anisotropy? Is time linear, or is space bounded? What is the relation between time and change, or time and causation? In the absence of an answer to these and other questions, we are left with only a very partial understanding of the full richness and complexity of Leibniz's philosophy of science and metaphysics. Yet it is precisely such questions that are almost entirely ignored in the existing body of scholarship on Leibniz.

In this study I aim to redress these deficiencies by providing a systematic examination of Leibniz's philosophy of space and time. In broad terms the book is divided between two different sets of concerns. The first is what I will loosely refer to as Leibniz's ontology of space and time. Most obviously, this includes delving into what kind of being space and time have, and how their mode of existence differs from and depends upon the existence of other kinds of *entia*. Chapter 2's examination of Leibniz's relationalism focuses on this topic. This covers well-trodden territory, though much of what I say will go against the current of Leibniz scholarship. Less obviously, the ontology of space and time also includes a host of other topics, some specific to Leibniz's philosophy, some not. Two examples of the latter: First, In Chapter 6 I argue that Leibniz adopts certain key components of what is commonly termed the "B-theory" of time. Second, in Chapter 8, I place Leibniz's views on space and time in the context of his natural theology by examining the relation between these two orders and God. Against the claims of many of his contemporaries, Leibniz holds that neither spatial nor temporal predicates can be applied to God in a literal sense. An example of the latter kind of topic – one specific to Leibniz's own philosophy – is Chapter 7's reconstruction of Leibniz's monadological metaphysics to show that monads are intrinsically non-spatial and, what is to be expected less, non-temporal. In themselves, monads have neither spatial nor temporal properties, but have a derived position in the order of space and time in virtue of the organic bodies phenomenally represented in their perceptual states. There is a sense, then, in which ultimate reality lies outside of space and time for Leibniz.

The second set of concerns centers on a theme almost entirely overlooked by Leibniz exegetes. In sharp contrast to previous studies, I investigate at length the

kind of topology Leibniz thinks that space and time have, and the way in which the topology of time is grounded on the non-temporal structure of causation. Specifically, I argue that Leibniz holds that space and time are necessarily unified, that space is infinite in extent, that he abjures from making claims about the beginninglessness of time while holding that it is without end, that time is necessarily linear, and that he adopts a causal theory of time, one that grounds temporal facts on more analytically basic causal facts. These claims will be defended in Chapters 3 through 5. An important part of these chapters will also be determining the extent to which Leibniz thinks that the structure of space and time is a strictly philosophical question, one that can be decided by *a priori* reasoning instead of empirical investigation. As we shall see, Leibniz usually attempts to establish claims about spatial and temporal topology on the basis of purely philosophical grounds.

A book on Leibniz's philosophy of time is of paramount importance for understanding early modern philosophy, and in particular early modern history and philosophy of science. We have seen above that the Leibnizian system represents one of the two major alternatives confronted by natural philosophers of his day. To understand what is involved in this system – what motivates it, what its strengths and shortcomings are, how it ramifies in other areas of philosophy and science – is to understand much about the intellectual landscape of early modern natural philosophy. What is more, an assumption underlying the entirety of this work is that Leibniz's philosophy of space and time can best be understood by placing it within its historical context. Hence, throughout the book I draw attention to the way Leibniz's views draw on or differ from not only his Newtonian opponents but also his ancient and medieval predecessors and early-modern contemporaries. This book, then, is very much a work in the history of philosophy and science. But a study on Leibniz's philosophy of time ought not to be driven by purely historical interests. As will be emphasized throughout the book, Leibniz's philosophy of space and time is no mere historical curiosity or quaint relic whose appeal is limited to the confines of early modern thought. In many respects, his treatment of this subject strikes a markedly contemporary tone, even beyond its appeal as a form of relationalism. Leibniz's causal theory of time, his reflections on the unity of space and time, and his analysis of change all resonate with ongoing debates in philosophy, making many of his contributions to the philosophy of space and time as alive today as they were three hundred years ago. In short, Leibniz's insights continue to afford us insight into the perplexities and puzzles of space and time. This enduring intrinsic philosophical appeal will be emphasized when appropriate occasions present themselves, which will not be infrequently.

Having said that, I should point out at the start that, these similarities notwithstanding, there is one respect in which Leibniz is decidedly a thinker of early-modern natural philosophy. I am referring to his ready reliance upon explicitly theological premises in arriving at conclusions about the nature and structure of space and time. This is true not only in the well-documented case of his relationalism, but also of many of his claims about the topological structure of space and time. For example, in Chapter 4 we will find Leibniz insisting that space must be of infinite extent and time without end in order for God to maximize reality, and in Chapter 3 we will

explore the ways in which Leibniz uses a certain account of how God creates worlds to argue that space and time are necessarily unified. Also of central importance to Leibniz's philosophy of space and time is the relation of these orders to God, a topic taken up in the final chapter. It would be grossly anachronistic to see in this reliance the use of an improvised *deux ex machina*. That, certainly, is not how Leibniz viewed the matter. Theological concerns are at the very heart of Leibniz's metaphysics, and his metaphysics is at the very heart of his account of space and time. It is hardly possible to disentangle these various threads from each other without unraveling the tightly-woven fabric of Leibniz's thought, including his philosophy of space and time.

In virtue of the nature of the topic, the book aims to be interdisciplinary and to reach an audience beyond the limits of scholars working on Leibniz or early modern philosophy. I have striven to make the book accessible and relevant to those working in the history of philosophy more generally, the history of science, the philosophy of science, metaphysics, the philosophy of space and time, and (at least with respect to portions of the book) natural theology. I thus draw on a wide range of historical and contemporary sources, ranging from Aristotle and Aquinas to Grunbaum and Newton-Smith. My objective in doing so is usually to cast light on Leibniz's own views, as is only fitting in a work about him. Yet there are points in the book where it might seem that I digress onto the historical and philosophical context at a length that is greater than necessary for purely exegetical purposes. If this is so, I ask the reader for indulgence in these detours, an indulgence that I hope will be repaid by a worthwhile excursus into philosophically rich terrain. Leibniz thought that space and time demanded earnest and intense philosophical reflection. This book attempts to be an exercise in that endeavor.

Chapter 1
A Brief History of the Philosophy of Space and Time

Few contemporary philosophers undertake an analysis of the nature of space and time without at least nodding in Leibniz's direction, and the enduring interest of Leibniz's contributions in this area will be a theme to which we repeatedly return. My aim in this chapter is rather different. Though Leibniz may have occasionally possessed insights that were, as Reichenbach put it, "too sophisticated" by the measures of his intellectual context, it is nonetheless the case that his views are part of a rich and multi-voiced conversation about the nature of space and time. One is hard pressed to find in Leibniz a question about space or time that was not posed, if not settled, either by those before him or by his early-modern peers. Furthermore, Leibniz is usually quite aware of his engagement with a tradition that provides form and content for the articulation of his own views. This is not to say that Leibniz uncritically absorbs and passively mirrors the views of others. To the contrary, his insights about space and time are not infrequently highly original, and at times widely divergent from prevailing orthodoxies. Additionally, even on those occasions when we find him forging an agreement with others, it is often an agreement reached on distinctly Leibnizian grounds. Be this as it may, the conceptual grid that makes for Leibniz certain kinds of questions intelligible is not one that originates *de novo* from his own writings. Why Leibniz would deem certain problems worth pursuing, questions worth asking, or answers worth considering can best be understood by seeing him as a participant in a larger narrative that runs through the history of philosophy. This chapter traces that narrative.

I will focus on only those topics in the history of the philosophy of space and time that intersect Leibniz's own writings, topics common to him and his predecessors and contemporaries. In particular, I have selected four themes to canvass: (1) the debate between substantivalism and relationalism, (2) the unity of space and time, sometimes loosely referred to as the "plurality of worlds," (3) the infinitude of space and time, or – what is *not* the same thing – the infinitude of the world in space and time, and (4) the linearity of time. In Chapter 8, I will examine Leibniz's views on the relation of God to space and time and will reserve until then a discussion of the corresponding historical background. I choose these topics because they are of central importance to Leibniz and are on that account the centerpieces of the book. They are in addition among the more salient recurring

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leitmotifs in the history of the philosophy of space and time. Even with my range of topics delimited in this way, I make no claims of comprehensiveness or completeness, goals that extend far beyond the confines of the present chapter. The history that follows is both quick and highly selective, narrated principally to place Leibniz against the backdrop of some of his predecessors and contemporaries, not to provide an exhaustive treatment of the history of the philosophy of space and time.[1]

1.1 Substantivalism and Reductionism

Given that there are certain spatial and temporal facts about the world, what is the ontological ground of those facts? From what metaphysical basis do those facts result? What must the world be like, and what kinds of things must it contain, in order for statements like "The birth of Leibniz is earlier than the death of Newton" and "Hanover is to the east of London" to be either meaningful or true? Those broaching these questions have often done so within the conceptual framework provided by the distinction between reductionism and substantivalism. The second camp argues that space and time are structures that exist and have the properties they do independently of the existence of objects located in space and time, or that the existence of temporal and spatial items such as moments and places are ontologically independent of and prior to the things that occur during or in them. Space and time have an intrinsic structure that is not grounded on the structure of something more metaphysically or physically basic. Additionally, space and time are substance-*like* in that they underlie events and processes, and the spatial and temporal relations of these events and processes are dependent upon on the relations of spatial points or temporal instants. The most familiar formulation of the substantivalist thesis is that given by Leibniz's principle adversary, Isaac Newton: "For time and space are, as it were, the places of themselves and of all things. All things are placed in time with reference to their order of succession and in space with reference to their order of position" (1996, 233). From the foregoing we can see that the substantivalist answers the question "What is the ontological ground of a world's spatial and temporal facts?" with the response, "Spatial and temporal facts about things in the world are determined by an underlying, independently existing spatial and temporal structure."

Against the substantivalist, the reductionist denies the philosophical cogency of conferring on space and time an ontologically independent, *sui generis* existence. Space and time are merely relations the existence of which depends on the existence of related things, usually material objects. As Leibniz will put it, space is

[1] Better and deeper surveys than what I offer here can be found in Sorabji (1983 and 1988), Jammer, Duhem, Grant, and Čapek (1987). Much of what follows draws heavily, if selectively, from these authors.

"something purely relative, as time is… I hold it to be an order of coexistences, as time is an order of successions" (LC 3.4). Moreover, these related things are not spatial places or temporal moments, but things that occupy spatial places and temporal moments. Absent such things – bodies or events – spatial and temporal relations would not exist, and, by extension, the world would have no spatial or temporal facts true of it.[2]

Focusing more narrowly on time, the substantivalist holds that the passage of time does not depend upon a change of events in time. A frozen or empty universe where there are no changes in things still contains different moments of time serially ordered since time of itself flows forth. Opposed to the substantivalist view of time and change is the thesis that there is such an intimate connection between the two that the former cannot exist without the latter. Following Newton-Smith, and for reasons that will become apparent below, I will refer to this as Aristotle's Principle, or AP. Unlike their substantivalist opponents, defenders of AP take time to be ontologically dependent on change: no change, no time. This does not mean that at every moment of any given duration all things are in the process of changing, but only that there can be no temporal interval during which there is no change by anything; for any given interval, at least one thing must undergo change, even if all other things remain the same.[3] In one sense of "change," AP comes out trivially true. Take the publication of "The Monadology." This event is constantly undergoing change with respect to its properties, or at least with respect to certain kinds of properties. More fully, this event has changed from being in the far flung future, to being in the immediate future, present, the near past, and finally the ever increasing remote past. These changes are sometimes referred to as "McTaggartian" changes, changes that involve only the tensed temporal properties of the events or objects in question. A defender of AP may very well think that all intervals involve McTaggartian changes, events passing from being future to present to past, but that they must involve something more as well. They must involve changes that do not

[2] In his forward to Jammer's seminal *Concepts of Space: The History of Theories of Space in Physics*, Albert Einstein explicates the distinction between reductionism and substantivalism in these terms: "These two concepts of space may be contrasted as follows: (a) space as a positional quality of the world of material objects; (b) space as a container of all material objects. In case (a), space without a material object is inconceivable. In case (b), a material object can only be conceived as existing in space; space then appears as a reality which in a certain sense is superior to the material world" (XV). Dainton explains the difference thus: "Substantivalists maintain that a complete inventory of the universe would mention every material particle and also mention two additional entities: space and time. The relationist denies the existence of these entities. For them the world consists of material objects, spatiotemporal relations and nothing else" (2).

[3] For a refinement of this formulation, see Newton-Smith, 14–15. Newton-Smith correctly observes that there is change either if persisting things change with respect to their properties (alteration), or if, in the absence of persisting things, new things come to be while others cease to exist (generation and destruction). Either alteration or generation/destruction is necessary for time. In Chapter 2, I will distinguish between different types of reductionism, with one of them allowing there to be a temporal interval during which nothing changes, that interval being identified with the possibility of change or with possible events.

make reference merely to time or employ temporal indexicals. A chair being made and then destroyed, or being blue and then white, are non-trivial changes, whereas the chair's whiteness being future and then present is not. AP thus denies that there can be any period of duration without non-McTaggartian change.

It is no mere historical coincidence that substantivalists have rejected AP while reductionists have embraced it. Given their views about the ontological status of time, substantivalists are committed to disowning AP just as reductionists are committed to adopting it. Some have gone so far as to maintain that the very viability of reductionism depends on the presupposition that "it is necessarily true that there is no period of time without change taking place somewhere throughout that period" (Newton-Smith 1980, 14). If AP is false, so too is reductionism; if AP is true, so too is reductionism. The key tenet of reductionism is that all talk about time is really talk about things occurring in time. If there is time with no change, however, one cannot identify temporal talk with talk about things in time. The possibility of time without change undercuts the reductionist approach to time. Contrariwise, substantivalism upholds the independent reality of time, or the non-dependence of time on things in time. But if there cannot be time without things occurring in time, time is not ontologically independent in the appropriate manner. The debate between substantivalism and reductionism with respect to time thus comes down to the status of AP, to whether there can be time without change.

Milič Čapek maintains that substantivalist theories of time find few adherents prior to the Renaissance, with most philosophers accepting AP and backing a form of reductionism.[4] A brief survey of the historical texts supports this judgment. The inseparability of time from change is a thesis that we find affirmed in the earliest speculations about the reality of time. Plato's *Timaeus* provides an unambiguous if telegraphic formulation of this connection, holding that "it is not appropriate for what is always immovably in the same state to be becoming older or younger through time… These attributes have come into being as forms of time which imitates eternity and circles around according to number" (38a–b). For Plato, time is inextricably linked to the motion of the heavens. This is because time is by its very nature divided into the past, present, and future, and this division in turn depends upon that of the movements of the celestial bodies.[5]

The connection between time and change is most famously argued for in Aristotle's *Physics*. In line with Plato's *Timaeus*, Aristotle seeks to demonstrate that time would not exist in a world without change:

> On the other hand, time cannot be disconnected from change. For when we experience no change at all in our thoughts, or fail to recognize that we are changing, we do not think that time has elapsed… for under these circumstances, we fit the former now on to the later, making them one and the same and eliminating the interval between them because we did not perceive it. So just as there would be no time if there were no distinction between this

[4] "While the theory of absolute time had hardly emerged before the sixteenth century, that of absolute space is almost as ancient as Western thought itself" (1987, 596). This section is indebted to Čapek's instructive overview of the quarrel between substantivalists and reductionists.

[5] See Cornford, 102.

> now and that now, but it were always the same now, so also there appears to be no time between the nows when we fail to distinguish between them… It is clear that time does not exist without change and alteration (218b21–219a1).[6]

Several commentators have taken note of the fact that Aristotle starts with an epistemological premise and from there reaches an ontological conclusion, a move that we will also find Leibniz making in at least one text. The epistemological premise is our inability to detect time in the absence of change. If everything remains the same, including our own states of mind, then there are no grounds on which to assert the passage of time. The passage of time, in these circumstances, would be unverifiable, undercutting the possibility of offering empirical evidence in its favor. The ontological conclusion is that time cannot exist without change. We should be careful to avoid reading Aristotle as identifying time with change, for he is advancing only the weaker claim that change is a necessary condition for time. Why think that an ontological conclusion can be made to follow from epistemological premises? Sorabji has attempted to make this argument plausible by ascribing to Aristotle something akin to the principle of verification. Sorabji invites us to imagine a person claiming to have multiple hands, where these hands cannot be seen, felt, shaken, or used for any purpose. Such entities, Sorabji stipulates, we would not call hands at all. By parity of reasoning, a time whose passage cannot be detected is not, properly speaking, time at all. Flaws notwithstanding, this is one way in which Aristotle might attempt to establish metaphysical conclusions on the basis of epistemological premises. It is also an argument, as we shall see in Chapter 2, that resonates throughout the subsequent history of the philosophy of time, including Leibniz's.

The history of the philosophy of space and time exhibits a key dissimilarity between theories about the ontological status of space and that of time. Time is often associated with change and motion in a way that makes it dependent upon them for its existence. On the other hand, the existence of space is often seen as not depending upon the existence of objects in space, and is for that reason metaphysically independent of them. In line with substantivalism, space is held to have an existence and structure distinct from that of things in space. This, even while it is maintained that time would not exist were temporally related items not to exist. I do not mean to suggest that this combination of views was universally accepted, but only that it is not uncommon to find in a single thinker an admixture of spatial substantivalism and temporal reductionism.

Representative of this hybrid philosophy of space and time are the writings of the atomists. It is almost too well-known to repeat here that the atomists postulate the existence of space, the void, as something over and above things in space, atoms. Though perfect unanimity among them was lacking, Lucretius' *On the Nature of Things* provides an outline of what had become the canonical view among the late atomists about the ontological status of space: "All nature, then, as it exists,

[6] I set aside Aristotle's definition of time as the number of motion with respect to before and after, and the apparently idealistic implications this definition has.

by itself, is founded on two things: there are bodies and there is void in which these bodies are placed and through which they move about" (quoted in Jammer 1993, 12). Empty space, the void, exists as a distinct kind of thing in addition to, and is not founded upon upon, material atoms. Some have even gone so far as to interpret Lucretius as conferring on space a sort of ontological primacy since matter presupposes space without space presupposing matter.[7] Whether space is more real than matter or space and matter are on metaphysical par with each other, Lucretius makes clear that void space can exist without matter. Space can exist without matter in that there can be, and are, empty spaces between matter, but also in the stronger sense that space could exist even in the absence of all matter.

More interesting for our purposes is the atomist position, succinctly summarized again by Lucretius, that "time itself does not exist":

> But from things themselves there results a sense of what has already taken place, what is now going on and what is to ensue. It must not be claimed that anyone can sense time by itself apart from the movement of things or their restful immobility (quoted in Čapek 1987, 595).

Given the kind of broadly empiricist epistemology characteristic of the atomists, the inability to sense time in the absence of change provides strong grounds for denying that it exists independently of movement. In this passage, Lucretius is giving voice to a prevalent assumption of Ancient thought: the existence of time supervenes on that of change.[8] Were all movement to cease, so too would the flow of time. The ontology of time is therefore of a different sort than that of space: the latter can exist without material things in the world, the former cannot.

It is not until the early modern period that it becomes common for substantivalist theories of space to be coupled with those of time. Foremost among the proponents of the substantivalist theory is Pierre Gassendi, who, like the Epicureans, argues for the independent reality of space over and above bodies in it, and, unlike the Epicureans, argues for the independent reality of time over and above change and motion. In a passage that presages Clarke's asseverations against Leibniz, Gassendi contends

> that there were immense spaces before God created the World, that these would continue to exist were He, perchance, to destroy the world; and that of these God has chosen for his own good pleasure this specific region in which to create the World.. [I]t is not the case that if God were to move the World from its present location, that space would follow accordingly and move along with it. But the world alone would be moved, its space remaining unmoved (Gassendi 1976, 93)

The possible existence of space in the absence of any bodies entails that space is both ontologically distinct from and independent of the bodies it contains. This is further stressed in Gassendi's claim that moving or reorienting the world would in no way alter the structure of space itself, or the position of points in space; the world's spatial structure does not derive from the objects in that space. Indeed, the

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[7] Čapek (1987, 597).

[8] As Sorabji observes, "it was the exception in ancient Greek thought to allow time without change" (1983, 83).

very possibility of reorienting the world without altering the relative position of its bodies entails an independently existing space.

Gassendi is also a central figure in making the case for substantivalist theories of time. Repudiating his common source the Epicureans, Gassendi writes that "time is something incorporeal which is understood to exist *by itself* and not as something which accidentally pertains to things in the sense that there would be no time without change… If God reduced the whole universe to nothing, we comprehend that time would still flow" (Gassendi, 195). That time flows independently of things changing means that, *pace* Aristotle, time can exist without change or motion. Even were the entire universe to undergo a freeze, it would be a freeze that endures through time since time's passage flows unaltered by the occurrence or non-occurrence of motion. One common argument against the existence of time (and one that Leibniz on occasion employs) is that time cannot exist because it is composed of non-simultaneous parts, i.e., not all of its parts – past, present, and future – ever co-exist, and thus time cannot exist.[9] Against this, Gassendi urges that we must maintain a distinction between permanent and successive things. What is permanent must have all of its parts together at once, while "what is successive, can exist in its own way, that is, successively" (ibid., 196). To deny that time exists because it lacks coexisting parts is to commit a category mistake: it is to illicitly apply categories valid of one kind of thing (a permanent thing) to another kind of thing (a successive thing). The being of time is sui generis and categorically different from the being of non-successive *entia*. Concluding his exposition of the independent reality of time, Gassendi draws several analogies between the ontological status of space and that of time: (1) Just as space is unlimited, so too does time have neither a beginning nor an end; (2) just as place exists whether or not it is occupied, so too does time flow "with equal tenor" independently of change; and (3) just as place is immobile and "cannot be dislocated by any power," so too time "cannot be stopped or suspended by any power," inexorably flowing, as it does, forward uniformly (ibid., 199). In upholding these notions, Gassendi is among the first of the early moderns, and one of the few philosophers up to the early modern period, to treat both time and space as structures in their own right that possess in and of themselves properties not dependent on bodies and changes.

These claims will be developed at much greater length and with considerably more precision by Gassendi's British successors, especially the two Isaacs, Barrow and Newton. Barrow's argument for the independent existence of time is based upon his theory of absolute space. Starting from the assumption that space existed prior to the world being created in it, Barrow deduces that time must have existed likewise: "[C]onsequently Time existed before the World began… because 'tis possible that some Thing might have existed long before the World was made" (Barrow 1976, 204). How to empirically verify the passage of time in an empty space as void of change as it is of matter? Not unaware of Aristotle's and Lucretius' objections to the

[9] For Leibniz's formulations of this argument, see R 101, LC 5.49, and G 7.564. In the *Specimen Dynamicum*, Leibniz insists that both motion and time "taken in an exact sense never exist, because a whole does not exist if it has no coexisting parts" (GM 6.235/L 436).

passage of time without change,[10] Barrow tackles this protest head on by blocking the inference from an epistemological premise to an ontological conclusion. Granted that we do not perceive the passage of time if nothing changes, it does not follow that there is no such passage: "*We do not perceive the Thing, therefore there is no such Thing*, that is a false Illusion, a deceitful Dream, that wou'd cause us to join together two remote Instants of Time" (ibid.). Whether or not, in such circumstances, the instants of time would really be two is precisely what is at issue, so this part of Barrow's case appears to be question-begging. One might think that Barrow's refusal to deny existence to what is not perceived is more convincing. Notice, however, that he has changed the modality of the claim in a way that misrepresents, and weakens, the view of Aristotle and Lucretius. Their argument – and the one that will be repeated by Leibniz against Barrow and Newton – is not that what is not perceived does not exist, but rather that a putative passage of time that is in principle imperceptible does not exist. Some will find even this contentious, but it is not as obviously doubtful as the assertion ascribed to Aristotle and Lucretius by Barrow.

We will have occasion to examine the Newtonian view in more detail in Chapter 2, so this summary overview will suffice for now.

1.2 The Unity of Space and Time

For both substantivalists and reductionists, settling the question about the ontological status of space and time leaves unanswered questions about its topological structure. Substantivalism and reductionism alike are consistent with, for example, space and time being either unified or non-unified and either infinite or finite in extent. Of course, precisely what question is being asked will depend upon one's metaphysical commitments. As Dainton remarks, the substantivalist will take questions about space's and time's topology to be about the structure of actually existing entities, namely space and time, whereas the reductionist will take them to be about the spatial and temporal characteristics of material entities, i.e., how bodies are spatially and temporally related (Dainton 2001, 3). To ask whether space is infinite in extent is, for the substantivalist, to ask something about the structure of an independently existing space, whereas for the reductionist it is simply to inquire into how objects are spatially ordered. These differences aside, neither substantivalists nor reductionists are, in virtue of their underlying ontology, committed to any particular set of claims about space's and time's structure. It is to these kinds of claims that Chapters 3 through 5 will be devoted, and I will postpone until Chapter 3 a more systematic and rigorous presentation of the topological features of space and time. For the remainder of this chapter, I will turn to three of the more important structural features of space and time and how various philosophers prior to and

[10] "'Tis not improperly observ'd by *Lucretius*… Nor by the *Philosopher himself* [that when] *we wake we cannot perceive or tell how much Time has passed during our Sleep*" (ibid. 205).

contemporaneous with Leibniz tackled these issues. I start in this section with a consideration of the unity of space and time.

It is important at the outset to disambiguate between two very different questions here. When inquiring about the unity of space and time, what is being asked is whether or not there are actual existents that are neither spatially nor temporally related to those in our own world, to those things to which we are spatially and temporally related. If so, space and time are not unified; if not, they are. It might be the case that one is unified while the other is not. What is being sought, then, are philosophical theories that stake out a position on the possibility of multiple worlds, where "multiple worlds" is understood as a multiplicity of worlds that are not spatially and temporally related to each other. This is different from the question of whether or not there is or can be a plurality of planets, suns, or solar systems within a single spatiotemporal framework. Thinkers such as Bruno or Fontenelle who advocate a diversity of worlds in this latter sense are not thereby committed to postulating non-unified space and time. To the contrary, these latter sorts of claims are often, albeit implicitly, accompanied by the assumption that diverse worlds exist in a single space and time in such a way that they are spatially and temporally connected to each other. To make matters more confusing, these two questions are often concatenated under the general heading "plurality of worlds," where this ambiguous phrase sometimes means non-unified space and time, sometimes numerous planets in a single space and time. Since we are investigating only the former, we will need to keep these distinct theories disentangled from each other. To do this, we must distinguish between those arguing for or against non-unified space and time and those arguing for or against a plurality of world systems within a single space and time. I will refer to the first as "multiple worlds," and the second as "the plurality of worlds." The following survey will show that few philosophers opt for multiple worlds, with some going so far as to advance arguments that, if not directed against multiple worlds, have the effect of ruling them out.

Bearing this distinction in mind, let us turn to those philosophers who come closest to embracing the possibility or actuality of multiple worlds. It is often thought that the ancient atomists unambiguously declare in favor of the non-unity of space and time. In his "Letter to Herodotus," Epicurus boldly proclaims that "there nowhere exists an obstacle to the infinite number of worlds," and draws form this the considerably stronger conclusion that there are such worlds:

> There are infinite worlds both like and unlike this world of ours. For the atoms being infinite in number, as was already proved, are borne on far out into space. For those atoms, which are of such nature that world could be created by them or made by them, have not been used up either on one world or a limited number of worlds, nor again on worlds which are alike, or on those which are different from these.[11]

[11] See also Lucretius' argument that "when abundant matter is ready, when space is to hand, and no thing and no cause hinders, things must assuredly be done and completed," from which he concludes that our sun and Earth "are not unique but of number innumerable" (*De Rerum Natura*, Book 2, lines 1067–1089). Diogenes Laertius reports that one of the early founders of atomism, Leucippus, held "that the whole is infinite… part is full and part void… Hence arise innumerable worlds, and are resolved again into their elements" (quoted in Dick, 192).

Given the infinite number of atoms, it follows that there will be an infinity of worlds. Though this might be taken as strong evidence that the atomists promulgate the existence of multiple worlds in spaces and times that are not related to each other, it is not immediately apparent that this is Epicurus's objective. It could instead be to establish the existence of other worlds within the same space and time as ours. How else to make sense of the assertion that "atoms are borne on far out into space?" Far though they may be, they are still in the same space as our world. The other infinite worlds are simply other planets with their own suns and systems of local celestial phenomena, not other spaces and times unrelated to our own.

On the other hand, Epicurus' definition of "world" (*kosmos*) is evocative of multiple spaces and times, not a plurality of worlds within a single space and time. A world, writes Epicurus, is a

> circumscribed portion of the sky, containing heavenly bodies and an earth and all the heavenly phenomena, whose dissolution will cause all within it to fall into confusion: it is piece cut off from the infinite and ends in a boundary either rare or dense, either revolving or stationary: its outline may be spherical, or three-cornered, or any kind of shape (59).

In that a world is what, by definition, contains "all heavenly phenomena" and "ends in a boundary," different worlds look as if they have different spaces, and possibly different times as well. Yet Epicurus describes worlds as being a "circumscribed portion of the sky," and saying that it is cut off from the infinite (*apeiron*) is only to claim that it is of determinate form. Dick interprets Epicurus as understanding "world" in a way that makes "all visible phenomena as seen from our Earth… a single world accessible to human senses," and construes the Greeks as attempting to ascertain "whether this visible world is the all, the universe, or whether innumerable such worlds coexist, each with its own planets and stars" (6–7). So understood, "world" refers to the totality of all perceptually observable entities, and an infinity of worlds would be only an infinite number of systems observationally isolated from each other. If Dick is correct, then there is nothing about Epircurus' understanding of "world" that entails, or is even relevant to, the unity of space and time. It is true that other worlds might be *perceptually* unconnected to ours, unobservable because of the vast distance separating them from us; other worlds exist beyond the perceptible boundary of our own. This, however, does not show that other worlds exist *spatially* unconnected to ours. Perhaps it was also a tenet of ancient atomism that other worlds exist at an infinite distance from ours, and were thus not spatially related to our own. Such a line of reasoning I do not find explicitly stated in the atomist corpus, and the general aim of their arguments seems to point in the direction of establishing a plurality, not a multiplicity, of worlds.

It would hardly be going too far to conclude that this is the most that any of Leibniz's predecessors was willing to affirm. Nicholas of Cusa, well-known for his repudiation of Aristotle's closed and finite cosmos, is equally opposed to the accompanying belief that our solar system is unique. Given the infinite expanse of the universe, it is natural to assume that "life, as it exists here on earth in the form of men, animals, and plants, is to be found, let us suppose, in a higher form in the solar and stellar regions… we will suppose that in every region there are inhabitants" (Cusa 1954, 114–115). This position is repeated by one of Cusa's heirs,

Giordano Bruno, who seeks to establish the existence of many – infinitely many – other worlds throughout the universe. On the basis of the principle of plenitude,[12] Bruno concludes that a universe with less than infinitely many worlds would not be fit to be made by an infinitely abundant God. Because it is better that "an Infinite Excellence should express itself in innumerable individuals," there are "countless individuals such as are those great living beings of which our divine mother, the Earth, is one" (Lovejoy 1964, 119). The plurality of worlds is not mainly an empirical hypothesis supported by observational evidence – thought it may be that too – but is a derivation from a theological teaching about God's essence. That it follows of necessity on strictly theological grounds that there are infinitely many worlds is known a priori and to be verified afterward. Despite their differing reasons, this range of thinkers is of the same mind that our solar system is not unique. More importantly, they are also agreed that the plurality of worlds exist in a single universe, a single space and time that orders and connects them to each other. As in the case of the Epicureans, many of these worlds are almost certainly perceptually isolated from each other given the vast distances between them. Yet there is nothing to suggest that such worlds, however far apart they are from each other, exist in different spaces or times.

Speculations about the plurality of worlds abound in Leibniz's own writings, with most evincing strong evidence of agreement with the atomists, Bruno and his contemporaries. In the *New Essays* from 1704, Leibniz matter-of-factly comments that other "planets are much like our own," though he is careful to withhold final judgment until "we discover telescopes like those of which M. Descartes held out hope, which would let us pick out things no bigger than houses on the lunar surfaces." Not until this is accomplished will our conjectures about the constitution of other planets "be more useful and more open to confirmation" (NE 472–473). A more audacious and incautious declaration is found a few years later in the *Theodicy*:

> [It] must be acknowledged that there is an infinite number of globes, as great or greater than ours, which have as much right as it to hold rational inhabitants, though it follows not at all that they are human. It is only one planet, that is to say one of the six principle satellites of our sun; and as all fixed stars are suns also, we see how small a thing our earth is in relation to visible things (134).

This is Leibniz at his visionary and Baroquely best. Again and again, he proclaims that the harvest of nature is so rich and fecund that it yields infinitely many worlds. Passages such as these and others reverberate with the echoes of Bruno's synthesis of the principle of plenitude and the doctrine of the plurality of worlds, though it is

[12] Lovejoy defines this as "the thesis that the universe is a *plenum formarum* in which the range of conceivable diversity of kinds of living things is exhaustively exemplified, but also… the assumption that no genuine potentiality of being can remain unfulfilled, that the extent and abundance of creation must be as great as the possibility of existence and commensurate with the productive capacity of a 'perfect' and inexhaustible Source, and that the world is better the more things it contains" (52). As applied to the creation of a plurality of worlds, the principle involves an "inference from the assumed infinity of the productive potency of the First Cause to the necessary innumerability of the actual effects" (116).

difficult to establish any direct line of influence.[13] As in the case of his predecessors, this is in no way to commit Leibniz to the existence of worlds that are spatially and temporally unrelated to ours. The hypothesized plurality of worlds are contained in a single, infinitely vast universe (or so I will argue in Chapter 3) in such a way that all existents and events are both temporally and spatially related to each other. To be sure, this kind of plurality of worlds is consistent with multiple worlds as different world systems could exist in different spaces and times, but these different spaces and times are not required by such worlds. Put differently, no inferences about the topological structure of space and time follow from the plurality of worlds.

Are we to despair of finding philosophers who speak to the multiplicity of worlds? As I have already indicated, it is no easy task to locate sources endorsing non-unified space and time. On the other hand, there are some well-known figures who provide arguments from which we can extract a position on the possibility of multiple spaces and times. I deliberately use the term "extract" here in order to acknowledge that at least some of these arguments may be intended to refute not multiple worlds but a plurality of worlds. What I will attempt to show, however, is that even if this is the case, these arguments can be extended to rule out non-unified space and time. That is, even if we grant for purposes of argument that, e.g., Aquinas is attempting to refute the Epicurean doctrine of the plurality of worlds, the reasons he offers are equally inconsistent with multiple worlds, thus establishing the unity of space and time.

As early as Plato's *Timaeus* we find a philosopher turning his attention to the unity of space and time and arguing for a position that will later be embraced by Leibniz: there is and can be only one universe. For Plato, multiple universes are not possible. Unlike the views of his most famous student, who, while agreeing with Plato, will rely upon a theory of natural motion, Plato's argument is chiefly axiological, not what we might consider scientific. I describe it as "axiological" because the unity of space and time is argued for on evaluative standards that concentrate on criteria of goodness and perfection:

> Have we, then, been right to call it one Heaven, or would it have been true rather to speak of many and indeed of an indefinite number? One we must call it, if we are to hold that it was made according to its pattern… Accordingly, to the end that this world may like the complete and living Creature in respect of its uniqueness, for that reason its maker did not make two worlds nor yet an indefinite number, but the Heaven has come to be and is and shall be hereafter one and unique.

As Cornford explains it, Plato emphasizes the unity of the world because of his emphasis on the goodness of unity. For later thinkers, goodness and unity will become coextensive concepts differing in intension but not extension. This extensional equivalence is perhaps already present in Plato, and is employed in this passage to deny that there is more than one world.[14]

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[13] Koyré confidently contends that such a direct line of influence exists (44).

[14] Cornford's discussion can be found at 42–43. Cornford reads Plato as taking aim at the atomist thesis of a plurality of coexisting worlds in the same universe, and there is some reason for thinking that he is right. As I say with reference to Aquinas below, this kind of reasoning also rules out multiple worlds, even if it is directed at the plurality of worlds.

Like Plato, Aquinas employs primarily axiological arguments to deny multiple worlds. Aquinas begins by acknowledging that there are apparent reasons for positing a multiplicity of worlds, the most notable of which is God's omnipotence: "For the same reason that He created one, he could create many, since His power is not limited to the creation of a single world" (ST 1.47.3). Beyond this, the multiplicity of worlds appears to conform better not only to God's power but his goodness as well, for "it is better for there to be many worlds than one, because many things are better than a few" (ibid.). In the end, however, the unity of the world follows from certain kinds of constraints upon the nature of God's creation. Whatever God creates must contain order in a way that is incompatible with the existence of multiple worlds:

> The very order of things created by God shows the unity of the world. For this world is called one by the unity of order, whereby some things are ordered to others. But whatever things come from God, have a relation of order to each other, and to God himself… Hence it must be that all things should belong to one world (ibid.).

This argument, Aquinas goes on to observe, is the same as Plato's *Timaeus*. That Aquinas is arguing against the existence of multiple worlds and not merely the plurality of worlds is suggested by his insistence that all things "have relation of order to each other." Presumably, a plurality of worlds in a single space and time would satisfy this criterion, whereas multiple worlds would not. Moreover, the context in which Aquinas advances this thesis is one where he repeatedly uses the term "world" to refer to the totality of all created things, not merely our planet and its local neighbors. On the other hand, Aquinas does single out the atomist thesis of infinite worlds randomly arising from infinite atoms, sure evidence that "they do not acknowledge any ordaining wisdom" (ibid.). If he is trying to refute only this thesis, then his principle target is the plurality of worlds, not the multiplicity of worlds. Yet any argument based upon considerations of order and goodness that is designed to rebut the plurality of worlds would likely be applicable to the latter as well. If different worlds in different parts of the same spatiotemporal framework are lacking the requisite order, then surely different worlds in different spatiotemporal frameworks are too. Given that the constraint that all created things "have a relation of order to one another" precludes a plurality of worlds, it also precludes multiple worlds. In my view, though, the gist of these texts favors the conclusion that Aquinas has in mind multiple worlds.

Among Leibniz's early-modern predecessors, we find at least one notable philosopher simultaneously arguing for a plurality of worlds and against a multiplicity of worlds. This is the position adopted by Descartes, who, on the basis of his vortex cosmology, concludes that we can conceive of indefinitely many other vortices and star systems speckled throughout the indefinite dimensions of space. More important for our purposes is Descartes' accompanying denial that these vortices are or can be spatially disconnected. For Descartes, these many worlds and solar systems of necessity exist in the same space since they must all be formed from the same material plenum:

> From which it follows that there cannot be a plurality of worlds, because we clearly perceive that the matter whose nature consists in its being extended substance only, now occupies all the imaginable spaces where these other worlds could alone be, and we cannot find in ourselves the idea of any other matter (232).

Since Descartes later goes on to affirm the existence of multitudinous planets and solar systems, this passage evidently employs the phrase "plurality of worlds" to refer to spatially disconnected worlds. Descartes' reasoning rests on the identification of matter with extension, but there is slippage in the proof. He appears to assume that there cannot be two different material plenums, and thus not two different and spatially distinct worlds. While conditional is plausible, we are provided with no grounds for accepting its antecedent. Perhaps Descartes is implicitly invoking the indefinite extension of the material plenum: Given that one and the same material plenum occupies all possible places in virtue of its indefinite expanse, there is no where remaining for a spatially separate world to exist.[15]

Leibniz also will argue against the multiplicity of spaces and times, and like Plato and Aquinas and unlike Descartes will do so largely on considerations of order and goodness. The crucial ordering concepts for Leibniz will be what he terms "harmony" and "compossibility," though as I will attempt to show in Chapter 3, he takes these two notions to be mutually implicating. Consequently, while he finds himself in agreement with the atomists, Nicholas, and Bruno that the plenary nature of reality requires a plurality of worlds, he will fuse this with the claim that these worlds are of necessity spatially and temporally connected.

1.3 The Infinitude of Time and Space

Karl Popper has written that "the attempt to show by a priori reasoning the impossibility of time without beginning seems… doomed to failure,"[16] a position that has also been accepted by Quentin Smith and Richard Swinburne. Popper's proclamation and its subsequent endorsement by others notwithstanding, the history of philosophy is replete with thinkers who have attempted precisely what Popper says cannot be done: to rule out, on the basis of purely metaphysical or mathematical arguments, the possibility of an infinitely extended past. Indeed, the possibility of a world without a beginning, and one whose duration extends infinitely into the past, is among the most contentious topics in the history of the philosophy of time, and one that has been at the center of philosophical cosmology since at least Aristotle. Leibniz's own views on the possibility of an infinite temporal regress will be scrutinized in Chapter 4. In this section, I provide a cursory overview of the ancient and medieval background on this topic, not only because this background helps to clarify Leibniz's position, but also because it continues to inform current debates in the philosophy of time. We will also consider views on whether or not space can be shown, on properly philosophical grounds, to be infinite in extent.

In insisting that it is futile to attempt to disprove the possibility of an infinite past on a priori grounds, Popper is taking aim an argument whose origins can be traced

[15] Further assuming, that is, that the material plenum is indefinitely extended in every direction.

[16] Popper, 47–48.

to antiquity, and in particular to the ancient philosopher Philoponus. It is an argument that is a priori because it is based on various mathematical and metaphysical claims about the nature of the infinite, and how this rules out an infinite past. The infinite, Philoponus tries to show, is such that it precludes the possibility of a past with no beginning. Philoponus starts with a recognizably Aristotelian assumption – that an actual infinity cannot be traversed – but presses into service to reach a thoroughly non-Aristotelian conclusion – that, from an infinite past, the world could never have reached the present. Philoponus puts it as follows:

> But if [time] comes into being part at a time, one unit always existing after another, so that eventually an actual infinity of units will have come into being, then even if it does not exist all together at once (since some units will have ceased when others exist), nonetheless it will have come to be traversed. And that is impossible: traversing the infinite and, so to speak, counting it off unit by unit… For by nature the infinite cannot be traversed, or it would not be infinite (quoted in Sorabji 1983, 215).

In an important sense, the infinitude of the world's past duration is not an actual infinity since the past no longer exists. It is not an actual infinity in that all of the parts do not exist "at once." Actual infinity though it might not be, however, it is an infinity that will have to have been traversed in order to reach the present, for, if the world's history extends into the infinite past, we are now at a present that is preceded by infinitely many days, and that could therefore have been reached by going through each of those days. But it is a mark of the infinite, according to Philoponus, that the infinite cannot be traversed. Given this, the world cannot have an infinite duration in the direction of the past.

Philoponus' argument, or some variation on it, will later become the standard if not universally accepted position of medieval philosophy, and will also be an argument often repeated by Leibniz's own contemporaries. In later medieval philosophy, the philosopher most commonly associated with Philoponus' proscription of infinite temporal regresses is Bonaventure, who writes that it

> is impossible that infinitely many things have been gone through. But if the world does not have a beginning, there have been infinitely many days, and so infinitely many days between now and the past. Therefore, it is impossible to have gone through them. Therefore, it is impossible to get to *this* day (quoted in Kretzmann 1999, 178).[17]

Following Philoponus, Bonaventure presupposes the impossibility of traversing infinitely many things. Equally important, he also presupposes that a traversal between now and some time in the past, infinitely remote, would involve the going over of so many days. As we shall see momentarily, this second presupposition was subjected to probing criticisms by one of his medieval successors, Thomas Aquinas.

Undeterred by Aquinas' corrections, not a few seventeenth-century philosophers continued to repeat the contentions of Philoponus. Writing in the middle of the century, the Cambridge Platonist Ralph Cudworth decried an infinite past – or what he labels "the world's eternity" – as an "absolute impossibility." The absoluteness of the impossibility, I take it, is intended to mean that the world's eternity involves

[17] Dales deals deftly with the medieval arguments on this topic.

a contradiction, and a contradiction that arises from Arguing for a philosophical position as he often does – by citing the authorities of the ancients – Cudworth is content to repeat without revision the argument delineated by his predecessors.[18] Sounding a similar note, Richard Bentley alleged to have identified "an internal and natural impossibility" in the idea of a beginningless world. The crucial premise in this argument is Bentley's insistence that an infinitely long past entails that there is a moment an "infinite distance" from the present – again, the common thread running through many of these arguments. This would mean, as Bentley goes on to say, that between two revolutions of the Earth – one infinitely many days ago and the present one – there are infinitely many revolutions. Hence, a series bounded by the present revolution and a revolution infinitely many days ago would have infinitely many elements. Since these elements are not diminishingly small as in a convergent series, Bentley thinks it absurd that a bounded series could contain within itself infinitely many elements. This, as Bentley later asserts, is "a flat contradiction," and so the world must be finitely old. I should underscore that for Bentley the flat contradiction arises from there being infinitely many discretely ordered events within a *bounded* series. For this to make any sense at all, Bentley must be assuming that an infinitieth day serves as a boundary in the direction of the past.

Such claims might appear to be the naïve rants of pre-Cantorian philosophers who knew not whereof they spoke on matters pertaining to the infinite. Perhaps they were, but they are also claims that have doggedly persisted into recent philosophy of time. The tacit assumption in the above argument is that if the past is without beginning, then there is some moment in the past separated from the present by an infinite number of other moments. To reach the present from this ostensibly infinitely removed moment in the past, one would have to traverse the infinite number of intermediate moments separating now from that past time. This continues to be a line of defense invoked against those who would have a world with an infinite past. Summarizing and sponsoring this presupposition, G. J. Whitrow claims that "if the chain of events forming the past of *M* is infinite, there must have occurred events that are separated from *M* by an infinite number of intermediate events" (Whitrow 1966, 567). Similarly, William Craig contends that "if the chain of events prior to M is infinite, then there must be some event that is separated from M by an infinite number of intermediate events" (Craig 1979, 200). On this view, to say that there is an infinite regress of terms is to say that there are at least two terms such that between those terms there is an infinite number of terms. There can be no infinite regress of terms without at least two terms being separated by an infinity of terms – according to Bonaventure, Whitrow, and Craig.[19] It is with this assumption in hand that the authors, ancient and modern, go on to conclude that, if the past is without a beginning and has infinitely many days, the present could never have been reached. The assumed fact that an infinite temporal regress entails that there is some past event infinitely remote from the present – that if n events occurred before the present, there must have

[18] Cudworth makes explicit mention of Philoponus, citing his "twofold account of the impossibility of the world's eternity" (490).

[19] We shall see later that this is a view rejected as much by Leibniz as by his more recent counterparts.

occurred an event E_n (Whitrow 1978, 43) – is taken to be decisive evidence against the mathematical and metaphysical coherency of such a past.

Another argument in defense of the necessity of a finite past, albeit one that is rather more peculiar and specific to ancient and medieval philosophy, is one based upon the supposed impossibility of an actual infinity. This too has its source in Aristotle: "For in general infinity exists through one thing always being taken after another, what is taken being always finite, but ever other and other" (*Physics*, 206a27–29). A successive infinite can exist, but an infinite plurality of things cannot coexist simultaneously. Whatever Aristotle's intention, he was read by most successors as denying the possibility of an actual infinite plurality of things, and, read in this way, was once again used to establish a conclusion that he no doubt would have rejected: the finitude of past time. We have seen above that the traversal of infinitely many days does not itself violate proscriptions against an actual infinity since past days (or so it is claimed) no longer exist. Since an infinite past is a successive infinity, one where "one thing [is] always being taken after another," it cannot be ruled out as constituting an actual infinity. Rather, the previous argument is based on the impossibility of *traversing* an infinite time span, whether that an infinity be actual or successive. To see how a world without a beginning is taken to violate the proscription of an actual infinity, we need add, as did Philoponus, ancillary assumptions about the immortality of human souls. According to Philoponus, an infinite past entails an infinite number of departed (and immortal) human souls, and this in turn entails the existence of an actual infinity: "if the cosmos is uncreated, the result will that there exists and has occurred an actually infinite number [of souls]."[20] The consequent being impossible, and being impossible because of the impossibility of an actual infinity, the antecedent must be false. As with his other argument, this line of reasoning inaugurated what would become a commonplace trope in the later middle ages. Thus, Bonaventure, drawing from Algazel's *Metaphysics*, claims that the eternity of the world implies an infinite number of departed human souls. An infinite number of departed human souls is an actual infinity, and an actual infinity is impossible. Hence, the world cannot be eternal.[21] Admittedly, this is not an argument that, even on its surface, has the luster of soundness, but I mention it because, as we will see in Chapter 4, Leibniz tackles it head on.

In spite of whatever strengths these lines of reasoning may have had, there was not a universal consensus that an infinite past engenders conceptual absurdities. The most systematic and sustained reply to Philoponus et al. is to be found in the writings of Aquinas. First expressed in his *Scriptum super libros Sententiarum*, Aquinas' response holds that

> although the infinite does not exist actually and all at once, it can exist successively. For, so considered, any infinite is finite. Therefore, being finite, any single one of the preceding solar revolutions could be completed; but if, on the assumption of the world's eternity, all of them are thought of as existing simultaneously, then there would be no question of a first one, nor, therefore, of a passing through them, for, unless there are two extremes, no transition is possible (*SCG* 2.38.11).

[20] Quoted in Sorabji, 214.

[21] See Dales, 93.

This passage is notable on two counts. First, Aquinas explicitly allows that a successive infinity can exist. For this reason, an infinite past cannot be ruled on that basis alone, that is, without further assumptions about what else it would take for an infinite past to result in an actual infinity. An infinite past by itself does not generate an actual infinity since past days or no longer in existence. Second, and more pertinent to Philoponus' first argument, Aquinas asserts that something can be traversed if and only if it has a term from which and a term to which, a beginning and an end. To traverse any amount of time, there must be a starting point and an ending point. On the basis of this tenet, Aquinas delivers a devastating blow to his opponents: whatever two extremes are chosen, there is only a finite distance between them. Or, as Aquinas says elsewhere, "take any determinate time at all: from that time to this is always a finite time." Insofar as one must traverse time by starting at one moment and ending at another, such a traversal will never cover more than a finite number of moments.

Aquinas is no more impressed with Philoponus' second argument, the one based on the impossibility of there being an actually infinite number of departed souls. As we saw, Philoponus and Bonaventure assume that with time extended into the infinite past, an actually infinite number of departed souls necessarily ensued. But since no kind of actual infinity can exist, time cannot extend into the infinite past. Reporting possible replies to this argument (none of which he himself adopts), Aquinas writes that

> What is said about souls is more difficult. But, nonetheless, the argument is not much use, since it presupposes many things. For some people who maintain the eternity of the world have also claimed that human souls do not exist after the body. Others, however, claimed that of all the souls there remains only a [unique] separated intellect – either an agent intellect, according to some, or a possible intellect as well, according to others. But others maintained a cycling of souls, claiming that after some ages the same soul goes back into bodies. And others say that there is no absurdity in there actually being infinitely many things that are not in an ordered relation to one another (SCG 2.38.14).

As Kretzmann has observed, Aquinas accepts Aristotle's prohibition on an actual infinity and the personal immortality of souls unique to individuals. Thus, of the possible responses, Aquinas himself openly adopts none of them, and so remains content to offer an argument ad hominem.[22]

In the seventeenth century also, arguments against the metaphysical possibility of unbounded time were not universally accepted, and there were not a few proponents of the beginninglessness of the world, or at least of space and time. The most vocal proponents of the infinitude of both time and space in this period are those backing substantivalism. Already in the early part of the century, two notable English atomists, Thomas Hariot and Walter Warner, argue both for the independent existence of space and time over and above that of bodies, and for their infinitude and co-eternality with God.[23] This is a prelude to a fugue that is developed at greater

[22] See Kretzmann, 181

[23] See Garber, Henry, Joy and Gabbey, 558–561.

length in the thought of later atomists. We have already encountered Gassendi's insistence that time and space exist independently of things in time. For Gassendi, this is closely tied to the further claim that they are infinitely extended: "As Place as a whole is unlimited, so Time as a whole has neither a beginning nor an end" (Gassendi, 199). While space and time are infinite, the world is finite with respect to both. A finite world, that is, is created in an infinite space and time, underscoring the independence of the latter from the former.[24] On the creation scenario envisioned by Gassendi, God chooses a finite portion of infinite space in which to create the material world, and he chooses one temporal interval from a time without beginning and end during which the world will exist. This will provide Leibniz with one of his central rebuttals of substantivalism: If a finite world exists in infinite space and time, why did God create the world here rather than there, now rather than then? This is not to say that Leibniz denies that the space and time are infinite in extent, only that they contain a finitely old and large world.

Many of Leibniz's contemporaries, especially those inspired by Gassendi's atomism, argued either for the boundlessness of space or time. Barrow holds both to be infinite in extent, arguing that the infinitude of time follows from two assumptions. The first is that there was space before the world began. The second is that time "does not imply an actual Existence, but only the Capacity or Possibility of the Continuance of Existence" (204).[25] Given (1) that space existed before the world, (2) that this existence made possible the existence of things before the world, and (3) that time requires only the possibility of the existence of things, even if such things do not in fact exist, time existed before the world. To establish that time extends infinitely in the direction of the past, one need only add the further hypothesis that, for any possible existent, there is a prior possible existent. This is a curious argument in that in seeking to establish that time existed before the world, it gives logical priority to the existence of space before the existence of the world. But how is one to make sense of this latter claim without already thinking the prior existence of time? In order for space to have existed before the world, there must have been some time during which it could have existed. A more charitable interpretation would be that Barrow stipulates that it is possible for something to have existed before the world, and from there proceeds to the conclusion that space and time antedate the creation of the world. The prior existence of space is not logically prior to that of time since they both follow from the same principle. This does not encumber Barrow with the foregoing objection, but it is taking considerable liberty with

[24] "Again as from Place or immense space is taken a portion in which the world is located, so from infinite Time a part was selected in which the world exists (Gassendi, 199).

[25] Stated in its entirety, Barrow's argument is this: "I answer that, since there was Space before the World was created, and that there now is an Extramundane, infinite Space, (where God is present;) inasmuch as there might have been of old, and now may be, such, and so many Bodies, which then were not, and now are not; Consequently Time existed before the World began, and does exist together with the World in the Extramundane Space, because 'tis possible that some Thing might have existed long before the World was made; and there may now be something in Extramundane Space, capable of such a Continuance" (203–204).

the text. Whatever the underlying reason, Barrow stays in step with his atomist predecessors in upholding the infinite extension of space and time.

Locke, something of an atomist himself, draws upon an argument that dates back to Archytas, and that was employed by another atomist, Lucretius, to prove that space is infinitely extended. Archytas challenges his opponent to imagine what would happen were he to stick out his hand from the edge of space. If the hand is stopped, it is stopped by matter, in which case the person was not at the edge of space. If the hand goes through, then it goes through into space, in which case again the person was not at the edge of space. Since this dilemma can be repeated indefinitely, space must be infinite. In Lucretius' formulation, the "doubter" is challenged to go to extreme limit of the universe and hurl a spear. If the spear is stopped, "there will be matter beyond," but if it goes through, "there will be empty space beyond" (quoted in Bailey 1976, 35).[26] Like Archytas, Lucretius takes this as *a apriori* evidence for the infinitude of space. Locke reiterates this argument almost word for word:

> If body be not supposed infinite, which I, think, no one will affirm, I would ask, whether, if God placed a man at the extremity of corporeal beings, he could not stretch his hand beyond his body? If he could, then he would put his arm where there was before space without body; and if there he spread his fingers, there would still be space between them without body. If he could not stretch out his hand, it must be because of some external hindrance… and then I ask, whether that which hinders his hand from moving outwards, be substance or accident, something or nothing? (2.13.21)

Unfortunately, Leibniz's running commentary on Locke's *Essay* offers no direct response to this passage, though he appears to be content to tacitly accept Locke's conclusion, if not the route by which he arrives at it. What Leibniz does say is that "there is never an infinite whole in the world, though there are always wholes great than others *ad infinitum*… the universe itself cannot be considered a whole" (AK 6.6.151). Leibniz is not denying that space is infinitely extended, only that the world is itself an infinite *whole*; the world is not an infinite whole, even though, spatially, it is extended without end in every direction. Had Leibniz wanted to deny that space is infinite, it is hard to imagine him passing on this opportunity. His reasons for not doing so will be examined immediately below and again in Chapter 4.

Lest I be misunderstood, it is no part of my account to establish a conceptual connection between substantivalism and infinite space and time. As I have already said, I do not think that either substantivalism or reductionism entails any particular topology. Having restated this, one can make a case that substantivalism is more consonant, from a strictly theological viewpoint, with an endless past. If time exists independently of change in a way that it can antedate the creation of the world, one

[26] Le Poidevin reconstructs the argument as follows: "[I]t is suggested that any failure to extend our arm beyond a given point would have to be explained by the presence of a physical barrier, and since this would necessarily take up space, it follows that there would have to be space beyond that point" (2003, 90). Alternatively, if there is nothing beyond the edge of space, then there can be no impediment to me extending my arm. Sorabji (1988, Chapter 8) contains an extended discussion of ancient criticisms of this argument.

does not run afoul of various theological strictures – the world having a beginning – by positing an endless past. The reductionist, in contrast, can allow for time to have an endless past only if the world itself has an endless past. This at least is true for the kind of reductionism espoused by Leibniz.

There is an additional reason in favor of the infinitude of space that I will quickly cover before moving on. This is an argument that sees space's infinitude as following from certain theological considerations, and it is an argument that will be used on a variety of occasions by Leibniz. The claim is this: Only an infinitely extended space can provide God with a medium through which to maximize the total quantity of reality; only an infinitely extended space allows for the created world to be the best possible world in virtue of containing the greatest amount of essence and existence. One of Leibniz's own versions is as follows:

> There is no possible reason that can limit the quantity of matter, and therefore such limitation can have no place.
>
> And supposing this arbitrary limitation of the quantity of matter, something might always be added to it without derogating from the perfection of those things which do already exist, and consequently something must always be added in order to act according to the principle of the perfection of the divine operations (4.21, 4.22).

As in the case of the plurality of worlds, the infinitude of space is avowed on the grounds of the principle of plenitude. This is a variation on a theme composed already by Bruno. For Bruno, as for Leibniz, Divine goodness can "be communicated to infinite things and can be infinitely diffused," from which it follows that it is "extended indefinitely to an infinite sphere" (quoted in Koyré 1957, 53). For God's perfection to be mirrored in the world, the latter must be without limit. Also like the plurality of worlds, the infinite extent of space is an a priori derivation from strictly theological grounds, one that does not lean upon an accumulated body of empirical data.

Space is infinite because it must be in order for God to maximize the world's perfection in a way suitable to his nature. Should not the same considerations apply to time to demonstrate that the world has no beginning? An affirmative response is found in the though of Anne Conway, who concludes that since

> The infinity of time from the beginning of creation can likewise be proved from the goodness of God. For God is infinitely good, loving, and bountiful; indeed he is goodness and charity itself, the infinite fountain of goodness, charity, and bounty. In what way is it possible for that fountain not to flow perpetually and to send forth living waters?… it necessarily follows that he gave being to creatures from time everlasting or from time without number … the eternity of creatures is nothing other than an infinity of times in which they were and always will be without end (13).

Conway strikes a notably neo-Platonist note: the world is a necessary emanation from a God whose overflowing goodness generates it coeternally with himself. As in the case of space, the presupposition is that goodness cannot be maximized by placing limits on the world, for such limits, spatial or temporal, would derogate from its perfection (though in this particular argument equal weight is placed on the goodness of God and what follows therefrom). Since Leibniz has conceded that, on account of this, the amount of matter in the world must be infinite in extent, one

might expect to find him doing so in the case of time too. Contrary to expectations, he resists this conclusion, an apparent inconsistency that Clarke is quick to point out. The internal coherency of Leibniz's position will be analyzed in Chapter 4.

1.4 The Linearity of Time

The last topic to be considered in this chapter is a topological feature specific to time alone, viz. its linearity. As with the unity of space and time, we must take care to distinguish between two different issues. On the one hand, events or times might be cyclic in the sense of recurring again and again. This could be true of kinds of events or of particular token instances of those events, where the numerically same event endlessly recurs. Newton-Smith has pointed out that, though this looks *prima facie* like non-linear time, it is not. The very notion of the same event occurring again requires that time be linear, for if the same event or time is to be *repeated*, it must occur at a later moment of time. Sometimes it is claimed that the numerically same instant, not merely event, recurs endlessly. This leads to the odd consequence that a particular moment of time occurs again at some other moment of time. Newton-Smith derides this as an incoherent, contradictory notion, and I am inclined to agree.[27] Nevertheless, it has not lacked for its supporters in the history of the philosophy of time. What we are after are theories according to which time is closed, by which I mean a temporal ordering according to which the temporal relations "before" and "after" are symmetric and reflexive. If time is closed in this way, then it is non-linear.

The most obvious candidates for advocates of non-linear time are the Stoics, and at least one scholar has concluded that they in fact opt for this view. Among early Stoics, and Chrysippus in particular, time is conceived as, in a sense to be specified below, cyclical. The non-linearity of time comes into sight in Chrysipuss' contention that "after our death, we will return to the shape we now are, when certain periods of time have elapsed." This theory is later documented by the Stoic expositer Nemesius of Emesa: "Again there will be Socrates and Plato and each one of mankind with the same friends … they will suffer the same things and encounter the same things."[28] This account of recurrence follows from the Stoic doctrine of the evolution of the world and its eventual destruction in a great conflagration. After the world's destruction, it is reborn and remade by the Stoic gods. Since the world is providentially ordered to be the best possible world, and since successive worlds follow from the same cause – divine logos – they must be the same. (If a different world followed, then of the two, at least one would have to be less perfect than the other. But since each world is maximally good, and there is only one maximally

[27] "For to entertain the idea of the same time occurring again and again is really to entertain the idea of the same time occurring at different times and that is just contradictory" (Newton-Smith, 57).

[28] Both passages are quoted in Long, 13.

good world, there is only one world that eternally recurs.) I will not attempt to enter into the minutiae of Stoic cosmology, but only note that some scholars have stressed the numerical identity of the world destroyed with the world reborn, and thus of Socrates and Plato of one world and the Socrates and Plato who will recur again after the great conflagration. It is the self-same Socrates, and not merely some counterpart Socrates, who "lives his life without the smallest difference of detail an infinite number of times" (Long 1985, 26).[29] For Long, this is taken to mean that the Stoics propounded a non-linear, closed conception of time.[30]

This may very well have been their intent, but this conception of time, so explicated, is anything but non-linear. There is nothing internal to the notion of closed time that allows one event to recur endlessly, an infinite number of times. This, in fact, runs contrary to the basic contention of closed time. As we have seen above, the very notion of the same event being repeated requires a linear ordering of time, one in which a particular event occurs once, and then again at a time later than the first occurrence, where the first occurrence is earlier than the later but the later is not earlier than the first. Implicit in the *recurrence* of events is the unfolding of the world's history along different segments of the line of time. If in addition to holding that events recur endlessly the Stoics also hold that times recur endlessly, then they are guilty of the confusion decried by Newton-Smith. For here we are to envision a particular moment of time occurring, and then, in order for it to be *repeated*, that self-same moment recurring *at another moment of time*. It is as though the different moments of the circle of time are repeatedly being mapped on to some linear super-time. If the Stoic doctrine is one of recurrence, then it cannot also be one of closed time on pain of serious conceptual confusion and palpable absurdity. Perhaps they are guilty of this confusion, or perhaps their teachings on the world's recurrence are not intended to defend closed time. Whether the error is one in interpretation or Stoic thought is an issue I will not seek to resolve.

Among Leibniz's immediate predecessors and contemporaries, the linearity of time is commonly if only tacitly endorsed. This is largely due to a particular conception of time, one that sees it as flowing into the future. Variously referred to as the A-theory or tensed-theory of time, the idea is that time moves along with the now always changing, the future becoming present and then passing into the past. We will examine this with more attention in Chapter 6 where I will argue that Leibniz disclaims this understanding of time. His substantivalist peers, however do not. Or at least this is suggested by some of their occasional comments:

- "If God reduced the whole universe to nothing, we comprehend that time would still flow" (Gassendi, 195).
- "As a Line, I say, is looked upon to be the Trace of a Point moving forward, being in some sort divisible by a Point, and may be divided by Motion one Way, viz. as to Length; so Time may be conceiv'd as the Trace of a Moment

[29] Long generalizes this point: "the same things return infinitely without end" (13).

[30] For an opposing interpretation of the Stoics that saves them from the objection that follows, see Hudson.

continually flowing, having some Kind of Divisibility from an Instant, and from a successive Flux … And like the as the Quantity of a Line consists of but one Length following the Motion; so the Quantity of Time pursues but one Succession stretched out as it were in Length … We therefore shall always express Time by a right Line" (Barrow, 208).

- "Absolute … time, in and of itself and of its own nature, without reference to anything external, flows uniformly … the flow of absolute time cannot be changed" (Newton 1996, 231–232).

For these thinkers, time itself flows forth inexorably into the future irrespective of what events are occurring in time. It is a consequence of this that time is intrinsically directional. There is good reason to think that because the directionality of time is grounded on its passage, on temporal becoming, time must be linear, for such passage is not readily reconcilable with its being closed. If time flows into the future, then the present, or what is present, is always changing. On the assumption that time is closed, the ever-changingness of the present will be represented as the now continually moving around the circle, with different moments on the circle successively becoming present. Because of the circularity of time, each moment of time will become present again and again as the present completes its successive revolutions around the circle. If this is so, a temporal ordering that is intrinsically directional because of its future-directed flow cannot be closed.[31] It is therefore reasonable to surmise that Gassendi and Newton – and perhaps substantivalists more generally – accept what Barrow says directly, namely that time is linear, and is linear because it flows.

We will later see that this is one of the few points of convergence between Leibniz and his Newtonian adversaries. Like them, he will argue that time is necessarily linear, and that closed time is thus not a possible temporal topology. Unlike them, he will ground his account of temporal linearity on a causal theory of time. More on that in Chapter 5. With this brief historical background in hand, we can now turn to Leibniz.

[31] For this argument, see Le Poidevin 2003, 86.

Chapter 2
Leibniz's Reductionism

Few disputes are more central to the history of the philosophy of space and time than that between substantivalists and reductionists, and no episode is more central to this dispute than the contentious exchange between Leibniz and the Newtonian Samuel Clarke. It is Leibniz, of course, who rejects the philosophical cogency of absolute space and time, arguing instead that they are orders or systems of relations. To contemporary philosophers of science, Leibniz's disavowal of absolute space and time firmly establishes his legacy as a philosophical and scientific adversary worthy of Isaac Newton, for it is in his views that they find the first profound and systematic instance of reductionism.

All of the above is undoubtedly correct. Leibniz is through and through a reductionist, one who sees substantivalism as a philosophical muddle and a theological danger. He is also a reductionist who promulgates some of the same arguments that to this day continue to be offered in support of reductionism: statements about the world's position in an absolute time and space are unintelligible in the absence of a procedure for determining that location. But one does a serious injustice to Leibniz's reductionism if, as is all too often the case, one leaves it at that. Leibniz himself informs Clarke that, apart from the "standard justifications" of reductionism, he has "many demonstrations, to confute the fancy of those who take space to be a substance or at least an absolute being" (LC 14–15). Few readers of Leibniz have taken note of his pronouncement; some have charged him with false advertising.[1] In fact, Leibniz's boast to Clarke is not hollow rhetoric. It is the aim of this chapter to identify the nature of Leibniz's reductionism and the many arguments he offers in its favor. In Section 2.6 I will conclude that Leibniz adheres to what Le Poidevin has termed a "non-modal" form of reductionism, one that not only reduces facts about space and time to facts about the relations among spatio-temporal objects, but that also – contrary to a common interpretation of Leibniz – rules out spatial and temporal vacua.

[1] John Earman, among others, accuses Leibniz of empty boasting in claiming to "have many demonstrations" against substantivalism: "There is nothing in the Leibniz corpus to indicate that Leibniz had other confutations up his sleeve" (117).

M.J. Futch, *Leibniz's Metaphysics of Time and Space*,

Leibniz's many writings on the ontology of space and time are exceedingly complex and can easily generate confusion. This complexity is exacerbated by the different senses of "time" and "space" in Leibniz's corpus. On some occasions, these terms designate the temporal and spatial facts about the world – the spatiotemporal relatedness of phenomenal objects given in the perceptual states of monads. It is these facts which receive a reductive analysis: "place and time, far from being determinants by themselves, must themselves be determined by the things they contain" (AK 6.6.289). When it is said that Leibniz is a reductionist, what is meant is that for him facts about bodies' spatial and temporal locations are facts about their relative ordering to one another. Time and space understood in this way are what, in the Clarke correspondence, Leibniz dubs a "concrete space and time."[2] They are not concrete in virtue of existing independently of spatiotemporally related things, but in virtue of being spatial and temporal facts about a particular world, or being a particular world's temporal series and spatial arrangement. On other occasions, the terms "space" and "time" are used to refer (if they have referents at all, properly speaking) to space and time as a particular kind of being: a continuous, abstract, ideal quantity. In this sense, space and time are like abstract mathematical entities that are grasped by the imagination; they are not phenomenally present in the perceptual states of monads. I will try to make sense of the relation between these different conceptions of space and time in Section 2.6. For now I wish only to make explicit that Leibniz's reductionism is directed at time and space in the first sense, not the second.

2.1 Leibniz and Reductionism

We have seen in the previous chapter that the substantivalist posits the existence of space and time as structures in their own right, not supervening on things "in" space and time. In direct opposition to this, Leibniz adopts a form of reductionism. To say that Leibniz is a reductionist is to say that he sees the spatial and temporal facts about the world as facts about things and their relatedness in the world. Space and time are not independently existing entities or structures in their own right, and spatial and temporal facts are not grounded on facts about such independent structures. Against the substantivalist, Leibniz's reductionism denies the philosophical cogency of conferring on space and time an ontologically independent, *sui generis* existence. Space and time are merely relations the existence of which depends on the existence of related things: "I hold space to be something purely relative, as time is … I hold it to be an order of coexistences, as time is an order of successions" (LC 3.4).

[2] "The parts of time and place considered in themselves are ideal things, and therefore they perfectly resemble one another like two abstract units. But it is not so with two concrete ones, or with two real times, or two spaces filled up, that is, truly actual" (LC 5.27). Again, time and space are not real in the substantivalist sense, but only that they involve actual divisions of indeterminate magnitudes.

While it is obvious that Leibniz adopts a form of reductionism, it is much less obvious precisely what kind of reductionism it is. Here it will be helpful to draw on Robin Le Poidevin's distinction between modal and non-modal forms of reductionism. Briefly put, modal reductionism with respect to time holds that a time T_1 *n* units before or after an event E_1 "is just the collection of actual and possible world-occurrences of actual or possible world events located *n* units before/after E_1" (1993, 154). A largely similar analysis can be provided in the case of space, where modal reductionism would hold that there is a (spatial) location L_1 *n* units in a particular direction from a body B if and only if there are either actual or possible physical entities *n* units in a particular direction from B. Contrariwise, a non-modal reduction of time to events maintains that there exists some time T_1 *n* units after an actual event E_1 if and only if there exists some actual event E_2 *n* units after E_1, and that time T_1 is nothing more than the collection of events occurring n units after e_1.[3] In the case of space, we may say that there is a spatial location L_1 *n* units in a particular direction from a body B if and only if there are actual physical entities *n* units in that direction from B.[4] One important difference between modal and non-modal forms of reductionism is that the former allows for times without events or changes and locations unoccupied by bodies, whereas the latter does not. This is not to say that the modal reductionist grants that time and space can exist in the absence of *any* changes or bodies, but only that not all moments and locations must be occupied by events or bodies. For time to exist, there must be some changes, and for space to exist, there must be some bodies, but there can nonetheless be temporal and spatial vacua. If we have a frame of reference consisting of four bodies not lying in the same plane, then we can define and identify other points of space by their relation to our frame of reference, even though these other points might be unoccupied by any existing body.[5] It suffices for the modal reductionist that it is possible, in some sense that I will not here specify, that there exist an event or a body at that moment or location. On the other hand, spatial and temporal vacua are precluded by non-modal reductionism. Where there is no actual event or body, there is no moment or location.

With these distinctions in hand, we can chart the range of alternatives open to Leibniz:

1. Adopt modal reductionism with respect to space and time.
2. Adopt non-modal reductionism with respect to space and time.
3. Adopt non-modal reductionism with respect to space and modal reductionism with respect to time.
4. Adopt modal reductionism with respect to space and non-modal reductionism with respect to time.

[3] See Le Poidevin 1993, 152.

[4] Unlike the case of time, we are not identifying a spatial location with a particular set of physical existents.

[5] For a more detailed elaboration on this point, see Khamara, 477–479.

I will attempt to identify which of the above four alternatives Leibniz embraces only after we have examined his arguments in favor of reductionism, for it is only with these arguments in hand that we will be in a position to rule out all but one of the alternatives. For now I enumerate these options to draw them to the reader's attention.

2.2 Sufficient Reason, Indiscernibility, and Reductionism

The most well-known and often-cited arguments Leibniz sets forth against reductionism are either based on or derived from (through the Principle of the Identify of Indiscernibles) the Principle of Sufficient Reason. It is these principles on which Leibniz leans the most heavily in his exchange with Clarke, and it is the arguments employing them that have continued to attract the attention, if not always the agreement, of Leibniz's more recent counterparts. Unfortunately, the underlying unity of Leibniz's arguments against reductionism has often been missed by some of his readers and critics. On one construal, we find not one argument underwritten by the Principle of Sufficient Reason, but three distinct and independent refutations of the absolute nature of space and time. First, Leibniz provides an epistemic argument about the meaninglessness of statements with no observational consequences. This includes statements about the movement of a world within absolute space, statements that on this criterion are void of meaning and intelligibility. Second, he offers a "pure metaphysical" argument resting upon the use of a suspect metaphysical principle, the Principle of the Identity of Indiscernibles. Since there cannot be in nature two numerically distinct things that are not intrinsically discernible, there cannot be in nature points of absolute space or moments of absolute time. Third, Leibniz advances a "metaphysical-causal" argument resting on an even more dubious theological principle, the Principle of Sufficient Reason. God can have no reason to create a world in a particular location of absolute space or at a particular moment of absolute time. Hence, absolute space and time are fictions of heretical imaginations.[6]

It is not my intention to maintain that Leibniz abjures from these lines of reasoning, but only to show that the first two cannot be extricated from the third. The epistemic argument presupposes both the metaphysical and the metaphysical-causal argument, and the metaphysical argument presupposes the metaphysical-causal argument.

2.2.1 Sufficient Reason and Identity

The Principle of Sufficient Reason (PSR) is a guiding thread woven throughout the entirety of Leibniz's thought. It is found both early and often in his writings. As

[6] For these divisions, see Sklar, Chapter 3.

Leibniz sees it, PSR is one of the two great principles on which all human reasoning is based.[7] Leibniz's myriad formulations of PSR make clear that its scope encompasses statements, existents, and facts alike: "There must be a sufficient a reason for anything to exist, for any event to occur, for any truth to obtain" (G 7.419). In other writings Leibniz explicates PSR in terms of all effects demanding causes, or, less trivially, all things having causes. This alternative formulation is a result of Leibniz's identification of a *ratio* with a cause.[8] Whether it is in fact one of the two great principles of all human reasoning, PSR enjoys this status in Leibniz's thought. We find PSR pressed into service in Leibniz's proofs for the existence of God, his complete concept theory and theory of truth, his attempted demonstration of the non-existence of atoms, and, most relevant for our purposes, his disavowal of substantivalist theories of space and time. We will take up the last in the next section.

Benson Mates has correctly observed that Leibniz implicitly restricts the kinds of reasons that can be sufficient for any given *explanandum*.[9] More accurately, Leibniz restricts the kinds of reasons that count as reasons at all. This restriction will play an important role in his exchange with Clarke, whom Leibniz accuses of failing to grasp the import of PSR. In fact, this ostensible failure on Clarke's part is really only a disagreement about what qualifies as a reason, and thus what qualifies as a sufficient reason. This divergence of views leads Clarke to maintain that absolute space and time are perfectly consistent with the requirements of PSR, whereas Leibniz, on the basis of his narrower conception of sufficient reason, insists that they are not. To get at what kinds of reasons count as genuine reasons for Leibniz, we would do well to start with a statement from the *Specimen dynamicum* of 1695: "I think that there is no natural truth in things for which we must find the reason in the divine action or will, but that God has always put into things themselves some properties by which all their predicates can be explained" (GM 6.242/L 441). An explanation provides a reason, and is truly explanatory, only if the *explanans* is intelligible, and it is intelligible only if it is natural. By "natural" I (and Leibniz) do not mean "refers to laws of nature" or "refers to natural causes." Rather, something along the following lines is intended: For any thing S having a property P, a reason R will count as a sufficient reason for S having P if and only if it explains S having P by referring to S's nature. Whatever we assert to be true of something must be explainable by that thing's nature and essence. It will suffice for our purposes to extract the following general point: an explanation provides a reason if and only if the *explanans* is intelligible and understandable. In this sense, the reason must be transparent to human reason, transparent to human reason not

[7] "There are two first principles of all reasonings, the principle of contradiction… and the principle that a reason must be given" (G 7.309).

[8] For a discussion of Leibniz's tendency to "fuse" reasons with causes, see Adams 1994, 116–119.

[9] Mates, 156–157.

in that it is easily understood, but in that it is the kind of explanation that *can be* understood by reason. An explanation that appeals to a causal factor inscrutable to reason, or an explanation that appeals to sheer brute facts, is an explanation in name only. Mercer has serialized these assumptions as follows (94–95):

- For any fact F, there is a complete reason for F.
- The complete reason of F is the necessary and sufficient conditions of F.
- The complete reason of F is perspicuous in that it enables one to understand why F rather than – F obtains.
- The complete reason of F is intelligible.

These last two requirements I will refer to as the "intelligibility constraint."[10]

In his dispute with Clarke Leibniz often presents PSR as being sufficient itself for disproving the viability of substantivalism. In many instances, however, his attempts to undermine substantivalism combine PSR with yet another principle, the Principle of the Identity of Indiscernibles (PII). This "most manifest axiom" holds that "there is no such thing as two individuals indiscernible from each other" (G 7.372/L 687), and "it is not true that two substances may be exactly alike and differ only numerically, *solo numero*" (G 4.433/L 308). This is sometimes misidentified with the more general Leibniz's Law: two things are the same if and only if they share all their properties. In fact, PII asserts only that if everything true of X is true of Y and vice-versa, then X and Y are the same.

The logical relation between PSR and PII is not entirely clear, though Leibniz at times implies that the latter is derivable from the former. This much is claimed in *First Truths*, where Leibniz writes that from PSR "it follows *that there cannot be in nature two individual things which differ in number alone*" (MP 88).[11] How does this follow from PSR? If X and Y are different, then it must "be possible to give a

[10] I have been assuming that the above is an interpretation of PSR itself, and that PSR alone stipulates that explanations must utilize intelligible reasons. It might be argued that this stipulation falls outside the mandate of PSR and represents an independent constraint. This interpretation may be correct, but it does not harmonize entirely with some important texts. Most notably, in his second letter to Leibniz Clarke appears to grant PSR only to add immediately that "this sufficient reason is often times no other than the mere will of God" (LC 11). This qualified admission elicits a strong rebuke from Leibniz, who reprimands Clarke for granting PSR in words only and in reality denying it (LC 14). Why, according to Leibniz, does Clarke grant PSR only in words and not in reality? Because he offers as a sufficient reason a causal factor that has no intelligible ground – a reason that is unintelligible. What is important to note is that Leibniz asserts that an appeal to the divine will alone is a violation of the intelligibility constraint, and is thereby a violation of PSR. But if a violation of the intelligibility constraint is *ipso facto* a violation of PSR, then this constraint must be a part of PSR itself; it is not an additional constraint supplementing PSR, but is partially constitutive of PSR. This is precisely what we should expect given Leibniz's understanding of "complete reason": a reason as such is perspicuous and intelligible.

[11] At LC 5.21, Leibniz informs Clarke that "I infer from that principle [PSR] that there are not in nature two real, absolute beings indiscernible from one another."

reason" why they are different. But if they are indiscernible with respect to all of their properties, then no such reason can be given. Hence, to maintain that things are different though they are indiscernible is to maintain that there is some truth or state of affairs for which no reason can be given. But if PSR is correct, there can be such truth or state of affairs; the truth of PSR is inconsistent with the falsity of PII. Or so Leibniz concludes.[12] In the Clarke correspondence, Leibniz re-affirms the entailment of PII by PSR, but sets forth a different line of reasoning. I cannot improve on Cover's and Hawthorne's recent formulation of it:

> [I]f ours were a world W in which there are indiscernibles, then there would be some distinct world W^* such that God could have no sufficient reason for preferring W over W^*; but since by PSR God in fact has a reason for every decision … it follows that there are no indiscernible objects (187).

If there are numerically distinct and indiscernible objects, there can be a world numerically distinct and indiscernible from ours. But God could have no sufficient reason for choosing between such worlds. Since God cannot act without a sufficient reason, indiscernible worlds are not possible, and if indiscernible worlds are not possible, then neither are numerically distinct indiscernibles more generally.

Just as PSR places constraints on what counts as a reason, so too does PII tacitly limit what counts as a difference. In one passage we find Leibniz avowing that things numerically distinct "must differ in some way, or have *in themselves* some assignable diversity" (G 2.249, emphasis added). The significance of "in themselves" is underscored and expounded upon in the *New Essays*:

> In addition to the difference of time or of place there must always be an internal *principle of distinction* … Thus, although time and place (i.e. the relations to what lies outside) do distinguish for us things which we could not easily tell apart by reference to themselves alone, things are nevertheless distinguishable in themselves. So time and place do not constitute the core of identity and diversity (AK 6.6.230).[13]

PII therefore incorporates what I will term the internal discernibility constraint (ID), and, in full, should be read as "There are no two individuals indiscernible from each other with respect to at least one internal difference."

This constraint is born of Leibniz's distinction between extrinsic and intrinsic denominations, and his further claim that the former are grounded in the latter. An extrinsic denomination is one that belongs to a substance "only in virtue of the general connection of things" (G 2.56/M 63). Borrowing Cover's more exact formulation, a denomination D_E is extrinsic if and only if it is "not possible that both (1) there exists some substance x that is D_E and (2) there exists no y distinct from x" (1989, 191). A substance x has the relational property "being loved" only if there is at least one other substance y that loves x. Contrariwise, any accident from the

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[12] For a trenchant criticism of this argument, see Cover and Hawthorne, 189–190.

[13] See also LC 4.18, where Leibniz writes that "any external reason to discern between [parts of space] can only be grounded on some internal one"; and MP 133/C 8, where we find Leibniz informing us that "it is not possible for two things to differ from one another in respect of place and time alone, but that it is always necessary that there shall be some other internal difference."

category of quality – habits or natural powers, for instance – can in principle be possessed by x even on the assumption that there is no other y in x's world. If for some denomination D_I it is possible that some substance x have D_I and that there is no substance y distinct from x, then D_I is an intrinsic denomination.

As important as the nature of the distinction between extrinsic and intrinsic denominations is the grounding relation between them. Leibniz never tires of reciting his dictum that "there are no bare extrinsic denominations." Among the countless reminders of this tenet, we find Leibniz's assertions that "there is no purely extrinsic denomination," "there are no purely extrinsic denominations which have no basis at all in the denominated thing itself," and "there is no denomination so extrinsic that it does not have an intrinsic denomination as its basis."[14] Given the above characterization of extrinsic and intrinsic denominations, these statements are best read as expressing the proposition that any relational property of a substance is grounded in some non-relational accident, an accident that is fully intelligible without the compresence of some other term. In his fourth letter to Clarke, Leibniz says precisely this: "any external reason to discern between [parts of space] can only be grounded upon some internal one" (LC 4.18).

Leibniz illustrates this doctrine with multifarious examples, two of which are particularly pertinent for our topic. In two pieces from his later period, Leibniz states that being in a place or having a position are extrinsic denominations, not bare extrinsic denominations (which do not exist), but extrinsic denominations "demanding a foundation from the category of quality." Distance and the degree of distance are mere "results, which do not constitute any intrinsic denomination *per se*, and so … they demand a foundation derived from … an intrinsic accidental denomination" (C 9/MP 134). This intrinsic accidental denomination is a "degree of expressing in the thing itself." In a similar vein, Leibniz notifies De Volder that "to be in a place is not a bare extrinsic denomination" (G 2.240/L 526). What Leibniz is expressing is that, not being a "*bare* extrinsic denomination," to be in a place has "an intrinsic denomination as its basis" (ibid.). Reiterating the position of the "Principle of the Identity of Indiscernibles," Leibniz writes in his letter of June 20, 1703 to De Volder that this intrinsic denomination is an expression of position: "Also, things which differ in position must express their position, that is, their surroundings, and are hence not to be distinguished merely by their location or by a solely extrinsic denomination" (G 2.250/L 529). The solely extrinsic denomination referred to here is the denomination "having a place" without that denomination being founded on an internal expression. On this view, extrinsic denominations result from or supervene on intrinsic denominations such as perceptions and expressions.[15]

Given the above assumptions, it will not do to argue that two things can differ with respect to their extrinsic denominations alone. Though external differences are

[14] Quoted from C 520/L 269, C 519/L 268, and G 2.240/L 526 respectively.

[15] See Cover (1989) and Mugnai for a fuller presentation of these points.

often sufficient for our recognition of things' differences, they are not sufficient for ontologically grounding them: "although time and place … do distinguish for us things which we could not easily tell apart by reference to themselves alone, things are nevertheless distinguishable in themselves. So time and place do not constitute the core of identity and diversity" (AK 6.6.230).

2.2.2 PSR, PII, and Reductionism

In his *On the Place and Duration of Things*, Pierre Gassendi advances a substantivalist conception of time in the following terms:

> We comprehend that even before there were any things time flowed; and from this we acknowledge that they could have been created by God earlier than they were created – that is, either a short time or a long time or even an eternal time earlier … and if God reduced the whole universe to nothing, we comprehend that time would still flow; we also understand that if God would wish to recreate the universe, time would flow in the interval between its destruction and recreation (quoted in apek 1987, 600).

Here we find the central contention of substantivalism – the independent existence of time – united with a confirmation of one of its consequences – God's ability to create the world at a time different than he did. If time exists in its own right, separately from the things that it contains, then its existence can be temporally and ontologically prior to the existence of the material universe. Consequently, God could have created the material universe sooner or later than it was in fact created. But then why did God create the universe at the moment it was created? Why not sooner or later? It is the entailment of this question by substantivalism that provides Leibniz with one of his main arguments for reductionism: substantivalism violates PSR, and reductionism does not.

Leibniz's use of PSR to disprove the absolute reality of time is a variation on a theme dating at least to Augustine.[16] Like Augustine, Leibniz points to the theological untenability of substantivalism to show that "time does only coexist with creatures and is only conceived by the order and quantity of their changes" (LC 5.55). More specifically, Leibniz argues that on the assumption that time is a thing existing in its own right, it would be impossible for God to act with a sufficient reason in creating the universe. The universe would have to be created in time, at one particular moment rather than another, something for which no sufficient reason can in principle be given. Writes Leibniz:

[16] In *Confessions* XI Augustine seeks to resolve the apparent conundrum of God was doing before he created the world. After tentatively responding that God was stoking the fires of hell for those with the audacity to ask such questions, Augustine concludes that time is concomitant with and does not precede creation. This response, Augustine believes, renders manifest the latent conceptual incoherence of the very question itself, a question that erroneously presupposes that time is causally or ontologically prior to and independent of creation. Leibniz concurs, though he refrains from considering Augustine's first alternative.

> Supposing anyone should ask why God did not create everything a year sooner, and the same person should infer from this that God has done something concerning which it is not possible that there should be a reason why he did it so and not otherwise; the answer is that his inference would be right, if time was anything distinct from things existing in time (LC 2.6)

Leibniz echoes the position adumbrated by Gassendi: given the absolute existence of time, it is possible for God to have created the world earlier than he did. Going beyond this implication, Leibniz further adds that this creation would necessarily be without a sufficient reason. Yet this is impossible, so there is no absolute time. Put differently, one cannot provide an intelligible answer to why God did not create the universe sooner or later than he did. It is, however, only on the substantivalist view of time that this question can arise, as it is only then that there will be time existing independently of the physical universe within which the universe is created, and relative to which it could have been created earlier. To dissolve this aporia, one must renounce the independent reality of time.

The same considerations militate against absolute space. To "confute the fancy" of those who take space to exist independently of spatially related things, Leibniz reasons that

> if space was an absolute being, something would happen for which it would be impossible to give a sufficient reason – which is against my axiom. And I prove it thus: Space is something absolutely uniform, and without the things placed in it, one point of space absolutely does not differ in any respect whatsoever from another point of space. Now from this it follows (supposing space to be something in itself, besides the order of bodies among themselves) that it is impossible there should be a reason why God, preserving the same situation of bodies among themselves, should have placed them in space after one certain particular manner and not otherwise (LC 3.5).

As in the case of time, one cannot provide an intelligible answer to why God put the (finitely large) world in one part of (infinitely large) space, or why it is oriented in a particular direction relative to an absolute space. These questions, however, are generated only on a substantivalist theory of space, since it is only on this theory that there will be an independently existing space within which to place the universe. Violating PSR in the same way that absolute time does, absolute space must likewise be dispensed with.

As the passages above make clear, God cannot have a sufficient reason to create the world at a particular place or moment in an absolute space or time because of the indiscernibility of the parts of space and time as such. It is because "all time and all spaces [are] in themselves perfectly uniform and indiscernible" that "one of them cannot please more than another" (LC 5.60). Or, again, "good reasons for a choice are not to be found where everything is indiscernible" (LC 5.58). If there were differences within the parts of time or space, those differences could provide a reason for creating the world at a particular moment and place. Without rehearsing Leibniz's arguments for the indiscernibility of space and time as such, we should note that this tenet is presupposed in any use of PSR to disprove substantivalism. This is not to say that PII is being assumed – it is not. Leibniz's argument is only that the parts of time and space in themselves are indiscernible, and therefore they can provide no sufficient reason for creation at a particular time or place. He is not

arguing that since the parts of time and space as such are indiscernible they are therefore identical, and, being identical, there can be no sufficient reason to choose one moment or place. To the contrary, Leibniz's use of PSR grants, if only for purposes of argument, that, given substantivalism, God is confronted with a decision about when and where, among distinct and indiscernible moments and places, to create the world. The weight of the argument is entirely on God's inability to act with a sufficient reason in the absence of discernible and distinguishing features of parts of time and space; it does not rest on the identity of those parts. Of course, Leibniz will argue that also, but nothing about his PSR argument commits him to it.

In light of the preceding account of PII it is unsurprising that only a certain kind of difference among parts of space and time will count as a genuine discernibility, and will therefore be able to provide a sufficient reason. We have seen that Leibniz holds that all extrinsic denominations must be grounded on intrinsic denominations, so that if two or more things differ externally – if they differ with respect to their relations to one another – they must also differ internally. This is true of points of space and moments of time: they cannot differ either *solo numero*, or only in virtue of their different spatial or temporal relations to other moments or points. These are merely external differences that require an internal difference. Making this point about space, Leibniz informs Clarke that "any external reason to discern between [the parts of space] can only be grounded in some internal one" (LC 4.18). It is not external differences per se, but only external differences *qua* indicative of internal differences that provide God's choice with an intelligible ground. There must be something internal to the nature of space and time in virtue of which there is a sufficient reason for the creation of the world here rather than there, now rather than then.[17] When we add to this the additional assertion that space and time abstracted from the things they contain are perfectly alike, with no internal differentiations at all, we are led to conclude that they cannot provide God with a sufficient reason.

It is also worth pointing out that Leibniz's more restrictive understanding of "sufficient reason" is operative in his exchange with Clarke. Clarke, who claims to agree with PSR, replies that "this sufficient reason is often times no other than the mere will of God" (CL 2.1). More fully, "There can be no other reason but the mere will of God, for instance, why this particular system of matter should be created in one particular place" (ibid.). In Clarke's hands, PSR reduces to the trivially true claim that "where there is no cause, there can be no effect" (ibid.). Leibniz does not disagree with this as far as it goes, though he disagrees that it goes far enough. Given PSR, not only must every effect have a cause, but it must have an intelligible cause. An intelligible cause is precisely what God's mere will alone is not. Making this point to Clarke, Leibniz rejoins that "my axiom has not been well understood,"

[17] As Mates puts it, "in the arguments about space and time, only 'internal' properties of the universe… were to be considered by God" (156–157).

as Clarke's view is tantamount to maintaining that "God wills something without any sufficient reason for his will" (LC 3.7).

I would like to suggest that we understand Leibniz best if we see him as holding that indiscernible parts of time and space must be identical lest we run afoul of PSR. Leibniz himself indicates as much when responding to Clarke that if there were two indiscernible entities, then "God and nature would act without reason in treating the one otherwise than the other" (LC 5.21). It is the impossibility of God acting in such a manner that rules out the numerical difference of indiscernible entities, and thereby the substantivalist view of space and time. PSR is therefore presupposed in Leibniz's use of PII.

By further extension, PSR is presupposed in Leibniz's verification arguments. In these arguments, Leibniz assumes, to borrow Sklar's phraseology, that the meaningful assertion of the existence of some entity or feature of the world requires that the presence of that entity or feature have observational consequences.[18] What Leibniz claims is that the existence of space and time in their own right violates the principle of verification: substantivalism postulates entities that have no observational consequences at all. Take the case of space: If Newtonian space exists, it makes sense to ask what the position of the whole of the world is in space, or how fast the world as a whole is moving through space. The problem that the substantivalist faces is that we can observationally determine only the spatial relations of material objects to one another, or the motion of material objects relative to one another. We never observe, nor can we ever observe, the motion of a body relative to absolute space. There are no observations that could conceivably determine the position of the world as a whole in Newtonian space, nor could we possibly determine the motion or velocity of the world as a whole through Newtonian space. So too in the case of time: it should in principle be possible to verify where events are located relative to absolute time, but all we can ever observe is the temporal position of an event relative to another event, not to time itself. Experience gives us only the order of events and existents, where that order is an order of events and existents relative to one another. This being so, it would be impossible to verify, e.g. a shift of the sequence of events two days into the future. Just as in the case of space, the assertion of the existence of time in itself generates other assertions that are meaningless because unverifiable, and so Newtonian time must suffer the same fate.[19] What is important to note is that the above transformations are unverifiable because the parts of space and time are indiscernible; it is the absence of internal differences, for instance, in the parts of space that make it impossible to verify a re-orientation of the world in that space. And this, as Leibniz makes plain, is itself grounded on PSR: "When there is no change that can be observed, there is no

[18] Sklar, 173.

[19] That such unverifiable shifts are not only meaningless but also non-existent is based on what Leibniz in one place refers to as his "Herculean argument": "that all those things which are such that it is impossible for anyone to perceive whether they exist or not, are nothing" (AK 6.4.1637/A 261).

change at all. The contrary opinion is grounded upon the supposition of a real absolute space, which I have demonstratively confuted by the principle of the want of a sufficient reason" (LC 5.52).[20]

Within the context of his exchange with Clarke, then, PSR bears the burden of Leibniz's argumentative load. This is most evident when Leibniz appeals to it alone and makes no reference to PII. But even his arguments invoking PII, at least within the context of his exchange with Clarke and the denial of substantival space and time, ultimately depend upon PSR, for the basis of the former is, according to Leibniz, to be found in the nature of sufficient reason. It also follows that Leibniz's verificationist style arguments are no less dependent on PSR, albeit by way of their presupposition of PII. Rather than seeing these as three independent arguments, or three arguments grounded on independent principles, it is more accurate to see them all as firmly rooted in Leibniz's assumption about the intelligibility of the world.

2.3 Space, Time, and Substance

It is often thought that Leibniz's defense of reductionism is based entirely on, and therefore stands or falls with, PII and PSR. As we have seen earlier, some commentators suppose that Leibniz offers no defense of reductionism that is not based on them, and that these defenses exhaust the full range of refutations of substantivalism. It is true that Leibniz's letters to Clarke rely heavily on PII and PSR, and it is also true that these arguments are articulated at greater length here than elsewhere in his works. Yet as Leibniz himself observes, he does have other arguments up his sleeve – arguments expounded in the Clarke correspondence itself. Perhaps the most important is one that draws on his most basic metaphysical commitment: ultimate reality is composed of nothing more than substances and their accidents. It has now been over one hundred years since Bertrand Russell first noted that "for a philosophy of substance, it is essential to disprove the reality of space … a monadist [must contend] that space is an assemblage of relations" (119). Following Russell, and in contrast to most recent commentators, this section argues that Leibniz's commitment to a substance/accident ontology is among the most fundamental reason for his disavowal of substantivalism. An important motivation of Leibniz's reductionism, that is, is the fact that "time and place … are not subsistent things nor are they attributes" (LH, IV, 7c, Bl. 75–78).

The commitment to a substance/accident ontology is a commonplace theme in early modern philosophy, but it is not a universally shared metaphysics. Indeed, Leibniz's most important adversary on space and time unequivocally rejects it:

> [Extension] has a mode of existing proper to itself that pertains neither to substance nor to accidents. It is not substance both because it does not subsist absolutely *per se*, but is, as it

[20] The motion referred to here is that of the created material world through an absolute space.

> were, an emanative effect of God, and an affection of all being, and because it does not underlie proper affections of the kind that denominate substance (Newton 1962, 99).

Summarizing (while rejecting) this position, Ralph Cudworth remarks of Gassendi's atomism that "this space is really neither an accident, nor substance, but a certain middle nature or essence betwixt both" (231).[21] In short, most substantivalists of the seventeenth-century variety deny that the conceptual categories that govern the logic of traditional substance/accident ontologies are sufficiently rich to account for the reality of space and time.[22] Newton's insistence that space has a *sui generis* existence – a kind of existence not identifiable with that of either a substance or a mode – is part of his more general suspicion of the very concept of substance. Insisting that we can observe only the qualities of material bodies such as shapes and colors and odors and flavors, Newton infers that "we certainly do not know what is the substance of any thing … there is no direct sense and there are no indirect reflected actions by which we know innermost substances" (1996, 341). Even more strongly, the term is wrongly taken to denote "a certain unintelligible reality that they call substance" (Newton 1962, 99). In contrast to the notion of substance, which is a metaphysical mystery the comprehension of which lies beyond the powers of human experience and understanding, "we have an exceptionally clear idea of extension" and of space (ibid.). In addition to the incomprehensibility of the very notion of substance, Newton has other reasons for refuting the substantiality of space and time. Accepting the standard definition of a substance as what has a *per se* existence, Newton contends that extension (read "space") is both an effect from God and a common external affection of all existents. As an effect dependent upon God, its existence depends upon the existence of something else, disqualifying it from counting as a substance.

Newton does not infer from this that space must be an accident or property. It is true that space is a common affection, but it is not a property that inheres in a thing as a predicate in a subject. Specifically, space and time do not inhere in material bodies that are spatially and temporally located. Were they to do so, their existence would depend on the existence of material bodies, and were all material bodies to be destroyed, so too would be space and time. This is exactly what a substantivalist of Newton's stripe cannot grant: "We can clearly conceive extension existing without any subject, as when we imagine spaces outside the world or places empty of body" (Newton 1962, 104). Not only that, but space and time also are ontological preconditions for the existence of material bodies, so far are they from being accidents dependent upon them. In this respect, space is "more thing-like than an accident, and more closely approaches the nature of substance" (ibid., 99).

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[21] As Gassendi himself puts it, "Space and time must be considered real things, or actual entities, for although they are not the same sort of things as substance and accidents are commonly considered, they still actually exist" (quoted in Grant 1981, 210).

[22] See McGuire (1995), Chapter 1. My exposition of Newton traces McGuire's rich discussion, including drawing on his translations.

Newton and Leibniz agree that space and time are neither substances nor accidents, but the conclusions they draw from this significantly differ. Whereas Newton uses this premise to establish the sui generis existence of space and time as distinct kinds of *entia*, different in kind from both substances and accidents, Leibniz uses it to argue for the reductive character of a world's spatial and temporal facts. This is because, unlike his Newtonian adversaries, Leibniz insists on the adequacy of a substance/accident ontology: "Every entity is either a *substance*, or an *accident* or *mode*" (AK 6.4.1506/A 283). Leibniz's ontology of substance relies heavily on the standard Aristotelian distinction between accident and substance, where the former is said to inhere in the latter, and the latter to inhere in nothing more fundamental. As an ultimate subject of predication, a substance is what, in a late study, Leibniz terms "a concrete being," or something "that can be distinctly conceived" and "in which abstract beings inhere and which does not itself inhere in something else" (C 438, 437). In contrast, abstract beings "separate" (*discriminant*) diverse predicates of the same being and must have a subject, or concrete being, in which to inhere. In a learned and pious man inhere (*inhærere homini tanquam subjecto*) the abstract beings learning and piety. The distinction between concrete and abstract beings will be important below when we find Leibniz invoking it to deny the substantiality of space.

To get at why space and time cannot be accidents requires delving more deeply into Leibniz's substance ontology. In line with the logic of a substance metaphysic, Leibniz maintains that an "accident [is] whatever in itself presupposes a complete substance, so that it cannot naturally exist without this substance" (L 602). This is simply to say that accidents are not free-floating *entia*, but must exist in a subject. To this, though, Leibniz adds the key additional assumption that "a modification is essentially connected to that whose modification it is" (L 614), or, again, that "two different subjects … cannot have precisely the same individual affection, since it is impossible that the same individual accident should be in two subjects or pass from one subject to another" (LC 5.47).[23] This furnishes grounds for denying that space can be an accident, for if it were, Leibniz argues, it would have to inhere in multiple subjects, now this one, now that:

> If space is the property or affection of the substance which is in space, the same space will be sometimes the affection of one body, sometimes of another body … But this is a strange property or affection, which passes from one subject to another. Thus subjects will leave off their accidents, like clothes, so that the other subjects may put them on (LC 5.39).

Though he does not explicitly say so here, presumably Leibniz is willing to extend this line of reasoning to time as well. Whereas in the case of space the same property will successively inhere in different subjects, in the case of time it would simultaneously inhere in spatially diverse subjects. In both cases, a numerically identical accident occurs in multiple subjects, a violation of the requirement that an accident is essentially connected to a particular subject.

[23] As Leibniz puts it in the *Monadology*, "Accidents cannot be detached, nor wander about outside of substances, as the sensible species of the Scholastics formerly did" (Mon. 7).

There are still further reasons for denying that space can be an accident. As an accident, space would need a subject in which to inhere: "No modification can subsist by itself but essentially entails a substantial subject" (L 609). On the Newtonian assumption that space can be and often is empty, however, there will be no subject supporting the accident. And this in turn means that, in the case of empty space, space will be an accident without a subject: "If space is property or attribute, it must be the property of some substance. But what substance will that bounded empty space be an affection or property of, which the persons I am arguing with suppose to be between two bodies" (LC 4.8). As Leibniz concedes, this is an ad hominem argument aimed at a combination of assumptions – that space exists in its own right and that space can be empty – that, while adopted by Newtonians, he himself does not share.

To this point we have examined how Leibniz uses a substance ontology to demonstrate that space and time cannot be accidents. Drawing a distinction between concrete beings, which are ultimate subjects of predication, and abstract beings, which are predicated of concrete beings, Leibniz insists that space and time are not the kinds of things that can be accidents. This division of beings also gives Leibniz reason to deny that space and time can be substances. In the case of space, this denial is typically couched in terms of his insistence that Cartesian *res extense* is, as it was for Descartes, a substance. The concept of extension includes only the attributes "plurality," "continuity," and "coexistence." The first of these it has in common with number, and the second it has in common with time and motion (G 2.169–170). Consequently, only coexistence is specific to extension. Coexistence is, however, an abstract being falling under an incomplete concept that can be exemplified by a plurality of concrete beings. By extension, extension in general is abstract:

> I deny that extension is a concrete, for it is abstracted from the extended … extension is only an abstract thing, and it requires something extended. It needs a subject; it is something relative to that subject, like duration. It even presupposes something prior to it in this subject, which is extended, is expanded with the subject, and is continued. Extension is the diffusion of this quality or nature (AG 261).[24]

In this passage, Leibniz's argument against the substantiality of extension is based on his distinction between abstract and concrete beings. Hence, the structure of the argument relies on the ontological posteriority of extension with respect to an extended thing. The relevant sort of ontological posteriority is that between an ultimate subject of predication and a predicate or attribute of that subject. Since extension needs a subject in which to inhere, it is not a concrete being. Moreover, as all substances are concrete beings (either complete per se unities or incomplete

[24] This echoes Leibniz's chafing reminder to De Volder that "extension is an abstraction from the extended and can no more be considered substance than number or a multitude, for it expresses nothing but a certain non-successive (as in the case of duration) but simultaneous diffusion or repetition of some particular nature" (G 2.269).

aggregates), extension cannot be classified as a substance. For the reader who has accepted the distinction between abstract and concrete beings – a fairly non-controversial distinction among many of Leibniz's contemporaries – and the claim that extension is an attribute inhering in a subject, Leibniz's argument against the substantiality of extension presents no points of contention.

The case for the substantiality of time is even worse. Not only does time, like space, involve plurality, but it involves a plurality of parts that exist successively. Given the successiveness of time, there are always parts of it that are non-existent, a fact that Leibniz takes as decisive for undermining time's claim to be a substance: "One can see that time is not a substance, since one hour or whatever part of time one takes never exists entirely and with all of its parts together" (G 7.564).[25] Embedded in this statement is the presupposition that a being, even if it has parts, must have parts all of which exist simultaneously. If some aggregative entity is such that it always lacks some of its parts, then it is not a being properly speaking. This, though is the essence of time, for time is merely an order of successive existence.

These kinds of arguments, relying on a substance-accident ontology, are admittedly less appealing to modern sensibilities than those based on PII or some form of verificationism. They are nevertheless at the very core of Leibniz's own thinking about space and time.

2.4 Aristotle's Principle, Time, and Change

As we saw in Chapter 1, one of the principal points of disagreement between reductionists and substantivalists is the connection between time and change. For the substantivalist, time is an independently existing entity, *a fortiori* an entity existing independently of change. In response to the question if time implies change, Isaac Barrow responds, "Not at all, I reply, as far as its absolute, intrinsic nature is concerned; no more than rest; the quantity of time depends on neither essentially; whether things run or stand still, whether we sleep or wake, time flows in its even tenor" (quoted in Čapek 1987, 598). As an ardent adherent to reductionism, it is no surprise to find Leibniz asserting that time and change are inextricably intertwined: "time … presents to the mind only an order of changes" (L 496). In the *New Essays*, he presents one of the standard arguments in favor of AP. Start by assuming something akin to the Principle of Verification: an assertion about some entity or feature of the world is meaningful if and only if one can specify the conditions under which that thing or feature could be observed. As Sklar puts it, "to affirm the existence of features of the world with no detectable consequences is not to espouse some kind of meaningful skepticism, but rather to affirm the intelligibility of the unintelligible" (173). If we grant this principle, Leibniz argues, then AP, and thereby

[25] See also Robinet, 281, L 436, and G 3.457.

reductionism, must be true. That is because the postulation of time without change violates the Principle of Verification, for how could one verify the passage of time in the absence of any change, mental or physical? Writes Leibniz:

> If there were a vacuum in space (for instance, if a sphere were empty inside), one could establish its size. But if there were a vacuum in time, i.e. a duration without change, it would be impossible to establish its length. It follows from this that we can refute someone who says that if there is a vacuum between two bodies then they touch, since two opposite poles within an empty sphere cannot touch – geometry forbids it. But we could not refute anyone who said that two successive worlds are contiguous in time so that one necessarily begins as soon as the other ceases, with no possible interval between them. We could not refute him, I say, because that interval is indeterminable (AK 6.6.155).

Leibniz attempts to prove the impossibility of knowing that nothing, including one's own mental states, has changed over an interval of time by arguing that such an interval is indeterminable. Since it cannot be determined, Leibniz assumes, its existence cannot be verified. To illustrate, take a world where time passes independently of change, where thousands of years can go by while everything occurring in time, including the mental states of the world's inhabitants, is frozen. It will be compatible with the experience of this world's inhabitants that thousands of years have passed between what, from their perspective, are any two moments. Such inhabitants might find themselves sitting at a traffic stop for several years, even though nothing in the world has changed, and they were not aware of the passage of time. But what could possibly count as evidence for them that time has changed? Indeed, as Sydney Shoemaker has pointed out, the very possibility of such scenarios should give one pause about the possibility of time passing without change.[26]

Leibniz's adherence to and defense of AP is even more evident in a recently published set of notes, dating from the 1680's, in which he expressly argues for the impossibility of time without change. In these studies, Leibniz provides purely conceptual, *a priori* grounds for upholding the impossibility of time without change. More strongly, he also holds that change can be conceived without time. These concepts are not equi-primordial or mutually implicative; rather, in the order of knowing and being, change is prior to time. This comes to the fore most clearly in his ordering of what he terms the "primitive concepts of thought." In a spectacular and quintessentially Leibnizian attempt to identify the most fundamental categories of thought and being, Leibniz writes that "almost all of our concepts [*notiones*] are contained in these few: … Variety … Consequence … Order … from order and consequence taken together, cause and effect are born. From these comes change, and then time" (AK 6.4.398). In a similar study, Leibniz adds that all concepts are "reducible [*revocari*] to these: … Consequence, Order, Causality, Change" (AK 6.4.873). Without entering into the array of complexities engendered by each of these kinds of relation (that will be done in Chapter 5), it will suffice for our

[26] It should be noted that Shoemaker goes on to attempt to refute AP by showing that there are conditions under which there would be indirect evidence that time has passed without change.

purposes to note that relations of consequence and order obtain when some A is a necessary or sufficient condition for some B, and A asymmetrically determines B. What I wish to emphasize, however, is the *logical sequence* obtaining among the kinds of relations themselves. In writing that causal relations result from relations of order and consequence taken together, Leibniz is telling us that causality is logically and ontologically posterior to relations of order and consequence. This means that the second two kinds of relations are ingredients of causal relations, but not vice-versa. Similarly, change "comes from" cause and effect, and time from change, in that (1) cause and effect enter into our concept of change, but change does not enter into our concept of cause and effect, and (2) change can be conceived prior to and independently of time, but time cannot be conceived prior to or independently of change. More fully, causal relations obtain among things ordered both by relations of consequence and order, and there is change when a causal relation obtains between incompatible things.

Because the categories of cause and effect, change, and time are themselves logically ordered, it is reasonable to infer that Leibniz conceives of change as a conceptual and ontological requisite for time and the concepts of temporal priority, posteriority, and simultaneity. The former concept enters into the latter ones in that temporal relations are partially defined in terms of the order of change, an order that is itself not temporally specified. One naturally wonders how Leibniz can give an account of change without time, but I will put off this question until Chapter 5. Right now it is enough to observe that, for Leibniz, temporal relations are grounded on the alteration of substances or phenomena.[27] The analysis of time in terms of change makes impossible time without change, thereby bolstering the case for AP.

2.5 Leibnizian Reductionism

In Section 2.1 we canvassed two different types of reductionism – modal and non-modal – and four different alternatives available to Leibniz:

1. Adopt modal reductionism with respect to space and time.
2. Adopt non-modal reductionism with respect to space and time.
3. Adopt non-modal reductionism with respect to space and modal reductionism with respect to time.
4. Adopt modal reductionism with respect to space and non-modal reductionism with respect to time.

For the reductionist, these options are mutually exclusive and jointly exhaustive. The question that we now confront, and that we are now in a position to answer, is

[27] In fact, Leibniz himself explicitly draws this inference: "It is obvious that [temporal] priority and posteriority do not enter into [*ingredi*] the definition of change" (AK 6.4.569).

which of these options Leibniz supports. To the extent that this question has been addressed at all, no consensus in the scholarly community has been achieved. Le Poidevin, for instance, refers to Leibniz's philosophy of time as "simple reductionism," contrasts it with the kind of modal reductionism adumbrated in Section 2.1, and correctly notes that it rules out the possibility of temporal vacua (1993, 155). Khamara, on the other hand, distinguishes between "an extreme and a moderate version" of reductionism, and avers that Leibniz held the latter:

> On the *extreme* version, Leibniz rules out the possibility of unoccupied places … what Leibniz is saying here is that there is no spatial position unless it is occupied by some material object. On the *moderate* version, Leibniz does not rule out the possibility of unoccupied places … what Leibniz is saying here is that if there are no material objects then there is no space at all, but if there *are* material objects then it is possible to have unoccupied as well as occupied places (476).

Ascribing to Leibniz the moderate version (what I am referring to as modal reductionism) Khamara insists that Leibniz is not committed to allowing for the existence of space only where there is matter: Leibniz "does not rule out a world with unoccupied places" (478).[28] Though he does not extend this analysis to time, there is no reason to think that similar reasoning does not apply. If so, then, on this view, Leibniz adopts modal reductionism with respect to both space and time. In this section, I will argue that this conclusion is incorrect, and that Leibniz consistently favors non-modal reductionism in the case of both space and time. More precisely, the underlying logic of Leibniz's arguments in favor of reductionism forces him to accept non-modal reductionism.[29] I should acknowledge at the outset that I think no definitive answer can be given here, and that there are good reasons for seeing Leibniz as adopting 4. But the weight of evidence, I hope to show, tips the scales in favor of 2.

Let us start with the case for construing Leibniz as adopting modal reductionism in the case of space. According to Khamara, Leibniz's moderate version of reductionism requires only a reference frame "consisting of a set of *actual* physical objects, relatively to which spatial positions can be assigned to *other* physical objects, whether these objects are actual or merely possible" (474). Khamara believes that

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[28] See also Vailati, 117: "Leibniz did hold that a vacuum is metaphysically possible… he was also committed to the possibility of a vacuum."

[29] What I am not claiming is that reductionism in general forces one to deny spatial and temporal vacua. See Newton-Smith, 38–42. Clifford Hooker attempts to show that the reductionist is, by the logic of this position, firmly committed to denying spatial vacua: "Unoccupied space as something like the permanent possibility of spatial relations places [the reductionist] on the horns of a dilemma: Either he must ultimately admit that such spatial positions exist independently of material objects or it seems that he must after all deny the existence of a vacuum… Clearly the Relationalist must opt for denying the vacuum if he is to maintain his position" (110–111). Though I incline towards Hooker's position, I will not attempt to decide between these two claims, but only to show that Leibniz's particular version of reductionism rules out the existence of spatial and temporal vacua.

his reading of Leibniz has at least two important virtues. First, it disentangles two separate theses. Leibniz holds not only that space is relative, but that there is no spatial vacuum. Unless Leibniz is willing to grant that the second thesis follows logically from the first, he cannot adopt non-modal reductionism, for then the non-existence of a vacuum would be entailed by the relative nature of space. Khamara maintains that this is an implication that Leibniz resisted, since "he did not wish to deny the possibility of a vacuum," which is merely a contingent matter of fact (482). Khamara's argument comes to this: Since reductionism is necessarily true, and the non-existence of a vacuum is only contingently true, the latter cannot be entailed by the former, and so Leibniz cannot adhere to non-modal reductionism. The second virtue of this reading of Leibniz is that it makes the infinity of space necessary: "Given an actual frame, all the possibilities of being situated relatively to that frame are also given. This at once guarantees, *a priori*, both the continuity and infinite extent of relative space" (478).

It is true that Leibniz on occasion appears to countenance the possibility of a vacuum. In the *New Essays*, he argues that one can measure the distance between two points separated by empty space in a way that one cannot measure the distance between two events separated by time without change: "If there were a vacuum in space, one could establish its size. But if there were a vacuum in time, i.e., a duration without a change, it would be impossible to establish its length" (AK 6.6.155). The thrust of this passage is that the existence of a spatial vacuum is verifiable and determinable, but the existence of a temporal vacuum is not. Hence, even if we assume the principle of verification, there is no reason to gainsay the possibility of empty space. The possibility of spatial vacua cannot be denied on verification grounds. This, however, is not to say that it does not violate other principles that are central to Leibniz's metaphysics. I will argue below that it does.

It is also relevant to note that Leibniz often denies the actual existence of a vacuum based on the principle of the best. Leibniz's claim in these passages is that this world, the best of all possible worlds, does not contain empty space because such space would be barren and useless. In one representative text, Leibniz writes that from

> an infinity of possible [worlds], God chose, in accordance with his wisdom, that which is most appropriate. However, it is obvious that the vacuum (and likewise atoms) leaves sterile and uncultivated places, places in which something additional could have been produced, while preserving everything else. For such places to remain contradicts wisdom. I think that there is nothing sterile and uncultivated in nature, even if many things seem that way to us (AG 170–171).

This argument hardly suffices to rule out the metaphysical possibility of a vacuum, for it establishes only that it is not consistent with the maximization of perfection. A world with a vacuum is, insofar as it has uncultivated, bare space, a less perfect world, but it is not *ipso facto* an impossible world. The most that we can conclude based on this line of reasoning is that vacua derogate from the perfection of worlds, not that they render them impossible.

Were these the only arguments Leibniz submitted against vacua, we would be left with the conclusion that there are possible worlds with empty space. But these

are not Leibniz's only reasons for denying the existence of empty space, as is indicated in the following letter to Clarke:

> *To omit many other arguments against a vacuum and atoms*, I shall here mention those which I ground upon God's perfection and upon the necessity of a sufficient reason. I lay it down as a principle that every perfection which God could impart to things without derogating from their other perfections has actually been imparted to them. Now let us fancy a space wholly empty. God could have placed some matter in it without derogating in any respect from all other things; therefore he hath actually placed some matter in that space; therefore there is no space wholly empty; *therefore all is full* (LC 4.46, emphases added).[30]

Here again we find Leibniz denying that our world has empty space because of its maximized perfection. This claim, taken on its own, suggests that the plenary nature of matter is a contingent matter of fact about our world, or, at most, some possible worlds. More important for our purposes, though, is Leibniz's explicit statement that this is only one of "many other arguments." So even if this particular argument fails to establish the impossibility of empty space, we cannot rush to the conclusion that Leibniz upholds the possibility of empty space.

What, then, are the other arguments that Leibniz has omitted in this letter to Clarke? In texts spanning a thirty year period, we find Leibniz disallowing the existence of empty space on precisely the same grounds that he argues against Newtonian space: it violates PII. In "First Truths," Leibniz declares that "*There is no vacuum*. For the different parts of empty space would be perfectly similar and congruent with each other and could not by themselves be distinguished. So they would differ in number alone, which is absurd" (L 269). The incompatibility of PII and empty space is reiterated in the *New Essays*' contention that the former principle "puts an end to … empty space" (AK 6.6.57), and again in Leibniz's fourth letter to Clarke:

> To suppose two things indiscernible is to suppose the same thing under two names … The same reason which shows that extramundane space is imaginary proves that all empty space is an imaginary thing (LC 4.5–6).

This passage is especially striking in that it establishes a common ground for Leibniz's reductionism *and* his denial of empty space. Precisely the same principle that Leibniz deploys against Newtonian space he also deploys against empty space. Strictly speaking, Khamara is right in saying that Leibniz does not establish the plenary nature of matter on the basis of his reductionism, for the latter is not logically prior to the former. But it is going too far to say, as Khamara further adds, that

[30] In "A Specimen of Discoveries about Marvelous Secrets," Leibniz stipulates that a vacuum is not "consistent with the reasons for things; for, *to pass over the fact that space is nothing real*, it is certain that a vacuum is inconsistent with the perfection of things" (MP 82, emphasis added). This too signals that while the perfection of things is an argument against empty space, it is not the only one available to Leibniz.

the two are "logically independent" (479). The two are logically connected in that they are derivable from the same underlying premise: indiscernible things do not occur in nature. Assuming that points of empty space are indiscernible – that there is no *internal* difference between them – they cannot exist.[31] The non-existence of empty space, on this reading, has precisely the same status as the reductive nature of space.[32]

Finally, as we have seen above, Khamara believes that it is a consequence of Leibniz's modal reductionism that space, though perhaps not matter, is of necessity infinite. Yet, as I will argue at greater length in Chapter 4, Leibniz neither endorses the *necessary* infinitude of space, nor does he establish the actual infinitude of space on the basis of his reductionism.[33] To be sure, this is not definitive evidence that Leibniz disavows modal reductionism (he might simply think that it does not imply the infinity of space), but it does show that one cannot attribute the "moderate" version of reductionism to Leibniz because of its putative link to the infinitude of space.

The above arguments apply equally to time. A temporal vacuum, no less than a spatial vacuum, runs contrary to PII. We may also assume, though Leibniz nowhere makes this argument, that a temporal vacuum is not compatible with the strictures of PSR. In much the same way that one would be unable to provide a sufficient reason for one particular ratio of matter to empty space, so too one would be unable to provide a sufficient reason for one particular ratio of change to empty time. Additionally, we have seen that Leibniz thinks that there is an argument against empty time that is inapplicable to empty space. This is the fact that the magnitude of a temporal vacuum is in principle indeterminable, and that its existence is in principle unverifiable. This is surely what Leibniz has in mind when writing that "we could not refute someone who said that two successive worlds are contiguous in time so that one necessarily begins as soon as the other ceases, with no possible interval between them" (AK 6.6.155), but this inability to refute such a claim is because it is unverifiable. I take these considerations to weigh in favor of attributing to Leibniz non-modal reductionism with respect to space and time.

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[31] Recalling Leibniz's requirement that "things that differ ought to differ in some way, that is, have an intrinsic difference that can be designated" (AG 174).

[32] Leibniz also attempts to show that empty space contravenes two other metaphysical principles: The Principle of Sufficient Reason, and the Principle of Continuity. It violates PSR because it "is impossible that there should be any principle to determine what proportion of matter there ought to be, out of all the possible degrees from a plenum to a vacuum, or from a vacuum to a plenum" (LC 4.46). For a discussion of empty space's violation of the Principle of Continuity, see Mates, 165.

[33] In the "Metaphysical Foundation of Mathematics," Leibniz argues that space and time are of necessity infinite, but he is referring to space and time as ideal, mathematical continua, not to the spatial expanse or temporal duration of the actual world.

2.6 Space and Time as Continuous Magnitudes

As I mentioned at the beginning of this chapter, Leibniz's late philosophy repeatedly draws contrasts between time and space as such and what, in the Clarke correspondence, he often calls concrete times and spaces. The latter are the spatial and temporal facts about the phenomenal world represented by monads, and these facts are reductively analyzed in terms of facts about the relative relations among bodies and their changes. To say that Hanover is east of London is not to say that it occupies a position in an independently existing space that is east of another such position occupied by London; to say that the birth of Leibniz is earlier than the death of Newton is not to say that it occupies a moment in an independently existing time that is earlier than another such moment occupied by Newton's death. Talk about the spatial and temporal locations of bodies is to be recast as talk about those bodies' ordering relative to one another, and nothing more. Reversing the ontological priority of his substantivalist opponents, Leibniz declares that it "is by means of things that we must distinguish one time or place from another, rather than *vice versa*" (AK 6.6.230). I have argued that this constitutes a form of non-modal reductionism, where a world's temporal series is identified with the events actually occurring during that series, and where is some spatial location L_1 if and only if there are bodies appropriately related to each.

This is only part of the story. Leibniz comes to hold by the 1690's that time and space in themselves are *entia rationis*. Time, like space, is "a continuous quantity which is indeterminate in itself, or indifferent to the parts one might take in it, or which could actually be found in nature" (G 7.562). This idea is echoed in a letter to Des Bosses, where Leibniz advises his correspondent that "space, just like time, is a certain order … which embraces not only actuals, but possibles also. Hence it is something indefinite, like every continuum whose parts are not actual, but can be taken arbitrarily … Space is something continuous but ideal" (G 2.379). Continuous quantities like space and time are contrasted with discrete things, which include both monads and aggregates of monads, things that are actual and determinate in virtue of being divided in a particular manner. Opportunities for confusion abound due to Leibniz's unfortunate terminological conventions, and to avoid this confusion interpretative caution is needed. Specifically, Leibniz often reserves the terms "continuous" and "discrete" to mark a distinction between different kinds of beings, or different levels of reality. Their modern meaning notwithstanding, these terms, for Leibniz, have as much a modal as a topological connotation.[34]

Space and time as continuous quantities – as opposed to the particular temporal series of changes or spatial arrangement of bodies of the actual world – are indeterminate:

[34] This point is emphasized in Crockett, Hartz and Cover (1998), and Levey (1999).

"indeterminacy is of the essence of continuity" (G 7.563). This means that while space and time are divisible in infinitely many ways, there are no actual divisions. Of even greater importance for present purposes is Leibniz's further contention, based upon the indeterminacy of time and space considered as ideal continua, that they "express possibilities, just as do numbers" (l 583/G 4.568). This is elaborated in a letter to De Volder from 1706:

> But a continuous quantity is something ideal which pertains to possibles and to actualities only insofar as they are possible. A continuum, that is, involves indeterminate parts, while on the other hand, there is nothing indefinite in actual things, in which every division is made that can be made" (G 2.282/L 539).

A continuum is indeterminate precisely because it includes within itself possibilities and, as Leibniz says, actualities, but actualities only insofar as they are considered as merely possible. Hence, the indeterminacy of a continuum is closely linked with it being an order of possibilities. Further, since "indeterminacy is of the essence of continuity," there is an equally close connection between something being a mathematical being of reason, such as space and time as continua, and the inclusion within such beings of reason of possibilities.

These attributes of ideal space and time make them markedly different from the spatiotemporal array of bodies given to us in perception. The contrast between space and time as ideal quantities and concrete space and time is made explicit in notes from 1702, where Leibniz writes that

> space and time taken together constitute the order of possibilities of the one entire universe, so that these orders – space and time, that is – relate not only to what actually is but also to anything that could be put in its place … This inclusion of the possible with the actual makes a continuity which is uniform and indifferent to every occasion … [T]he actual world does not remain in this indifference of possibilities but arises from the actual divisions or pluralities whose results are the phenomena which are presented in practice (G 4.570/L 583).

The phenomena "presented in practice" are changing bodies, spatially and temporally related to each other, given to us in perception. In the case of time and change, an actually existing series of things brings about determinate divisions within the indeterminate continuum of time. As this passage also makes evident, Leibniz's inclusion of the possible within the actual is only with respect to space and time as ideal, continuous magnitudes that have no reality and that are objects of the imagination. It is precisely because ideal space and time contain possibles, in addition to actual things considered as possible, that they are mathematical beings of reason. But the temporal series of the actual world (and so too with its spatial expanse) includes only actually existing things, not actual and possible things. Making this point to De Volder, Leibniz writes that "an essential order of particulars corresponds to the definite parts of time and space" (G 2.271/L 538, emphasis added). The definite parts of space and time – the temporal and spatial facts about the world – are here identified with an essential order of particulars, an order of existing

things.[35] More generally, discrete things are fully determinate and actually divided in a particular way. But discretely ordered entities – material bodies or moments of time – do not, unlike continua, include within themselves mere possibilities. And to anticipate a point that will be of importance below, discretely ordered entities need not have empty interstices separating them, for discrete though they are, they may still be contiguous.

Vailati has taken the distinction between continuous and discrete entities to imply that Leibniz is encumbered with empty space. Taking the discreteness of matter to imply interstitial vacua, Vailati writes that "the discrete structure of matter is too coarse to map onto that of space. So there must be space where there is no matter … making the void not merely possible but actual" (Vailati 1997, 119). Even if correct, this is not a difficulty only for those ascribing to Leibniz a non-modal form of reductionism, for all Leibniz scholars alike, including Khamara and Vailati, are agreed that he denies the actual existence of a vacuum, the only differences arising about the possibility of a vacuum. On Vailati's assumption, how can Leibniz retain the thesis that there is (and, if I am right, can be) no empty space while still holding that matter is discrete? Part of the answer is to be found in what Leibniz refers to as the "law of continuity," according to which "one can say in general that though continuity is something ideal and there is never anything in nature with perfectly uniform parts, the real, in turn, never ceases to be perfectly governed by the ideal and the abstract" (GM 4.93/L 544).[36] In the case of space and matter, this governance amounts to the claim that, though matter is too coarse to be perfectly isomorphic to a continuous magnitude, there is no assignable difference between the two. Vailati draws our attention to Leibniz's statements that "coincidence [is] infinitely small distance" and that "matter is not a continuum but an actually infinitely divided discretum, although no assignable part of space is without matter" (GM 4.93/L 544; G 2.278). From this, Vailati concludes that "the discrepancy between ideal space and real matter is infinitesimal and therefore unassignable" (120).[37] If Vailati is correct, then Leibniz's avowal that there can be no vacuum comes to the claim that no part of *assignable* space can be without matter.

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[35] See also his claim to Clarke that "[a] particular time considered without the things is an impossible fiction" (LC 5.58). This is unambiguously incompatible with identifying a moment of our world, or any actual world, with a set of merely possible events. As formulated earlier, there exists some time T_1 *n* units after an actual event E_1 if and only if there exists some actual event E_2 *n* units after E_1, and that time T_1 is nothing more than the collection of events occurring n units after E_1.

[36] In another formulation, also from 1702, Leibniz writes that the law of continuity is "never violated by actual phenomena, since the difference is always less than any given assignable amount" (G 2.271/L 539).

[37] Strictly speaking, since Leibniz thinks that infinitesimal quantities are mathematical fictions that serve only a heuristic function, the empty interstices between discrete bits of matter are not infinitesimally small. But they are smaller than any given assignable quantity. Whatever quantity of space one takes, there is a still smaller quantity that more closely approaches the magnitude of empty space.

This is admittedly weaker than the claim that there is no empty space, but it is, on Vailati's construal, the strongest claim to which Leibniz is entitled.

Since there is a deep ambiguity in the way that Leibniz uses the terms "discrete" and "continuous," Vailati's interpretation is not inescapably forced on the Leibniz exegete. We have seen above that these are often modal concepts, not ones bearing topological connotations. On the basis of this distinction, Crockett urges us to see Leibniz as holding that although matter is modally discrete it is topologically continuous, or, more precisely, dense. Crockett argues that while matter and change are not mathematically ideal, and thus not continuous in this sense, they are still topologically continuous (which Crockett has Leibniz identify with density), even though they are modally discrete.[38] If there is the kind of structural isomorphism between (modally) discrete and (modally) continuous entities posited by Crockett, then Leibniz is able to retain the stronger thesis that no part of space is, or can be, without matter. I am reluctant to accept this interpretation. Crockett is certainly right to underscore the nuances in Leibniz's views on continuity and discreteness, and to make the case that modal continuity is neutral with respect to topological requirements. Crockett is also right that there are different senses of "continuous" and "discrete" operative in Leibniz's texts such that something can be both continuous and discrete. Something modally discrete cannot be continuous when continuity is understood as designating a mathematical being of reason that is indeterminate, but it can be continuous when this is taken in its topological sense. But while it does not follow that what is modally discrete is also topologically discrete, it also does not follow that it is not. Moreover, there are a number of places in Leibniz's texts where he suggests that what is modally discrete is also topologically discrete.[39] Thus, I must part company at this point with Crockett's otherwise useful analysis.

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[38]"So there are no discontinuities of any kind in motion or in the perceptual series of a monad. Change, in both cases, is every bit as structurally continuous as space or time. But when Leibniz says to De Volder, for example, that change, like matter, is discrete, he is making a different point. Namely, he is claiming that unlike Cartesian extended substance, matter and change are completely determinate since they are well-founded in completely determinate and discernible substances" (Crockett, 132). Crockett distinguishes between what he labels "M-continuity" and "S-continuity," with the former referring to mathematically ideal entities such as space and time as such, and the latter referring to a particular kind of structural feature, density. With these senses of continuity disambiguated, Crockett contends that though discrete entities, fully actual and determinate, are not M-continuous because not mathematically ideal, they are S-continuous because densely ordered.

[39] This is unequivocally stated with respect to change, which Leibniz defines as "a complex of two contradictory states that are immediate to one another" (AK 6.4.869), or "an aggregate of two contradictory states where one follows immediately from the other" (AK 6.4.568–569). This is preceded by the comment that the states are "necessarily immediate, since a third state is not given," and followed by the remark that immediate states are those where "another state does not intercede" (ibid.). Elsewhere Leibniz writes that "change is an aggregate of two contradictory states. These states are necessarily immediate to one another, since there is no third state between contradictory things" (AK 6.4.556). If states are serially ordered in such a way that there are two states between which there is not another, then they are discretely ordered. If they were either

If matter is indeed topologically discrete, must it also be gappy in a way that leaves empty, if unassignable, space? There is reason to think that Leibniz holds matter to be both modally and topologically discrete but that there is no empty space. In notes from the Paris period, Leibniz describes matter as a "discrete being, not a continuous one; it is only contiguous" (AK 6.3.474). Matter is not continuous because, not remaining in a state of indeterminacy, it has actual boundaries, i.e., different pieces of matter are distinguished from one another on the basis of their differing boundaries. These boundaries are differing in that diverse pieces of matter do not share a common boundary, and are therefore not continuous in the Aristotelian sense of the term. The contiguity of matter is asserted in a still earlier piece from 1669, where Leibniz writes that "two spheres, one included in the other, can be moved in different directions and yet remain contiguous, though they cease to be continuous" (AK 6.2.436). Though they are discrete, contiguous bodies are such that they do not result in a vacuum: "contiguous things are those between which there is no distance" (AK 6.3.94).[40] We cannot rule out the possibility that Leibniz means no *assignable* distance, but this reading is certainly not unavoidable. If there is no distance *simpliciter* between different bits of matter, then discrete matter forms a plenum in which there are no empty interstices. And, when coupled with Leibniz's reductionism, this in turn means that there is a spatial location L_1 *n* units in a particular direction from a body B if and only if there are actual physical entities *n* units in that direction from B. In this way, we are able to preserve the more robust non-modal reductionism I am ascribing to Leibniz.

densely or continuously ordered, between any two states there would be a third. This is precisely what Leibniz has denied, and in doing so denied that the sequence of changes is either dense or continuous. Or rather, he has denied that change is always densely ordered. For a somewhat different reading than this, see Levey (2003), which ascribes a fractal theory of change to Leibniz, one in which at least some changes are not densely ordered.

[40] The exposition of this third alternative – topologically discrete matter forming a material plenum – tracks Levey (1999): "Contiguity really *is* supposed to preserve the integrity of the plenum because immediately neighboring bodies will *touch* in the strong sense that there is no empty space between them… all the parts of matter in the universe are so packed together that the boundaries of contiguous parts are 'indistant' from one another, leaving no empty spaces anywhere" (84 and 86; cf. 117 footnote 23). Many of the translations in this paragraph are taken from this article.

Chapter 3
The Unity of Time and Space

The topological structure of time has long beguiled and perplexed philosophers and scientists. This is nowhere more evident than in the metaphysics of Leibniz, whose writings brim with speculations about infinite temporal regressions, the unity of time, and the relation between time and causation. Even so, this facet of his thought has been almost entirely neglected by commentators, a neglect that has been to the detriment of both Leibniz scholarship and philosophy of time more generally. In this and the next two chapters I aim to redress this deficiency by providing a systematic examination of Leibniz's views on the structure of time.

Before delving into an extended analysis of Leibniz's views on the structure of time, it will be useful to provide an overview of the kinds of questions that are most pertinent to this topic. Current discussions of time's topology typically center on four characteristics that time might or might not have. The first is the boundedness or unboundedness of time. Time will have a beginning if there is a first instant prior to which there is no earlier instant, and time will have an end if there is a last instant after which there is no later instant.[1] Failure to meet both of these requirements means that time is unbounded; failure to meet one of these requirements means that time is bounded at only one end. The second topological feature is the linearity or circularity of time. If time is linear, then there is no instant both before and after itself, or, as Le Poidevin has put it, the instants of time "are isomorphic to the collection of points on a line" (1993, 158). Consequently, in linear time "before" and "after" are irreflexive and asymmetric relations. In contrast, these relations are

[1] I should point out that time can be both unbounded and of finite duration. This can happen in at least two ways: if it is structurally isomorphic to (1) an open interval or (2) a circle. Le Poidevin (2003, Chapter 5) contains a clear discussion of these points. I will argue in Chapter 5 that Leibniz rejects the second possibility, and to the best of my knowledge there is nothing in his texts indicating that he entertained, much less endorsed, the first. It is also the case, however, that I can also find nothing in Leibniz's texts that is incompatible with time being like an open interval, so I will not venture to insist that he flatly rules it out. Even so, all of his discussions (of which I am aware) of the boundedness or unboundedness of time are framed in terms of its infinite extent. Hence, my use of the terms "bounded" and "unbounded" will, within the context of my exposition of Leibniz, connote time (or space) that is infinitely extended in at least one direction, a connotation that Leibniz himself appears to have accepted.

M.J. Futch, *Leibniz's Metaphysics of Time and Space*,

reflexive and symmetric in closed time. Questions about time's topology also are concerned with the unity of time, i.e., with the possibility of there being more than one time stream. Finally, philosophers and scientists have sought to determine whether the series of instants or temporal intervals forms a discrete, dense, or continuous series.

Although among contemporary philosophers of science nothing approaching a consensus has been reached, what has come to be termed the "standard" topology of time obtains, as elaborated by Newton-Smith, if and only if the following statements are true[2]:

1. $(x) \sim Txx$
2. $(x)(y)(Txy \rightarrow \sim Tyx)$
3. $(x)(y)(z)((Txy \,\&\, Tyz) \rightarrow Txz)$
4. $(x)(y)(y \neq x \rightarrow Txy \vee Tyx)$
5. $(x)(y)(\exists z)((Txy \,\&\, x \neq y) \rightarrow (Txz \,\&\, Tzy \,\&\, z \neq x \,\&\, z \neq y))$
6. $(x)(\exists)(Tyx)$
7. $(x)(\exists)(Txy)$

The first proposition stipulates that the relation "temporally prior" is irreflexive and that one instant cannot be temporally prior to itself; 2 asserts the asymmetry of T, denying that x can be both prior to y and y prior to x, and 3 asserts the transitivity of T: if x is prior to y and y is prior to z, then x is prior to z. As Newton-Smith observes, it immediately follows from 1, 2, and 3 that time is linear, or non-circular. The relatedness of temporal events is asserted in 4, which, in conjunction with the preceding three propositions, rules out non-unified time. According to 5, between any two instants at least one other instant can be interposed, which means that the series of instants forms a dense series. 6 and 7 assert that time has no beginning and no end respectively – time is unbounded at both ends. The standard topology of time, then, holds that time is (1) unbounded, (2) linear, (3) unified, and (4) dense.

In seeking to elucidate the structure of Leibnizian time, I will examine his views on six of the above outlined seven tenets of the standard topology of time, and the extent to which they commit him to three of the four features of that topology. In Chapter 4 I will turn to Leibniz's views on the boundedness and unboundedness of time,[3] and in Chapter 5 I address his views on the linearity of time. In this chapter, I examine Leibniz's views on the unity of time. This might sound like an anachronistic rational reconstruction that imposes on Leibniz a conceptual repertoire entirely alien to his thought. Leibniz's myriad writings on time and worlds, however, are rich with suggestive and sometimes explicit comments about his views on the unity of time. What I will attempt to establish is that Leibniz believes that time is of necessity unified, and that he holds this to be demonstrated on philosophical grounds.

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[2] T denotes the temporal relation "prior to." The following seven propositions, their discursive elaboration, and their topological implications are taken from Newton-Smith, 52.

[3] Again, using these terms within the context of my discussion of Leibniz to refer to time and space of infinite extent.

My principal concern over the next three chapters will be to provide an analysis of Leibniz's views on the topology of time, but I will also attend to his views on the topology of space. Indeed, Leibniz's views on the unity of time can hardly be extricated from his views on the unity of space; to address one is, in many instances, to address the other. This chapter argues that, as in the case of time, space is of necessity unified, and that the necessity of the unity of space is entailed by the same principles as the necessity of the unity of time. Both space and time are, therefore, unified of necessity. As in the case of time, I will wait until Chapter 4 to examine the unboundedness of space.

3.1 The Unity of Time

Can there be more than one time stream? Is it possible for there to be an alternate and actual world that is not temporally related to our own? If so, time is not unified. Newton-Smith has observed that there are at least three ways in which time might be non-unified. The first is if there are multiple time streams, i.e., two or more sets of events where every event in one set is temporally related to every other event in that set, but not to any event in another set.[4] The second is tree time, or what I will refer to as "branching time," where up through some time T1 there is only one time stream, and then after T1 two or more timelines diverge from that time stream. All of the events in the divergent time streams are later than, and hence temporally related to, all events at and prior to T1 (as well as being temporally related to every event in that divergent stream), but no event in a divergent time stream is temporally related to any event in another divergent time stream. Finally, there is fission-fusion time, which is simply branching time where the divergent time streams re-converge at a time T2 to a common time stream. If there is only one time stream, time is unified. These four possibilities can be diagrammatically represented as follows:

Multiple Time Streams

TL1 ---------->
TL2 ---------->

Branching Time

---------> TL2
TL1 ---------->
---------> TL3

Fission-Fusion Time

---------> TL2
TL1 ----------> ----------> TL4
---------> TL3

Unified Time

TL1 ---------->

[4] This and what follows is taken from Newton-Smith, 80–81.

In Section 3.1 I will show that Leibniz holds that branching time is impossible, and that this conclusion is to be established on purely philosophical, as opposed to empirical, grounds. Similarly, Section 3.2 argues that Leibniz finds the possibility of multiple time streams to be founded on a confused and philosophically indefensible view of what is involved in the very idea of a world. Consequently, non-unified time is, for Leibniz, an impossible temporal topology, meaning that time is of necessity unified.[5]

3.2 Branching Time

Understanding Leibniz's views on the possibility of branching time must start from an understanding of what he thinks time is. Leibniz explains that time is the order of things "inconsistent but connected," or things which are "incompatible but which we nevertheless conceive as all existing" (G 4.568/L 583). There are three elements of this definition on which we need to focus: order, incompatibility, and connection. As a species of order, time is a system of relations among numerically distinct things by which these things can be discriminated (*discriminatur*) from one another (C 476). Unlike some other orders (such as space), time is an order of things that are incompatible and that, in some unspecified sense, stand in relations of contrariety to one another. But even though time is an order of incompatible things, it is nonetheless an order of things that are *connected*. Given Leibniz's multifarious definitions of "connection," this means that, for any two things that are temporally related to each other, the existence of one can be inferred from the existence of the other.[6] It is this last claim that I wish to emphasize: it is true by definition for Leibniz that all things that are temporally related are *eo ipso* connected, for that is part of what it means for things to be temporally related.

Prima facie, none of the above suffices for ruling out branching time. It tells us only that if two things are temporally related, they are connected in such a way that from the existence of one can be inferred the existence of the other. It does not tell us that all existents are temporally related. If some are not, then there can be multiple time streams where the existents in each distinct time stream are not temporally related to each other. There is accordingly no obvious reason why Leibniz should reject branching time as being a possible temporally topology, or even one that is true of the actual world. Or so it appears.

A closer examination of Leibniz's corpus shows this appearance to be illusory. To start, Leibniz unambiguously endorses 4: $[(x)(y)(y \neq x \rightarrow Txy \vee Tyx)]$. That all

[5] Though I will not directly address Leibniz's views in fission-fusion time, the same arguments that Leibniz uses to refute branching time apply equally to it.

[6] A relation of connection is one in which the existence of the connected things are "involved in" the existence of each other (AK 6.6 N493$_1$), and two or more things are involved with one another if from the existence of one can be inferred the existence of the other (AK 6.6 N 269)

existents are temporally related is affirmed in the late "Metaphysical Foundations of Mathematics": "whatever exists is either simultaneous with other existences or prior or posterior" (L 666). I will refer to this as the Temporally Related Criterion (TR). The status of this contention will be examined in Section 3.3.2, but for now we should note that Leibniz thinks that it is true *of the actual world*. In the actual world, all existents are, *qua* temporally related, connected to each other, with the consequence that the actual world's topology is unified, since non-unified time is a time structure with temporally unrelated events. This, though, says nothing about *possible* temporal topologies.

To get at this, we need to examine more closely what is involved in the notion of temporal relatedness, and the more general type of relation of which it is a species, viz. the relation of connection. In identifying temporal relatedness as a kind of relation of connection, Leibniz is employing a bit of technical jargon, the unraveling of which is indispensable for ascertaining his views on the possibility of branching time. Two things T1 and T2 are connected if and only if they are "involved" with each other, or if the existence of one is "involved" in the existence of the other (AK 6.4.2769). Elsewhere Leibniz writes that "those things are connected of which the one cannot be understood without the other" (AK 6.3.515). Furthermore, T1 is involved in the existence of T2 if T1's existence follows from T2's (AK 6.4.1439). The relation of connection is symmetrical in that if T1 is connected to T2, then T2 is connected to T1, and from the existence of one follows the existence of the other. The relation of connection also requires that if T1 and T2 are connected, then each is connected to anything connected to the other; given the connectedness of T1 and T2, neither can be connected to something that is not also connected to the other. For instance, if T1 is connected to T2 and to T3, then T2 must be connected to T3 also.[7] Given that time is by definition an order of connected events, it is not contingently true of a particular temporal series that its events are connected. It is, instead, necessarily true of all possible temporal series. It is necessarily true that for any two existing things that are temporally related, they are connected both to each other, and to everything connected to the other. I will refer to this as the Temporal Connectedness Criterion (TCR). What should be stressed is that this leads to the conclusion – one heavy with consequences for the possibility of branching time – that there cannot be two temporally related things T1 and T2 where, e.g., T1 is connected to T3 and T2 is not connected to T3. Put differently, there can, for Leibniz, be no three moments of time where two moments are connected to the first but not to each other.[8]

[7] This is because, given the connection of T1 to T2 and T3, T1 involves T2 and T3, and is involved by T2 and T3 (individually, not jointly). If T1 involves T3 and is involved by T2, then T2 involves T3, and if T3 involves T1 which itself involves T2, then T3 must involve T2. Thus, T2 and T3 are connected.

[8] Anthony Quinton has advocated a similar understanding of what is involved in the notion of temporal connection: "Let us call two events temporally connected if there is a time interval between them or they are simultaneous. This relation, like that of spatial connection, is clearly symmetrical and transitive" (Quinton, 204).

It bears noting that TCR – that if two existents are temporally related then they are connected to each other and to everything connected to the other – is not equivalent to TR – that all existents are temporally related. These are separate constraints, and the former can be true even if the latter is false. Even if some things are not temporally related, it still must be the case that of those things that are, they are connected to each other and to everything connected to the other. That these are in fact independent constraints can be illustrated as follows. Let us posit two different timelines:

TL1 ——————————— >
TL2 ——————————— >

In this example, we have two entirely independent timelines that share no common moment in that they neither diverge from a common past nor converge to a common future. From our description of multiple time streams above, we know that each event in one timeline is temporally related and connected to every other event in that timeline, and that no event in one timeline is either temporally related or connected to an event in the other the timeline. This scenario clearly violates TR as we have existents that are not temporally related: the existents in TL1 are neither temporally related nor connected to the existents in TL2. But it does not violate TCR. It does not violate TCR because there is no event temporally related to some other event that is not also connected to it and to everything connected to it. Or, for any two moments T1 and T2 that that are temporally related (moments of which TR is true), they are connected to each other and to everything connected to the other. It is true that there are events that are not connected – those events occurring in the different timelines – but neither are these events temporally related. There are no two existents or events of which TR but not TCR is true, while there are events of which TCR but not TR is true. TCR, and not TR, is perfectly consistent with the above.[9]

Though TCR does not bar multiple time streams, it is not obviously consistent with branching time. To show this, let us modify our example by positing a temporal fork:

——————— > TL2
TL1 ——————— >
——————— > TL3

In this example, we have two timelines (TL2 and TL3) that diverge at some moment from a common time segment (TL1). Once again, based on our earlier explication of branching time we know that every event or existent in TL1 is temporally related and

[9] Quinton also emphasizes this point, noting that the relation of temporal connection "allows for self-contained and exclusive groups of temporally connected events" (ibid.). These self-contained and exclusive groups of temporally related events are precisely what is envisaged in TL1 and TL2: every event or existent in each timeline is temporally related to every other event and existent *in that timeline* and to no event in the other timeline.

connected to every event or existent in both TL2 and TL3, but that no event in TL2 is temporally related or connected to any event in TL3, and vice-versa. As in the case of multiple time streams, we have a scenario where TR is violated. Given that there is some existent in, e.g., TL2 not temporally related to any existent in TL3, not all existents are temporally related. But here we also have a violation of TCR, for here we have an example where two moments are temporally related to a third, but are not connected to each other. On the stipulated assumptions, there is a moment T1 in TL1 that is temporally related to some moment T2 in TL2 and to some moment T3 in TL3. It necessarily follows, from TCR, that T1 is connected to both T2 and T3. The relation of connection, however, is such that if T1 is connected to both T2 and to T3, then T2 and T3 must be connected to each other. Yet this is precisely what the second assumption denies: T2 and T3 are neither temporally related nor connected. Given these assumptions *and* TCR, time cannot branch.

It is my contention that for precisely these reasons Leibniz must, and does, deny the possibility of branching time. What I will try to show is that Leibniz holds that existents in divergent timelines are temporally unrelated and disconnected from each other. At the same time, for these timelines to be *divergent* they must share a common history, meaning that existents in the divergent timelines are temporally related and connected to the existents or events in the common timeline. For time to branch, then, there must be disconnected existents that are connected to a common timeline, i.e., to the existents in the shared timeline. For time to branch, there must be at least two disconnected existents T2 and T3, both of which are connected to a third, T1. Because it violates TCR, which is necessarily true, branching time is an impossible temporal topology.

Why think, *on Leibnizian grounds*, that existents in divergent time streams cannot be connected? Though few of Leibniz's texts are explicitly framed in these terms, numerous passages provide us with at least an indirect response to this question. One such text is a 1687 letter to Arnauld, where Leibniz writes that a precondition for understanding substances as being part of a single temporal series is that they harmonize with one another, where such harmony in turn is spelled out in terms of the substances representing the same phenoneman. Absent such connected representations, substances cannot be understood as constituting the same world:

> all substances must have a harmony and connection which links them together, and must express in themselves the same universe … Otherwise, the phenomena of different minds would not harmonize with each other, and there would be as many systems as substances … The whole concept we have of time and space is based upon this harmony (G 2.115/M 147–148).

Another text announces that were there to exist some set of substances such that each substance represented a distinct timeline, then there would be "as many worlds *without connection* … as there are substances" (G 4.519/L 493, emphasis added). In representing different spatio-temporal systems, they form "worlds without connection." Embedded in these texts is a condition, both necessary and sufficient, for substances to be connected, that condition being the common representation of the same phenomena. As a consequence, not only are temporally related existents

connected (TCR), but connected existents must be temporally related.[10] That is to say, the only way of conceiving of substances as being connected to one another is to see them as standing in appropriate (second-order) spatial and temporal relations.[11]

That connected substances must represent the same phenomena – the same spatio-temporal array – is affirmed in an earlier essay from the *De Summa Rerum:*

> is that which brings it about that several perceptions cohere with each other at the same time … Therefore, the idea of space is recognized by this: namely, it is that by which we separate the place and, as it were, the world of dreams from our own … And it follows further, on the assumption that there are minds having perceptions not congruent with ours, that there can be an infinity of other spaces and other worlds such that there is no distance between them and ours … Whoever asks whether there could be another world and another space is just asking if there are other minds having no communication with ours (AK 6.3.511–512).

Once again we find Leibniz stipulating a condition for conceiving of diverse substances as forming the same world: the mutual coherence of perceptions. This mutual coherence of perceptions is identified with the representation of the same phenomena. Two or minds representing different worlds have incongruent perceptions and "no communication" with each other. Accordingly, they are not connected. In fact, Leibniz goes so far as to aver that to ask about the existence of other worlds just is to ask about the existence of other minds with incongruent perceptions. The existence of two minds with incongruent perceptions is sufficient and necessary for the joint existence of two worlds, and the existence of two or more worlds is sufficient and necessary for the existence of non-harmonizing minds. That is to say, for substances to be connected, they must have "cohering" perceptions, perceptions that are congruent in virtue of representing the same world. This most definitely is not to deny the possibility of distinct spaces, but only the connectedness of existents constituting distinct spaces. In a passage that we will examine at length below, Leibniz makes a similar claim about time, arguing that existents in distinct timelines do not stand in temporal relations to one another (LH IV vi 12F 14). In denying that these existents are temporally related, Leibniz is also denying that they are connected: "The whole concept we have of time and space is based upon this harmony" (G 2.115/M 147–148).

All of the above has been in the way of showing that existents can be understood as being connected only if they stand in appropriate spatial and temporal relations to one another. For two moments T2 and T3 to be connected to each other, T2 must

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[10] As Rutherford observes, space and time "determine the order of connection of all possible worlds" (1995, 198).

[11] This is point is underscored in the "Discourse on Metaphysics": "And God alone… is the cause of this correspondence of their phenomena and makes what is particular to one of them public to all of them; *otherwise, there would be no interconnection*" (DM 14; emphasis added). To see substances as being connected is to see them as corresponding in their expressions of phenomena. That is, it is only on the basis of an agreement of their perceptions with respect to the content of those perceptions that substances can be connected to one another.

be either simultaneous with or temporally prior or posterior to T3. If T2 and T3 are moments in divergence timelines, however, then T2 is neither simultaneous with nor temporally prior or posterior to T3. Thus, T2 and T3 are temporally unrelated and thereby disconnected. As moments in branching timelines, though, they *are* connected to at least one moment T1 in their common past. Therefore, T2 and T3 are both temporally related (and connected) to T1, though neither is temporally related (or connected) to the other. This leads to what Leibniz would take to be a philosophically untenable conclusion: the disconnectedness of two or more things, both of which are connected to a third thing. Since this consequence violates TCR, which is necessarily true, branching time is not possible.[12] For Leibniz, it is necessarily true that time does not branch. This is not a topological feature of time that is determined empirically, or that is a contingently matter of fact. Leibniz's proscription of branching time rests upon a priori, conceptual grounds, upon an analysis of what is involved in the very idea of time and what follows from that idea.

3.3 The Possibility of Multiple Time Streams

I have argued above that TCR rules out branching time and does not rule out multiple time streams. If there are multiple time streams, there will be things not temporally related, but the temporal relatedness of all things is not stipulated by TCR. Hence, TCR alone does not suffice to prove the necessary unity of time. It does not suffice to prove the necessary unity of time because it does not disprove the possibility of multiple time streams, and as long as multiple time streams are possible, so too is temporal disunity. To get that conclusion – the impossibility of multiple time streams and the necessary unity of time – we need a principle to the effect that, necessarily, all existents are connected, or, necessarily, all existents are temporally related. There can be no doubt that Leibniz thinks this is true of the actual world ("whatever exists is either simultaneous with other existences or prior or posterior" (L 666)). Does he also think this is true of every possible world? More precisely, are there possible collections of existents such that some of those existents are neither temporally related nor connected?

I find Leibniz's views here ambiguous. Let us start by revisiting some passages examined earlier. Leibniz variously claims that "all substances must have

[12] There is yet another reason why Leibniz would deny that time branches. As we will see in Chapter 5, Leibniz propounds a causal theory of time, one in which temporal relations are grounded on causal relations. The temporal connectedness of events presupposes (or simply is identified with) their causal connectedness. If we have a branch in time that results in two distinct timelines, then we will also have two distinct causal series. Many, and perhaps all, events in one timeline will be causally disconnected from the events in the other. On a causal theory of time, this implies that the events will also be temporally disconnected, and, if temporally disconnected, disconnected more generally. Once again, we see that branching time leads to a thesis that, for Leibniz, is necessarily false.

a harmony and connection which links them together, and must express in themselves the same universe," lest there be "as many systems as substances" (G 2.115/M 147–148), and again that "God could give to each substance its own phenomena independent of those of others," but in doing so "he would have made as many worlds without connection … as there are substances" (G 4.519/L 493). Leibniz is undoubtedly expressing his disapproval of this kind of creation scenario, one that is hardly worthy of the serious attention of a wise architect. And yet for all of that Leibniz concludes only that in creating non-harmonizing existents God would "have created as many systems as substances," a plurality of worlds without connection. To my ear, this sounds like an implicit acknowledgement that God could create such substances, even if in creating them he would create disconnected systems.[13] That is, Leibniz's God can create a collection of substances of which TR is not true, even if this collection does not, for reasons to be spelled out below, count as a world. If this is correct, then TR is an empirically contingent feature of this world (or, more precisely, of the collection of actually existing substances), and it follows from this that multiple time streams is a logically and metaphysically possible topological structure of time of distinct substances.

At least one early text openly announce God's ability to create more than one world from the infinitely many possible. In this piece, from 15 April 1676, Leibniz avers that "infinitely many other spaces and worlds can exist … if there exists certain minds to which other things appear which are in no respect consistent with ours … [T]here could be several spaces" (AK 6.3.511, AK 6.3.512). Again, non-harmonizing minds – minds "which are in no respect consistent" with one another – constitute different worlds. This is precisely what we should expect given Leibniz's later claims that in giving to each substance its own phenomena God would have created as many worlds as substances. From this, however, Leibniz does not conclude that such a creation scenario is not possible, or that God could not create non-harmonizing minds that are not mutually consistent. Rather, he postulates that other worlds can exist. This should not be confused with the weaker postulation that there are other possible worlds that could have existed but for the existence of the actual world; Leibniz means that there can be multiple actual worlds. The possibility of multiple actual and non-harmonizing worlds, expressly argued for here, appears to leave open the possibility that there can be multiple time streams and that time can be non-unified. If, as a matter of fact, the actual world's temporal topology is unified, it is not so of necessity.

This text notwithstanding, the remainder of this section argues that the underlying metaphysical principles of Leibniz's philosophy rule out the possibility of distinct time lines. This, in conjunction with the impossibility of branching time, commits Leibniz to the necessary unity of time.

[13] Cover and Hawthorne have recently provided an extended defense of this claim. See especially pp. 131–141.

3.3.1 Multiple Worlds in Leibniz's Early Philosophy

As we have just seen, there are passages that imply that God could create disconnected, and a fortiori distinct, timelines. This in turn implies that, even if time is as a matter of fact unified, it is not unified of necessity. This interpretation is neither conclusive nor fully coherent with some important texts in Leibniz's corpus. Indeed, Leibniz's speculations in favor of multiple worlds set forth in April 1676 are retracted by the end of that year, and in a piece from December 1676 we find Leibniz propounding a line of thought that flatly contradicts what he had said only months earlier. Writes Leibniz:

> There is no need for the multitude of things to be increased by a plurality of worlds; for there is no number of things which is not in this one world, and indeed in any part of it.
>
> To introduce another genus of existing things, and as it were another world which is also infinite, is to abuse the name of existence; for it cannot be said whether those things exist now or not. But existence, as it is conceived by us, involves a certain determinate time; or, we say that that thing exists of which it can be said at some certain moment of time, "That thing now exists" (AK 6.3.581).

This passage starts with the rather weak claim that "there is no need" for other actual worlds. I say that this is weak because, while apparently denying their existence, Leibniz does not rule out their possibility. The very phraseology that Leibniz employs suggests that there could be other actual worlds – more than one world – but that these other worlds are superfluous, and *for that reason* do not exist. Not existing because they are superfluous is importantly different from not existing because it is impossible for more than one world to exist. On the first, the multiple-time-streams structure is a possible temporal topology, while on the second it is not. Leibniz does not leave it at that, however, and the piece concludes by asserting the impossibility of a plurality of worlds, and thereby multiple time streams. To characterize the introduction of another world as an abuse of "the name of existence" is more than a little enigmatic. Leibniz might have in mind the notion, enunciated later in the Paris notes, that "for things to exist is the same as for them to be understood by God to be the best, i.e. the most harmonious" (AK 6.3.588). On this view, the introduction of multiple worlds would be an abuse of the "name of existence" since those worlds would not be harmoniously related to each other. Leaving this argument behind, Leibniz's central contention is the putative impossibility of saying of another world that it now exists. Given this, according to Leibniz, it is impossible for another world to exist. Why? Because, for any given thing that exists, it must be possible to say of it that it exists, and, at least at some point in time, that it exists now. But, for Leibniz, no such determination can be made of things not in our world, so no things not in our world can exist. Since, for anything that exists, there must be some time at which we can say that it exists now, and since things in multiple time streams are temporally unrelated to each other, there can be no other time streams.

This line of reasoning is no mere anomaly. In a study bearing striking similarities in both content and form, Leibniz seeks to disprove the possibility of other (actual) worlds as follows:

> If there existed another series outside of ours it would not be possible to say whether something in it existed simultaneously with something in ours, or not; therefore, it would not be possible to say whether it existed now, or not. Which is impossible. For necessarily it does or it doesn't exist now (LH IV vi 12F 14).

As with the preceding passage, the purpose of this argument is to show that there cannot be more than one actual series of existing things, which I take to mean, among other things, more than one timeline. Given such series, Leibniz contends, "it would not be possible to say" whether any event in our series is simultaneous with any event in the other series, that it exists now or not. Leibniz does not simply mean that we can say of things in other time streams that they do not exist now, or are not simultaneous with some time in our world, since they are temporally unrelated to our time stream. What he clearly intends here – and what he must have for his arguments to work – is the claim that either they exist now or do not exist now, where this second disjunct is taken to mean that they exist later or earlier than now. This is evident in Leibniz's more exact phrasing from above: "we say that that thing exists of which it can be said *at some certain moment of time*, 'That thing now exists' " (AK 6.3.581, emphasis added). To maintain, as Leibniz does in this passage, that it is *in principle* impossible to say whether the events of different timelines are simultaneous with something in ours is to say that they are not temporally related. All of this, Leibniz says, is impossible: it is impossible for it to be in principle impossible to say of some existent whether it is simultaneous or not with a particular moment in "our series," to say of it whether it exists now or not. This *reductio ad absurdum* is clearly designed to refute the opening premise of the passage: the possible existence of another series outside of ours. This premise leads to an absurd conclusion, and so must be false. On the basis of this passage, one would have to conclude that Leibniz denies multiple time streams to be a possible temporal topology.

Yet another passage from the Paris notes (also composed in December of 1676) sheds light on Leibniz's thinking. Starting with the principle that "Nothing is and is not at the same time, or anything either is or is not," Leibniz infers that

> There is only one kind of world, or, there are no entities besides bodies and minds, i.e., what we sense, nor are there any bodies except those which are at a certain distance from us. For if there were any, it could not be said whether they exist or do not exist now, which is contrary to the first principle. So it follows that not all possibles exist (AK 6.3.584).

I will address below the implications that this passage has for the unity of space. What I wish to focus on now is Leibniz's insistence that, for any existent, it must be possible to say of it that it exists now or not, and that this precludes the possibility of multiple worlds. Parkinson interprets this argument as resting on the principles of contradiction and excluded middle (expressed by Leibniz as "nothing is and is not at the same time, or anything either is or is not").[14] The existence of existents in other worlds violates the principle of excluded middle (since it cannot be said of them that they exist now

[14] See Parkinson's footnote to this essay in DSR (139, fn. 5).

or do not exist now). The principle of excluded middle is necessarily true, and thus whatever contradicts it is necessarily false. In this case, it is necessarily false that there are existents in other worlds; it is thereby necessarily true that time is unified.

These attempted disproofs of the possibility of multiple worlds are not without their shortcomings, at least as *defenses* of TR rather than declarations of it. The crucial assumption in Leibniz's arguments is that it is impossible not to be able to say of some existent whether it is simultaneous with an existent in our series, or to say of it that it exists now or not. Leibniz's reasoning here is opaque. Perhaps Leibniz thinks that (1) for something to exist it must exist at some time (excepting God), and (2) that if it must exist at some time then it must exist now or not, and (3) that the only way that we can make sense of that is to say that it is simultaneous or not simultaneous with a moment in our series. Because temporal relations do not obtain between existents in different series, there can be no series outside of ours. More fully, the temporal disconnectedness of events in different series makes it impossible for us to say of an event in another series that it exists now or it does not exist now. The first of the three numbered propositions appears plausible enough, while the second and third look to be more controversial. It is only with the second and third, however, that Leibniz is entitled to the conclusion that there can be no series outside of ours. Why accept the propositions that for something to exist it must exist now or not (and must be possible to say so), and be or not be simultaneous with a moment in our series? That is, why think that if (1) is true, so too must be (2) and (3)?

I see three possible answers. First, these contentions might simply presuppose the necessity of all existents being temporally related. Whatever exists, even in a different world, must be temporally related to existents in our world, and if they must be temporally related to existents in our world, it must be possible to say of them that they exist now or do not exist now. On this reading, (2) and (3) follow from (1) *because* of the temporal connectedness of all existents. Yet if these propositions presuppose TR, as they clearly do on this reconstruction of Leibniz's reasoning, they can hardly be put into the service of proving it. At most, they show that Leibniz adopts TR, not that he has good reasons for doing so.

A second interpretation is that Leibniz might be illicitly moving from the claim that it must be possible to say of something in a different world that it exists or does not exist to the entirely different claim that it must be possible to say of it that it exists now or does not exist now, or that its existence is or is not simultaneous with something in our world.[15] Perhaps Leibniz thinks these propositions equivalent, though they plainly are not. It *might* be true that it must be possible to say now that an existent in a different world exists or does not exist, but that does not get Leibniz the conclusion he needs. In short, we ought not to conflate the following to statements:

- It must be possible to say now that something in another time steam exists.
- It must be possible to say that something in another time stream exists now.

[15] Recalling Leibniz's contention that "If there existed another series outside of ours it would not be possible to say whether something in it existed simultaneously with something in ours, or not; therefore, it would not be possible to say whether it existed now, or not. Which is impossible. For necessarily it does or it doesn't exist now" (LH IV vi 12F 14).

The former statement is perfectly consistent with the temporal disconnectedness of existents in different worlds, and thus with non-unified time, whereas the latter statement is not. That is because the requirement that we must be able to say of any existent that it exists now or does not exist now presupposes TR and the unity of time. We can say that something exists now only if its existence is simultaneous with our utterance asserting its existence, and if it is simultaneous with this utterance then it is temporally related to it. In non-unified time, however, there must be existents that are not temporally connected, for if all existents are temporally connected, then time is unified. Without at the outset excluding the possibility of there being temporally unrelated existents, Leibniz is not entitled to maintain any kind of equivalence or logical implication between saying now that something exists and saying that something now exists. As with the previous reconstruction of Leibniz's reasoning, this argument appears to tacitly presuppose TR for the purposes of disproving the existence of other worlds. That is, throughout these passages Leibniz assumes TR as a premise in an argument the conclusion of which is the non-existence of other worlds. Leibniz is thus not so much concerned with defending TR as he is with elucidating one of its consequences. Accordingly, these passages fail to provide independent support for TR, though as advertisements of Leibniz's adherence to TR they are compelling.

The first two interpretations of this argument leave Leibniz with little more than a bald assertion of TR, but no defense of it. I would like to suggest that there is an alternative interpretation according to which these passages provide a rationale for TR and not merely declarations of it. On this interpretation, Leibniz is best seen as relying on something akin to the principle of verification. To see how such an argument might proceed, let us start with a more recent formulation. Swinburne seeks to establish the necessary unity of time on the following grounds:

> [A]ll events about which at a given instant an observer has knowledge occur at instants connected with the present instant by a temporal chain … Hence the claim that there were events not temporally related to each other could have no evidence produced in its favour. For evidence would be evidence about events at other instants and the only ways in which we could learn about those events would be ways which presuppose that the events are temporally related to the event of learning about them. If no evidence could (logically) ever be produced to support the claim that there were two times, any such claim must be empty of significance (1968, 199–200).

The assertion of the existence of another time stream is meaningless in the absence of any kind of (possible) verification of its existence. Yet any way of verifying its existence entails that it be temporally related to our own time stream. If it is temporally related to our own time stream, though, then it is not another time stream at all. Time is therefore necessarily unified.[16] It is not implausible to suppose that Leibniz's arguments attempt to make the same point, albeit in a less than fully

[16] Quinton too considers a line of reasoning that seeks to establish the unity of time based on how we come to have information about when things happen: "Provided they can be answered at all, questions as to where things are or when they happened can always, it seems, be answered in terms of a system of positional references in which all positions are connected. As things are, if a thing cannot be found a home in this unitary system of positions we conclude that there is no such thing" (205).

perspicuous fashion. Leibniz's possible employment of the verification principle is most strongly insinuated in his remarks that "we say that that thing exists of which it can be said at some certain moment of time, 'That thing now exists'" (AK 6.3.581), and that "there are no entities besides bodies and minds, i.e., what we sense" (AK 6.3.584). Add to these statements the further claims that "we have no idea of existence, other than that we understand things to be sensed" (AK 6.3.588) and that existence "consists in the fact that several people sense the same, and sense what is coherent" (AK 6.3.511). Existential statements are void of cognitive content to the extent that they do not have appropriate conditions of verification, but we can verify the existence of another time stream and its existents only if it can be said of it that it exists now or does not exist now. The proponent of non-unified time is in this manner caught between the Charybdis of meaninglessness (it is impossible to say of another time stream that it exists) and the Scylla of unified time (the putatively distinct time stream is really not distinct at all). Granted that Leibniz does not explicitly invoke the principle of verification as he so freely does in his later writings, this reading has the virtue of giving to him a non-circular defense of TR. This is not to say that his writings so interpreted are immune to criticism, for how one assesses this argument will depend upon how compelling one finds both the principle of verification and the claim that one cannot verify the existence of a distinct time stream.[17] These are questions that I shall set aside. What I do wish to note is both the conclusion and especially the nature of Leibniz's argument. The conclusion is that there cannot be more than one stream, and that, for any given existent, it must be temporally related to every other existent. In maintaining this position, Leibniz has also committed himself to the notion that this facet of time's structure can be decided on purely philosophical, as opposed to only empirical, grounds.

3.3.2 Compossibility and the Unity of Time

In Section 3.3.1 I have argued that by the end of 1676, Leibniz renounces the view (defended earlier that year) that there can be multiple actual worlds. This he does by trying to establish that it is necessarily true that all existents are temporally related, and that existents in different worlds are not temporally related. To the extent that these arguments are successful as a defense of TR, they implicitly presuppose a variant of the Principle of Verification. In this section I consider a different set of reasons Leibniz may have for adopting TR. On the interpretation advanced here, Leibniz maintains the following:

[17] Newton-Smith provides a counterexample designed to rebut the assertion that the existence of another time stream is unverifiable. See Newton-Smith, Chapter 4.

1. It is necessarily true that only compossible things can exist.
2. It is necessarily true that things are compossible with one another only if they are temporally related.

Given 1 and 2 we can infer:

3. It is necessarily true that all existing things are temporally related.

And this in turn entails

4. It is necessarily true that time is unified.

In short, Leibniz's doctrine of compossibility implies the necessary unity of time. Before turning to those writings on compossibility that favor the necessary truth of TR, I will take up an interpretation of Leibniz's views on compossibility that does not suffice for this purpose. With this done, I sketch an alternate interpretation of compossibility that does establish the necessary truth of TR.

According to Leibniz, the actual world is one but one of infinitely many possible worlds from which God chose. A minimal condition for a group of substances, possible in themselves, to co-exist is that they be jointly possible, or, to use Leibniz's terminology, compossible: "since there are different combinations of possibilities, some of them better than others, there are many possible universes, each collection of compossibles making up one of them" (G 3.572/L 662). The nature of compossibility is a recurring concern in many of Leibniz's writings, and much in his philosophy, especially about possible and actual worlds, rides on it. What counts as a world or a possible set of existents is thus closely connected to what Leibniz means by "compossible."

On one interpretation, compossible substances are simply those standing in appropriate relations of spatial and temporal harmony, and, by extension, incompossible substances are those that are not so connected.[18] This interpretation collapses the distinction between compossibility and harmony: "Leibniz sees an equivalence between the notions of compossibility and universal connection" (Rutherford 1995, 188). A world, as a collection of compossible substances, is a collection of temporally and spatially connected substances. On the basis of this understanding of compossibility, Rutherford contends that "universal harmony is a necessary feature of any possible world" (1995, 198), and further adds that this harmony requires the temporal relatedness of all existents. It is worth emphasizing that the equivalence between incompossibility and harmony means that substances are incompossible if and only if they are not harmoniously related to each other; this entirely exhausts what is meant by "incompossible."[19]

On the basis of this conception of compossibility, we can conclude that no possible *world* has multiple time streams. Multiple time streams imply the disconnectedness of substances, and this is precisely what this understanding of compossibility

[18] See Rutherford (1995, 187): "A group of substances is compossible only if such substances can be conceived as coexisting in the same world, which is to say, only if they agree in their respective expressions of the universe."

[19] Wilson (2000) adopts a view not entirely dissimilar to this, writing that substances are "compossible if and only if each perceptually represents (all) the others" (1).

rules out – at least with respect to substances understood as forming a world. Given that a world is a collection of compossible substances, and that substances are compossible if and only if they are harmoniously related to each other, it follows that no collection of substances that qualifies as a world can be disharmonious. A world is a collection of compossible, that is, harmoniously ordered substances. From this it might seem evident that Leibniz cannot allow for the coexistence of disjoint substances, and, in disallowing for this possibility, cannot allow for multiple time streams. This, however, is not correct, for this view of compossibility and possible worlds is too weak to rule out multiple worlds and, *a fortiori*, multiple time streams. Put differently, there is nothing internal to this understanding of "world" that prohibits multiple worlds/multiple time streams from existing. At most, this understanding of compossibility and world-hood disqualifies a *collection* of multiple worlds as itself being a world. A collection of multiple worlds as a whole contains non-harmonizing, and hence incompossible substances (substances in one of the collection's worlds will not harmonize with substances in another of the collection's worlds), and so the *collection* itself is not a world (since a world is a collection of compossibles). But this by itself doesn't imply that these non-harmonizing substances cannot be jointly actualized.

To illustrate, let us assume, for purposes of simplicity, that we have a class C consisting of exactly four substances, and that C is partitioned into two sub-classes W1 and W2 consisting of two substances each. Both sub-classes W1 and W2 contain two substances such that those substances harmonize with each other but not with the substances in the other sub-class. Therefore, W1 and W2 each individually counts as a world. C, on the other hand, does not count as a world, since C comprises both W1 and W2, and in comprising both of them contains non-harmonizing substances. Defining "compossible substances" as harmoniously ordered substances and "world" as a set of compossible substances disqualifies C as being a world, but not C as being a possible collection of existents.[20] In saying W1's substances are incompossible with those in W2, we are, on this view of compossibility, saying nothing more than that they are not harmoniously related. Again, incompossible substances, on the compossibility-as-harmony interpretation, are simply substances not standing in appropriate relations of connection to each other, substances that cannot be understood as forming a world. They are not substances the joint realization of which is impossible, however. It is a consequence of this that the substances that are elements of C can all exist (in spite of being incompossible), even though they cannot exist *as a world*. This understanding of "compossibility" and its concomitant conception of "world" are not inconsistent with multiple time streams.[21]

What we are looking for is a doctrine of compossibility that makes impossible the joint existence of incompossible substances – not only their joint existence in the same world, but their joint existence *simpliciter*. Put differently, to

[20] Acknowledging this point, Rutherford writes that the joint existence of non-harmonizing substances is possible, but they have no "claim… to form a single world" (1995, 198).

[21] For a similar point, see Wilson 2000, 13.

rule out the possibility of multiple time streams Leibniz's view of compossibility must both exclude the possibility of non-harmonizing substances existing in the same world *and* the possibility of non-harmonizing substances existing in different (actual) worlds. In exploring Leibniz's views on this topic, it is important to bear in mind the overall role that compossibility plays in his metaphysics. It is a central thesis of Leibniz's mature thought that there are non-existing things possible in themselves, i.e., things that do not exist even though their complete concept involves no contradiction.[22] Leibniz's doctrine of compossibility is thus designed to avoid the bête-noir of Spinozism by showing that not all possibles *can* exist, and that the existence of one thing precludes the existence of another thing. On compossibility as harmony, though, Leibniz is not entitled to the proposition that not all possibles can exist, but only to the much weaker proposition that not all possibles can co-exist as a single world. Compossibility so construed allows us to conclude that not all possibles can exist and in a way that they form a world, but not that not all possibles can exist simpliciter. To get the conclusion that Leibniz desires, we need a more robust notion of compossibility.

An alternative interpretation of Leibniz's theory of compossibility is advocated by Nicholas Rescher. According to Rescher, two substances are incompossible if their joint existence results in a logical inconsistency. I should stress that it is their joint existence per se, not their joint existence in a world, that results in this inconsistency. This interpretation is consonant with and an extension of Leibniz's definition of "possibility" as what involves no contradiction: two substances will be incompossible if their joint existence involves a self-contradiction.[23] Moreover, there is ample textual evidence to bolster Rescher's view. In one list of definitions likely composed around 1690, Leibniz writes that "Compossible is what, with another thing, implies no contradiction" (Grua, 325). In an earlier piece from the pre-Paris period, Leibniz notes that things are compossible if, with one posited, it does not from that fact alone follow that the other is taken away: compossible things are "those, one of which being given, it does not follow that the other is negated; or those of which one is possible, the other being assumed" (AK 6.2.498). And in still another study, Leibniz attempts to establish the immortality of the mind on the basis of it being possible "within itself and compossible with all other things, i.e. it does not impede the course of things" (C 530).

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[22] More precisely, there are internally consistent complete concepts with no individuals actually falling under them. For purposes of simplicity, I will continue to speak of non-existing things.

[23] As Rescher explains it, the inconsistency of two diverse substances arises if one substance has the property P and the property L_1 that no substance having Q stands in relation R to substances with P, and another substance has the property Q and the property L_2 that all substances with P stand in R to substances with Q. From the existence of one we can infer that all other existing substances with P stand in R to substances with Q, *and* that no existing substance with P stands in R to Q. These two substances, Rescher writes, "are patently incompatible (on logical grounds)" (1967, 16).

Leibniz's Paris notes are similarly rich with analyses of compossibility, all of which favor construing incompossible substances as logically incompatible substances. In December 1675 Leibniz observes that

> "Impossible" is a twofold concept: that which does not have essence, and that which does not have existence, i.e., that which neither was, is, nor will be because it is incompatible with God, or the with the existence or reason which brings it about that things exist rather than do not exist … The origin of impossibility is twofold: one from essence, the other from existence, or positing as actual (AK 6.3.463–464).

The duplex root of impossibility comes down to this: something is either impossible in itself because its concept implies a contradiction, or it is impossible relative to the existence of other things. In writing that something is impossible if it does not exist, Leibniz does not mean that what does not exist is impossible in itself, but that it is impossible given the existence of other things. This view of compossibility is reiterated again in the Paris notes when Leibniz claims that "all possibles cannot be understood distinctly by anyone, for they imply a contradiction" (AK 6.3.465). Parkinson correctly observes that it is all possibles conceived as a whole that cannot be understood by anyone, though of course God can conceive all possibles as partitioned into possible worlds.[24]

On all of the above definitions, two things are incompossible if the positing of one is by itself sufficient for inferring the negation or non-existence of the other, and the basis for this inference, presumably, is the logical incompatibility of the incompossible things. The joint realization of incompossible things enables one to infer logically contradictory propositions, so the instantiation of one incompossible *relata* precludes the instantiation of, "takes away," or "impedes" the other.[25]

Unlike compossibility as harmony, this notion of compossibility rules out the joint existence of incompossible substances. Demonstrating that incompossible substances cannot both exist simpliciter, and *a fortiori* cannot be jointly realized even in different worlds, it is not limited to establishing merely that incompossible substances cannot form part of the same world. The joint existence of incompossible substances results in a logical contradiction, and so the existence of one such incompossible "precludes" the existence of the other incompossible. Even so, this still does not establish TR – that, necessarily, all existents are temporally related. To do this, Leibniz needs to show that two or more things are incompossible if they are not temporally related. With this in hand, it is a short step to the conclusion that there can be no existents not temporally related. All compossibles are temporally

[24] See also Leibniz's contention that "there are as many possible worlds as there are series of things that can be posited without implying a contradiction" (Grua, 390).

[25] Savile adopts a similar interpretation of compossibility: "Leibniz is clear in his mind that God could not create several worlds because the very idea is incoherent. For that to be the case the putatively plural worlds' members would have to be compatible with one another, and if they were that they would all belong to a maximal set of compossibles, and thus all belong to one and the same world. Plurality here is a logical impossibility" (123).

related, and for any two or more existents, those existents must be compossible.[26] Hence, only temporally related things can exist. What is needed by Leibniz to rule out multiple time streams, then, is a conception of compossibility that at once makes it logically impossible for temporally disconnected things to exist – not, I should underscore, to exist (or be understood as existing) in the same world, but simply to exist.

There is some textual evidence that Leibniz incorporates spatial and temporal connectedness into his understanding of compossibility. In one especially perspicuous enunciation of this incorporation, Leibniz writes that "Space, just as a common time, is taken to be nothing more than a certain order of compossibles" (G 7.467). In contrast to his many definitions of space and time as such as orders of possibles, this characterization of space and time restricts it to compossibles only. This more restrictive conception is likely due to the fact that Leibniz is here referring to the concrete temporal framework – the "common time" – of a particular world. What is important to note is Leibniz's affirmation that such a temporal framework is determinative of which substances are compossible: for two or more substances to be compossible, they must fit into their world's concrete temporal framework, or "common time," i.e., they must be temporally connected. As temporal connectedness is a precondition of compossibility, and as only compossible substances can exist, only temporally connected substances can exist. Time, therefore, is of necessity unified.

The incorporation of spatial and temporal connectedness into compossibility is most evident in a letter to Bourguet from 1714:

> I do not agree that "in order to know if the romance of 'Astrea' is possible, it is necessary to know its connection with the rest of the universe." It would indeed be necessary to know this if is to be *compossible* with the universe, and as a consequence to know if this romance has taken place, is taking place, or will take place in some corner of the world, for surely there would be no place for it without such connections. And it is very true that what is not, never has been, and never will be is not possible, if we take the *possible* in the sense of the *compossible*, I have just said (G 3.572/L 661).

The sequence of events narrated in *Astrea* is possible in itself because nothing internal to it is contradictory, but it is compossible with other existents only if it stands in appropriate relations of connection, especially, Leibniz suggests, spatio-temporal relations. Without these relations, "there would be no place" for the events recounted in the novel. Consequently, these events never have been, are not now, and never will be, and it is this, Leibniz goes on, that makes them incompossible with the events to which they are not so related. It is the fact that the events in this novel are neither spatially nor temporally connected to events in actual world that

[26] Jalabert suggests a notion of compossibility along these lies: "For Leibniz, the correspondence and harmony [of nature] exist already at the level of the possibility of things, as they are conceived by the divine understanding. Each possible universe includes correspondence: phenomena that are not harmonious cannot constitute the same universe. So the universal harmony… is also pre-established in the sense that it is already constituted from the possibility of things, that God contemplates prior to his decision to create" (quoted in Wilson 2005, 119).

enables us to infer that they are not compossible with those events. The spatial and temporal connectedness of existents, or their mutual harmony, is a necessary condition for them to be understood as being compossible. Granting that the former is a necessary condition for the latter, however, is not to collapse the distinction between the two. It is to stipulate only that temporal connectedness is part of what it means for existents to be compossible, and, conversely, that temporal disconnectedness is part of what it means for existents to be incompossible. Another part of what it means for them to be incompossible, as we have seen above, is that their joint existence is logically contradictory.

The impossibility of jointly actualizing temporally non-unified existents is suggested elsewhere in Leibniz's corpus. In "On the Ultimate Origination of Things," Leibniz offers an explanation of why not all possibles can be actual, an explanation that underscores the way in which space and time delimit the range of what can actually exist. Writes Leibniz:

> And in this context, time, place, or in a word, that receptivity or capacity of the world can be taken for the cost or the plot of ground on which the most pleasing building possible is to be built, and the variety of shapes corresponds to the pleasingness of the building and the number and elegance of the rooms. And the situation is like that in certain games, in which all places on the board are supposed to be filled in accordance with certain rules, where at the end, blocked by certain spaces, you will be forced to leave more spaces empty than you could have or wanted to, unless you used some trick … And so, assuming that at some time being is to prevail over nonbeing, or that there is a reason why something rather than nothing is to exist, or that something is to pass from possibility to actuality, although nothing beyond this is determined, *it follows that there would be as much as there possibly can be, given the capacity of time and space (that is, the capacity of the order of possible existence)* (G 7.303–304/AG 150–151, emphasis added).

The spatio-temporal framework of a world imposes strict constraints on what combination of possibles can be actualized. Specifically, Leibniz insists in no uncertain terms that for something possible to become actual, it must fit into the space-time layout of the world in the appropriate manner. Taking seriously his analogy of the space-time receptivity of a world with the contours of a board game, it becomes obvious that all existents must "fill" this receptivity in the right way, that way being one in which all existents are temporally and spatially connected. In the case of the board game, the only pieces that can be placed are those that, given the placement of other pieces, can still fit onto the board. In the case of the world, the only possibles that can become actual are those that, given the actuality of other possibles, can still fit into the receptivity of the world. Clearly, Leibniz conceives the existence of some possibles as precluding the existence of other possibles precisely because the latter would not, were they to exist, stand in appropriate spatio-temporal relations to the former. This thesis at once expresses the view that only compossibles can exist, and that for things to be compossible they must stand in the right kind of relations of connection, including spatial and temporal connection.[27]

[27] For a discerning analysis of Leibniz's theory of compossibility that differs sharply from what I have defended, see Wilson 2000, 10–15.

To this point I have argued that Leibniz holds that it is logically impossible for disjoint substances to exist, and that substances not temporally connected are disjoint. Put differently, two or more substances can exist only if they are compossible, and they are compossible only if they are temporally related. In this regard, it is perhaps worth considering one final passage, one that is directly aimed against those upholding the possibility of multiple worlds:

> I call "World" the whole succession and the whole agglomeration of all existent things, lest it be said that several worlds could have existed in different times and different places … For they must needs be reckoned all together as one world or, if you will, one Universe. And even though one should fill all times and places, it still remains true that one might have filled them in innumerable ways, and that there is an infinitude of possible worlds among which God must needs have chosen the best … For it must be known that all things are connected in each of the possible worlds: the universe, whatever it may be, is all of one piece, like an ocean (*Theodicy,* 129).

Similarly, Leibniz avers that "one [world] embraces for us the entire universe of created things at any time and any place, and it is in this sense that we use the term 'world' " (G 6.440/S 116). In line with his other writings, Leibniz insists in the *Theodicy* that a world as such is composed only of interconnected substances. Added to this, in both the *Theodicy* and the *Monadology*, is the additional stipulation that a world includes all existents.[28] Given this stipulation, it follows that if two or more substances exist, they exist in the same world. More generally, for any given set of existents, those existents form a world. When we conjoin this with Leibniz's insistence that every substance in a world is connected to every other substance in that world – "it must be known that all things are connected in each of the possible worlds: the universe, whatever it may be, is all of one piece, like an ocean" – we are left with the result that all existents are connected, and thus temporally related. More strongly, it is not possible to have a set of existents that do not form a world, and that, in forming a world, do not standing in appropriate temporal relations to one another. This in turn implies that multiple time streams are not a possible temporal topology.

If the above is correct, then Leibniz has committed himself to the necessary unity of time. Having ruled out the possibility of both branching time and multiple time streams, this is the only possible temporal topology with which Leibniz is left. In maintaining this position, Leibniz has also committed himself to the notion that this facet of time's structure can be decided on purely philosophical grounds. That there is only one time, and more particularly that there is of necessity only one time, is a philosophical thesis proper that is arrived at a priori and on conceptual grounds.

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[28] Elsewhere Leibniz writes that the world is "the aggregate of all corporeal things" (AK 6.5.1509), or, alternatively, the "aggregate" of "limited existents." I take it that a possible world is an aggregate of possible limited existences. What is important is that a possible world is the sum total of all would-be existents.

3.4 The Unity of Space

As in the case of time, space is unified if and only if all existents are spatially connected. To elaborate, all existents are in the same space just in case all existents are spatially connected, and all existents are spatially connected to each other if each lies at some distance and in a definite direction from the others. It is typically thought, and I will leave this undisputed here, that spatial connection is symmetrical and transitive. If A is spatially connected to B, then B is spatially connected to A. And if A and B are spatially connected, then anything C that is spatially connected to A is spatially connected to B, and anything D spatially connected to B is spatially connected to A. Again as in the case of time, it is possible to arrange existents into sets such that each member of a set is spatially connected to every other member in that set and to no member not in that set. The question of the unity of space thus comes down to the question of how many such sets there are, which is just another way of asking whether or not all existents are spatially connected.

We have already encountered passages in Leibniz's early corpus where he allows for, without actually asserting, the existence of things not spatially connected to one another. The most striking passage in this regard is one from the *De Summa Rerum*:

> Space is that which brings it about that several perceptions cohere with each other … Therefore the idea of space is recognized by this: namely, that it is that by which we separate the place and, as it were, the world of our dreams from our own. As this is so, it does not follow that there exists anything but sensation, and the cause of sensation and its consistency. From this it follows that infinitely many other spaces and worlds can exist, in such a way that between these and ours there will be no distance, if there exists certain minds to which other things appear which are in no respect consistent with ours … Anyone who asks if there can be another world, or another space, is simply asking if there are other minds which have no communication with ours … Given that our sensation will be the more consistent the more carefully it is studied, it follows that space is infinite, as is the world . . But it does not follow from this that there is not another world, or other minds which cohere among themselves in a way which is different from that which holds in our case (AK 6.3.511–513).

The world of our dreams and our own world are spatially distinct worlds because they involve incoherent and non-harmonizing perceptions. Leibniz goes on to explain that these perceptions do not harmonize because there is no distance between the objects of perception., that is, between the objects of these worlds. It is precisely because the objects of the world of our dreams and the objects of our own world lie at no distance (and, presumably, in no direction) from one another that they constitute different spaces. In not being appropriately connected, they are in distinct spaces. In granting that "infinitely many other spaces and worlds can exist," Leibniz is not committing himself to the disunity of space, for he is not alleging that other spaces *do* exist. What he is committing himself to is the possible disunity of space. Thus, while silent about what is, as an empirically contingent matter of fact, the actual topological structure of space, Leibniz implicitly denies that space is of necessity unified.

We have seen above that Leibniz retracts this position only months later:

> Nor are there are bodies except those which are at a certain distance from us. For if there were any, it could not be said whether they exist now or do not exist now, which is contrary the first principle. So it follows that not all possibles exist (AK 6.3.584).

It is interesting to note that Leibniz's denial of the possibility of disunified space rides on certain assumptions about the unity of time. Specifically, Leibniz argues that space must be unified because the disunity of space implies the disunity of time. If there were to exist bodies not spatially connected to the bodies of our world, then there would be existents not temporally related to the existents in our world. Hence, there cannot be bodies that are not at some distance from, i.e., not spatially connected to, bodies in our world. Given the unity of time, the unity of space follows. The crucial premise in this argument is that spatially disconnected bodies are *eo ipso* temporally disconnected. Why accept that? In our passage, Leibniz is unhelpfully silent on this question. It is oft-stated principle of the later Leibniz, however, that space is an order of co-existence, or of simultaneity, and that two things are spatially connected if and only if they are simultaneous. All spatially connected things are simultaneous, and all simultaneous things are spatially connected. Perhaps implicitly assuming this understanding of space, Leibniz could be concluding that if two things cannot be spatially connected, then they cannot be simultaneous, and if they cannot be simultaneous, then they cannot be temporally connected. Conceiving space along these lines does establish that spatially disconnected existents are thereby temporally disconnected, and that the impossibility of the latter implies the impossibility of the former.

As in the case of time, I think that Leibniz's deeper reasons for avowing the necessary unity of space are grounded on his doctrine of compossibility. Spatial connectedness, like temporal connectedness, is integral to what it means for two or more existents to be compossible: "Space, just as a common time, is taken to be nothing more than a certain order of compossibles" (G 7.467). All existents must be compossible, and all compossibles must be spatially connected. From this we can infer that all that exists must be spatially connected, and that non-unified space is not a possible spatial structure.

Chapter 4
The Bounds of Space and Time

In this chapter we explore Leibniz's views on whether or not time has either a beginning or an end, paying particular attention to what Leibniz has to say about the possibility and actuality of an infinite temporal regress. For Leibniz, this question is tantamount to the question of whether or not the world has a beginning, or whether or not there is a first instant of time. As we have seen in Section 1.3 of Chapter 1, many of Leibniz's predecessors and contemporaries (and even successors) repudiated the possibility of an endless past because of its ostensible mathematical incoherency. Since an infinite past would require an infinite succession to be completed, the world – and time – must be of only finite duration in the direction of the past. As best as I can make out, this is not a view that Leibniz shares. On the interpretation defended here, Leibniz's philosophy of mathematics, and particularly his views on infinity, provides him with firm grounds for asserting the possibility of an endless temporal regress; for Leibniz, the world's eternity is not a metaphysical impossibility. Having shown that Leibniz allows for the possibility of infinite temporal regresses, I try to ascertain to what extent he is willing to say that the world's history is in fact characterized by such a regress. As we will see, some texts point to a world with no beginning. Nonetheless, I argue that in his most deliberate and thoughtful writings, Leibniz contends that the beginninglessness of the world cannot be a priori established on philosophical grounds. Thus, just as Leibniz renounces attempts to demonstrate via reason alone that the world must have a beginning, so too does he disown arguments purporting to prove that the world cannot have a beginning.

In arguing for this conclusion, this chapter sounds a discordant note within Leibniz scholarship. Citing the Clarke correspondence, many Leibniz scholars have simply assumed that Leibniz thinks the world has a beginning, and that it must have a beginning. Others take precisely the opposite view. Bas Van Fraassen, for instance, writes that "Leibniz and Kant … stated explicitly that the topological structure of time is that of a real line. That means that time has no beginning or end" (Van Fraassen 1970, 59). Both interpretations seriously misinterpret Leibniz's intentions. This does not mean that no evidence can be marshaled for either of these interpretations. We will see that the clear implication of at least one of Leibniz's writings is a world whose time regresses infinitely. Nonetheless, it is my view that in his most deliberate and considered writings on this topic, Leibniz refrains from

M.J. Futch, *Leibniz's Metaphysics of Time and Space*,

providing an answer to this question, displaying an uncharacteristic amount of skepticism about the ability of philosophy to resolve the dispute.

Our exploration of Leibniz's views on the boundedness of time will lead us into his writings on the boundedness of space. In Section 4.2 I will argue that Leibniz holds that the actual world's space is unbounded, but that this is only an empirically contingent feature of this world. More precisely, space is not of necessity unbounded, and so there are possible worlds with unbounded space and possible worlds with bounded space also.

4.1 Leibniz on Infinite Temporal Regressions

One of the relatively few claims about Leibniz's views on the beginninglessness of the past that can be stated with any certainty is his allowance for it. Whether or not time does in fact regress infinitely, Leibniz finds less than compelling attempts to reveal a conceptual impossibility surrounding infinite temporal regressions. Yet Leibniz does not always avail himself of the responses of his predecessors, frequently basing his counterarguments on assumptions about the infinite different from those of Aquinas and others. I will limit myself to a discussion of Leibniz's views on the boundedness of time in the direction of the past, and not both the past and future, for two reasons. First, the possibility of infinite temporal regresses has been a far more contentious topic throughout the history and philosophy of science than the possibility of infinite temporal progressions. Second, Leibniz's views on the beginninglessness of time are significantly more difficult to determine than his views on the endlessness of time. That he is committed to time being unbounded in the direction of the future is expressly revealed on a variety of occasions. In an essay from the middle period, Leibniz writes that in each piece of matter one can "read all of the past, and even all of the infinitely infinite future" (Grua, 554). It is appropriate that in a study devoted to Pascal's "double infinity" Leibniz should speak of an "infinitely infinite" future, but in virtue of what is the future doubly infinite, i.e., infinitely infinite? Leibniz explains that the future is infinitely infinite because "each moment contains an infinity of things that envelop in themselves an infinity" and, more relevantly for our purposes, because there is "an infinity of hours, of years, of centuries, and of eons in the entire eternal future" (Grua, 554). This doubtlessly commits Leibniz to the view that for any year Y_n, there is a later year Y_{n+1}; future years are infinite in that they have no limit, or in that there is no last year. The infinitude of the future duration of the world is reiterated in a 1708 letter to Des Bosses, where Leibniz writes that "by the name 'world' I understand the entire series of things, proceeding into eternity, to be sure *a parte posteriore*, that is, into the future" (G 2.362). Finally, in the *Theodicy*, a piece that Leibniz actually published, he holds that the universe "must extend through all future eternity" (195). With these texts as a backdrop, I will proceed on the assumption that Leibniz holds that time is infinitely extended into the future. The question thus

comes down to his views about the possibility of an infinite past, something, I contend, that Leibniz did not rule out.

To draw out the full force of Leibniz's views, let us start by recalling Bonaventure's contention that the world must have a beginning lest (a) an infinity be traversed and (b) an actual infinity come into existence. It is with this second claim, and Leibniz's response to it, that I will start. I will then turn to the more labyrinthine reply that Leibniz can offer to the first.

For Philoponus and Bonaventure, an eternal past implies an actual infinity because it implies that there will be infinitely many departed souls, souls that, because of their immortality, still exist. It is the continued existence of these immortal souls that results in an actual infinity. Like Aquinas, Leibniz believes that this argument is open to serious objections. Leibniz does not, however, always avail himself of the responses of his predecessors, frequently basing his counterarguments on assumptions about the infinite different from those of Aquinas and others. This is most explicit in an essay that offers an indirect rejoinder to one of the premises of Philoponus' first argument. In "Reflections on the Doctrine of a Single Universal Spirit," Leibniz critically examines a demonstration attempting to establish the Averroist doctrine that there is but one active intellect partaken of by all individual souls. In a passage reverberating with echoes from Aquinas, Leibniz expostulates that

> they were led to this doctrine of a universal immortal soul for all men by a fallacious argument. For they assumed that an actual infinite plurality is impossible and that it is therefore impossible that there should be an infinite number of souls but that this would necessarily follow if particular souls should subsist. For since it is their opinion that the world is eternal and the human race also, and since new souls are constantly being born, there would have to be an actual infinity by now if they were all to subsist.
>
> They regarded this reasoning as a demonstration. But it is full of false assumptions. There are those who disagree with them on the impossibility of an actual infinite, on the eternity of the human race, and on the generation of new souls, since Platonists teach the preexistence of souls and Pythagoreans teach metempsychosis (G 6.530/L 555).

Given (1) the impossibility of an actual infinite, (2) the eternity of the world, (3) the eternity of the human race, and (4) the continual production of new souls, it follows that there can be only one immortal soul, for were there to be immortal souls specific to each individual, then there would be an actually infinite number of souls, a conclusion that violates the first assumption. Leibniz, not impressed with this argument, calls into question its soundness, noting that it contains assumptions that are at best contentious and at worst false. If, in accordance with the Pythagorean doctrine of transmigration, souls successively inhabit different bodies, then a finite number of souls will suffice for an infinite number of lives. Alternatively, one could deny that the human race is eternal, limiting its existence to a part of the unending duration of the world. In proposing this possibility, Leibniz does not suggest that the assumption of the eternity of the world is false, but notes only that some have denied the eternity of the human race. Adopting either one of these two doctrines suffices for blocking the inference to a universal intellect while at the same time leaving in place the prohibition on an actual infinite and the possibility of an eternal world.

But Leibniz does not adhere to the transmigration of souls[1] and accepts the eternity of the human race. On pain of accepting the Averroist thesis of a universal intellect, it would seem that Leibniz must reject the eternity of the world. Yet this would be a precipitous conclusion, for it remains open to Leibniz to allow for actual infinities. This in fact is precisely what he does. In a passage directly announcing this acceptance, Leibniz writes that

> I am so in favor of the actual infinite that instead of admitting that Nature abhors it, as is commonly said, I hold that Nature makes frequent use of it everywhere, in order to show more effectively the perfections of its Author. Thus I believe that there is no part of matter which is not – I do not say divisible – but actually divided; and consequently the least particle ought to be considered as a world full of an infinity of different creatures (G 1.416).

And in a letter to Des Bosses from February of 1706, Leibniz adds that "I do not doubt that there is an actual infinity in nature … The objections brought against the actual infinite can, unless I am mistaken, be turned back, and they commonly rest on false hypotheses" (G 2.300). Leibniz's talk of an "actual infinity" can initially be misleading, suggesting a commitment to infinite number as a number than which there is no greater, or to an infinite magnitude as a magnitude than which no magnitude is greater. That Leibniz does not adhere to this conception of infinity can be inferred from his numerous studies on the nature of the infinite:

> numbers themselves absolutely per se do not go to infinity, since then there would be a greatest number (A 6.3.503).

> Arguments against actual infinity assume that if this be admitted, there will be an infinite number, and that all infinities will be equal. But it is to be observed that an infinite aggregate is neither one whole, or possessed of magnitude, nor is consistent with number. And, accurately speaking, in place of "infinite number," we should say that more things are present than could be expressed by any number (G 2.304).

> If there are ten terms, then there is a tenth; but it is debatable whether it follows from this that, if there are infinitely many terms, then there is an infinitieth one. Someone might say that an inference from the finite to the infinite is invalid in this case … It could equally well be argued that, since among any ten terms there is a last number, which is also the greatest number of those numbers, it follows that among all numbers there is a last number, which is also the greatest of all numbers. But I think that such a number implies a contradiction … When it is said that there are infinitely many terms, it is not being said that there is some specific number of them, but that there are more than any specific number (GM 3.566).

Without at the moment entering fully into the array of complexities presented by Leibniz's philosophy of the infinite, on the basis of these passages we can conclude that Leibniz thinks that there are infinitely many X's just in case for any number, the number of X's is larger than that number.[2] When in the "Reflections on the Doctrine of a Single Universal Spirit" Leibniz writes that the Averroist argument is

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[1] "… the transmigration of souls is an absurdity. Substantial principles do not fly about outside substances. The soul is never naturally without a body. So instead of believing in the transmigration of souls, we should believe in the transformation of one and the same animal" (NS 24).

[2] I am here following Levey (1998, 87), which is also the source of many of the translations in this paragraph.

"full of false assumptions," at least one of those false assumptions is that "an actual infinite plurality is impossible and that it is therefore impossible that there should be an infinite number of souls." It is true that if souls are put into a one-to-one correspondence with the series of whole numbers, there will not be an infinitieth soul, i.e., a soul paired with a number than which there is no greater number. To say that there is an infinity of souls – as Leibniz does at every opportunity – is to say the number of souls is greater than any given whole number, a view that engenders no absurdities for Leibniz. For this reason, those who have denied the possibility of an actual infinity of souls erred. On the other hand, at no point in his commentary does Leibniz say, or give any reason for thinking, that the eternity of the world is conceptually impossible. Quite to the contrary, the upshot of Leibniz's argument is that the eternity of the world does not imply the false conclusion that there is a single active intellect. This is not to go so far as to accept the past eternity of the world, but it is to remove what had become a stock objection to it. If Leibniz has yet to provide us with any reasons for thinking that the past is infinitely extended, he has at least removed a key obstacle to moving in that direction.

The first of Philoponus' objections is perhaps not so easily dispelled. On this objection, a world without a beginning and extending infinitely into the past was taken to mean that there is some moment L that is infinitely remote from the present. Or, as a more recent proponent of this argument has put it, "if the chain of events prior to *E* is infinite, then there must be an event 0 that is separated from *E* by an infinite number of intermediate events."[3] To have reached the present, these infinitely many interceding moments must have been traversed. Hence, on the assumption that the world is without a beginning, an actual infinity will have been traversed to reach the present. Opponents of unbounded time such as Bonaventure, Craig, and Whitrow take this as decisive evidence against the beginninglessness of the world. Recall also Aquinas' rejoinder that for any L in the past, L is only a finite distance from the present. To affect a traversal, there must be both a starting point and an ending point, in this case the present. Since there is no L that is infinitely remote from the present, any traversal will cover only a finite number of terms. Hence, unbounded time does not imply the traversal of an actually infinite number of moments.

Though not completely explicit, much of what Leibniz says about the nature of infinity and unbounded series suggests that he believes that there is no moment of time that is, or can be, infinitely removed from the present. That is, even if the world has no beginning, for any moment in the past, there are only a finite number of other moments between it and the present. Leibniz's adherence to this principle is most evident in a series of writings from the late 1690's, where he attempts to disprove to the renowned mathematician Johann Bernoulli the existence of infinitesimals,

[3] Craig, p. 200. See also Whitrow 1978, 40: "If *n* events occurred in sequence E_o, then there must have occurred an event [*n* number of events ago]. Similarly, if aleph-zero events occurred before E_o, then there must have occurred (in time past) events $E_{\text{-aleph}}$."

infinitely small quantities. According to Leibniz, if we suppose that there actually exist segments on a line that are designated by the fractions ½, ¼, 1/8, ad infinitum, all that follows is that there is some finite fraction of arbitrary smallness – a *finite* fraction of arbitrary smallness, not an infinitesimally small fraction. The ontological status of infinitesimals is not our immediate concern, so I will set it aside for now. What is of interest is Bernoulli's response to Leibniz, a response that provides Leibniz with the opportunity to advance an important clarification bearing directly on our topic. In essence, Bernoulli responds that in an infinite series there must be an infinitieth term: "If 10 members are present the 10th necessarily exists, if 100 then necessarily the 100th, if infinitely many then necessarily the infinitieth member must exist" (GM 3.563). Adolf Grunbaum has adroitly seen that the underlying assumption operative in Bernoulli's assertion is that "an actually infinite set of numbers has an infinitieth term which can be reached, so to speak, in the manner in which an inductive cardinal can be reached starting from zero" (Grunbaum 1963, 166). This operative assumption on Bernoulli's part is precisely identical to that made by Bonaventure, Whitrow, and Craig: infinitely many past events means some event E_{aleph}.

Is Bernoulli correct in his reply to Leibniz? If so, then an infinite temporal regression does imply that there is an infinitieth day in the past, and the objections of Bonaventure, et al. stand. But Bernoulli is not correct, and Leibniz provides strong reasons for rejecting his assumption. Countering Bernouilli's contention, Leibniz retorts that if "there are ten terms, then there is a tenth; but it is debatable whether it follows from this that, if there are infinitely many terms, then there is an infinitieth one." And again, "given infinitely many terms, it does not follow that there must also be an [infinitieth] term … the infinite must have its source in the unterminated" (L 514, L 543). Leibniz's fullest comments on this subject are to be found in an analysis of unbounded series, where he declares that if one were to propose that

> in an unbounded series there exists no last finite number that can be written in, although there can exist an infinite one: I reply, not even this can exist, if there is no last number. To this reasoning I have nothing else to reply, except that the number of terms is not always the last number of the series. That is, it is clear that even if finite numbers are increased to infinity, they never … reach infinity (AK 6.3.504).

According to Samuel Levey, the insight vaguely presaged in this passage is that the cardinality of an unending series is not determined by the ordinal number of that series' purportedly last term: there can be infinitely many numbers without there being an infinitieth number, i.e., an infinite number, in that series.[4] That is, the number that is the cardinal number of some set doesn't itself have to be an ordinal number in the set that it numbers – it can be, but it doesn't have to be. If we have a series with ten terms, then in that series is a tenth term. If we have a series of infinitely many terms, however, there is not in that series an infinitieth term. For Leibniz, we can have a series with infinitely many numbers without an infinite

[4] See Levey, 1998.

number occurring within the series. To use more updated jargon, just because the cardinality of the set of whole numbers is aleph-nought does not mean that aleph-nought itself is a member of that set. Now I say that Leibniz only vaguely presages this insight because it is not clear to what extent Leibniz has a fully articulated conception of cardinal numbers, and because he rejects infinite numbers of any kind. This difference aside, Leibniz agrees with modern philosophy of mathematics in holding that an endless series has infinitely many numbers without having an infinitieth number.

What implications does this have for the traversal of an infinite time? In fact, Leibniz's philosophy of infinity is rich with consequences for his philosophy of time. Leibniz denies that a series unbounded at one end has an infinitieth term at that end (or at any point in the series), and thus holds that whatever term in that series is taken is finite. If any term occurring in a series of numbers is finite, then the distance between any two terms in the series is finite. Therefore, *pace* Bonaventure, there will be no two days between which there are infinitely many days, but each day will be only a finite number of days in the past. More fully, let us take a regress of days extending infinitely into the past. These days can be put into a one-one correspondence with a series of numbers starting from 0, extending to −1, −2, etc. If we put past days into a one-one correspondence in this way – i.e., if the regression of days is structurally isomorphic to the series of negative whole numbers – and if there is no infinitieth number within the series, as Leibniz denies there is, then each day will be put into correspondence with a finite number. And that means that the distance between any two days, as the distance between any two finite numbers, will itself be a finite magnitude, however distant those days are. It is true that given any day in the past, there will be at least one earlier day. This is precisely what Leibniz means by saying there are infinitely many X's. But it is equally true that no day will ever be more than a finite number of days from the present. More explicitly still, there will never be an infinite number of days between any two days. Consequently, an infinite regression of days does not entail that between the present and some past day an actual infinity has been traversed. Quentin Smith, criticizing Whitrow, crystallizes this thoroughly Leibnizian thesis as follows:

> For if the past is an "actual infinity" in the sense of being an infinity of events that *have really occurred*, it does not follow that it is also an "actual infinity" in the sense that *some past events are separated from the present event by an infinite number of intermediate events*. It is quite possible for there to be an infinite number of events that have really occurred such that each of these events is separated from the present event by a *finite* number of intermediate events (Smith, 64).

I should reiterate that this line of reasoning as stated is not to be found in Leibniz's corpus. Be that as it may, it is a response completely derivable from tenets about the nature of the infinite and unbounded series that he openly embraces. On the basis of his philosophy of mathematics, Leibniz is not only entitled to the above response, but he is driven to it. That is, Leibniz is driven to the conclusion that an infinite temporal regression is not, at least for the reasons considered above, a metaphysical absurdity.

Before turning to the next section, it is important to note that Leibniz's allowance for the possibility of a world that is eternal is not a postulation of the existence of such a world. Nonetheless, it does suggest that Leibniz would take a dim view of those who have professed to uncover a latent conceptual incoherency in the very idea of an eternal world. In this respect, I think, Leibniz sides with Popper in holding that any attempt to show by a priori reasoning the *impossibility* of an eternal world is doomed to failure.[5]

4.2 The Eternity of the World

In the preceding section I have attempted to show why Leibniz is not, by his own lights, compelled to postulate bounded time. Leibniz's philosophy of infinity provides him with the conceptual resources with which to respond to those predecessors who held that unbounded time is a logical absurdity. Admittedly, Leibniz does not always employ his views on the infinite for that purpose, but one can rationally and non-anachronistically reconstruct on Leibniz's behalf such a response. In following sections I will examine those facets of Leibniz's philosophy that can plausibly be seen – and were so seen by some of Leibniz's contemporaries – as favoring the beginninglessness of time. In what follows I will show that there are internal pressures on Leibniz's philosophy to theorize infinite time that is unbounded at both ends. Some of these pressures arise from the overall architectonic of Leibniz's metaphysics, and some arise from more specialized studies articulating principles that need not be seen as integral to Leibniz's philosophy.

4.2.1 The Present as Midpoint

Few texts in Leibniz's corpus either directly or indirectly support the view that he maintains the beginninglessness of the world. In this section, I will examine a recently published set of notes that can be (though, to this point, has not been) reasonably construed as providing oblique evidence for Leibniz's adherence to an eternal world. I will conclude by proposing that it is open to doubt whether the aim of this study is to establish a conclusion which does admittedly follow from it, viz., the beginninglessness of the world.

By way of approaching this text, let us again start with Aristotle. At *Physics* 251b19, Aristotle attempts to establish the unboundedness of time via a conceptual or semantic analysis of what is meant by "moment":

> Now since time cannot exist and is unthinkable apart from the moment, and the moment is a kind of middle-point, uniting as it does in itself both a beginning and an end, a beginning of future time and an end of past time, it follows that there must always be time.

[5] See Popper, 1978.

If there is any time, there must be a moment, and if there is any moment, there must be some time that is past and some time that is future; given any moment, that moment is later than some moments and earlier than others. More explicitly, a moment is the only present "part" of time, and to understand that something is present or is occurring now is to conceive it as mediating between past and future time. Whatever moment is present is, in virtue of being present, later than some past moment and earlier than some future moment. Consequently, time is unbounded. More recently, Richard Swinburne has argued that "every past instant was a present one," "every future instant will be a present one," and each "present instant was future and will be past" (1968, 158). For a moment to be present, it must be understood as mediating between past and future moments, and since any moment is present, it must be both later and earlier than some other moment. Following in Aristotle's footsteps, Swinburne concludes from this that "time, like space, is of logical necessity unbounded" (1968, 207).

In a piece from the middle period that bears a striking similarity to the above arguments, Leibniz writes that

> whatever is future will be present, whatever is future will be past, whatever is past will always be past, whatever is future up to this time will be future, but not always, *whatever is past was future*, and whatever is past was present (AK 6.4.908, emphasis added).

Most of these statements are neutral with respect to the unboundedness of time. To say that every moment that is now future will be present is consistent with saying that one of those future moments that will be present will be (or is now and always has been) the last moment of time. Similarly, even though all past moments were at some time present, one of those past moments that was present might have been the first moment of time. Leibniz's observations that whatever is past will always be past and whatever is future will not always be future are obviously consistent with bounded time and need no comment. Hence, none of these statements have implications for whether or not time has either a beginning or an end.

On the other hand, Leibniz's assertion that "whatever is future will be past" entails that time has no end. If M is to be past there must be some moment N that is or will be present and that is later than M_n. More clearly, the only way for M to be past is if there is a moment later than M relative to which M is past. On the view that whatever moment is present will be past, N will itself be past, and so there must be another moment O that is or will be present, ad infinitum.

Given Leibniz's many open advertisements about the world's future eternity, it is hardly surprising to find him noting that whatever is future will be past. Less expected, though, and of more interest for our purposes, is Leibniz's contention that "whatever is past was future." The clear consequence of this is that for any moment, there is an earlier moment. For some past moment M could have been future only if there was another past moment L earlier than it and relative to which M was future when L was present. L was itself also future – *whatever is past was future* – and so there must be some other moment K earlier than L relative to which L was future, ad infinitum. No moment is the earliest or first moment, for then, contrary to Leibniz's stated tenet, there would be some moment that was not, at some earlier

time, future. In short, for every past moment to have been future, each past moment must be preceded by infinitely many moments. The (previous) futurity of all past events entails an endless temporal regression.

There can be no doubt that the Leibniz's statements in these passages imply that time is unbounded at both ends. The statement "whatever is future will be past and whatever is past was future" comes out true if and only if for any moment there is an earlier and a later moment. What is open to question is Leibniz's commitment to this statement. Or rather, it may be doubted that Leibniz meant to quantify over all moments with this generalization. It is possible that Leibniz intended this statement to hold only for those moments that do in fact have earlier moments. Rather than a conjunction, this statement would then take the form of a conditional: If some moment M is neither the first nor last moment, then M will be past, present, and future. Failure to make the requisite exceptions might have been an inadvertent omission in what has the appearance of being a somewhat hastily composed study lacking a rigorous formulation of the principles Leibniz was trying to expound. On this reading, Leibniz was not trying to provide an *a priori* argument for the unboundedness of time, one that follows from the very notions "future" and "past," but only delineating a set of truths that generally hold. Or perhaps Leibniz simply did not see the consequences that so clearly follow from this study. What is more, nowhere else in his writings – public or private – does Leibniz claim that the world's past is without end, and there are many places (one of which we will examine below) in which he argues against the necessity of an infinite temporal regress. For these reasons, one must be cautious in accepting this as definitive confirmation that Leibniz held time to be unbounded, even if it entails exactly that.

4.2.2 Plenitude and the Bounds of Space and Time

Late in his career, Leibniz was faced with the charge, put forward by Clarke, that the underlying principles of his philosophy committed him to postulate an eternal world. According to Clarke, Leibniz is, wittingly or unwittingly, compelled by his own doctrines to conclude "that the material world must be infinite and that it must have been from eternity and must continue to eternity" (4.40). In advancing this claim, Clarke had in mind Leibniz's views on compossibility and the principle of the best,[6] as well as Leibniz's inference that the quantity of matter is, in virtue of compossibility and perfection considerations, unlimited. Within the context of early modern philosophy and natural theology, this allegation was not to be taken lightly, for the eternity of the world was a doctrine commonly associated with heterodox religious and philosophical positions. In some corners, the eternity of the world was taken as evidence of its ontological independence from God: "Eternity is the mark

[6] Throughout this paper, I will employ the phrases "principle of the best," "principle of plenitude," and "principle of perfection" interchangeably.

of independence; thus it was necessary that the world have a beginning".[7] Others feared that the world's eternity would make it a necessary emanation from a God who could not have chosen freely to create or not create the world.[8] Fully aware of the metaphysical and theological heterodoxy of the eternity of the world, and refusing to be bested by the Newtonians, Leibniz resisted Clarke's imputation and insisted that his philosophy did not entail a beginningless world. In the immediately following sections I motivate and assess the merits of Clarke's accusation and Leibniz's rejoinder.

4.2.2.1 Compossibility and Plenitude

We have seen that Leibniz maintains that the actual world is one but one of infinitely many possible worlds from which God chose, and that a minimal condition for a group of substances, possible in themselves, to form a world is that they be jointly possible, or, to use Leibniz's terminology, compossible. As Leibniz puts it, "since there are different combinations of possibilities, some of them better than others, there are many possible universes, each collection of compossibles making up one of them" (G 3.572/L 662). What distinguishes the collection of compossibles that comprise the actual world from those collections of compossibles that comprise merely possible worlds is the former's realization of the greatest degree of reality, i.e., its maximization of perfection. To Bourguet Leibniz explains that a "universe is a collection of a certain order of compossibles only, and the actual universe is a collection of all the possible which exist, i.e., those which form the richest composite" (G 3.573/L 662). What criteria determine the richness of a composite? Leibniz's standard response is that the perfection of a world is determined by its variety and regularity:

> God has chosen that world which is the most perfect, that is, which is at the same time the simplest in its hypotheses and the richest in phenomena (G 4.43/L 306).
>
> Consonances please, since agreement is easily observable in them … Agreement is sought in variety, and the more easily it is observed there, the more it pleases; and in this consists the feeling of perfection. Moreover, the perfection a thing has is greater, to the extent that there is more agreement in greater variety, whether we observe it or not (GW 171/AG 233).

Given any two worlds W_1 and W_3, W_1 and W_3 are equal with respect to perfection if and only if they are equal with respect to both variety and regularity. If there are differences between W_1 and W_3 with respect to either variety or regularity, then whichever achieves the better balance, whatever that balance is, is more perfect.

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[7] Quoted in Rutherford (2000, 167).

[8] To this charge Leibniz offers a direct rebuttal: "as for the hypothesis [that the world has no beginning], it does not follow that what has no beginning exists necessarily; for it could have always been produced voluntarily by the sovereign being" (G 3.589).

As Leibniz's conception of the perfection of a world relies heavily on the concepts of variety and regularity, it is appropriate that we briefly turn to what is involved in each. Restricting our discussion to the level of spatio-temporal phenomena, the realization of a variety is in part explained by the actual infinite division of matter. First, such division insures that "there is everywhere actual variety and never a perfect uniformity, nor are two pieces of matter entirely similar to one another" (G 7.563). Second, the actual infinite division of matter implies that "there is no last little body" and that "a particle of matter, however small, is like a whole world, full of an infinity of still smaller creatures" (GM 2.157).[9] These are perhaps not features of all possible worlds – Leibniz writes that the infrangibility of material atoms would require a perpetual miracle (GM 2.145), but, by itself, this is not enough to preclude the metaphysical possibility of worlds with such atoms. What these passages do suggest is that a world's phenomenal variety is directly proportional to the variety of forms that this matter takes, a suggestion confirmed by Leibniz's statement that "matter is not everywhere alike, but is rendered dissimilar by forms … otherwise no diverse phenomena will arise" (C 534/MP 146).[10] A perfectly uniform material plenum contains less variation than a plenum with matter divided into diverse forms.

How are compossibility and the maximization of variety related to the beginninglessness of the world? As forming the actual *world*, existing substances are compossible with one another. As forming the *actual* world, this set of compossibles is the set maximizing perfection, and that means that it contains the greatest possible diversity. We have seen above that Clarke, citing these doctrines, accused Leibniz of defending the world's eternity. Why might Clarke think these doctrines entail that the world has no beginning, and that it infinitely extends into the past? The beginnings of a response are to be found in Leibniz's arguments attempting to demonstrate that compossibility and the principle of perfection entail a spatially unbounded world, or, more properly, a world in which the magnitude of space is infinite, i.e., greater than any assignable number.[11] I would first like to turn to these arguments, and then examine how Clarke extends them to encumber Leibniz with the eternity of the world.

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[9] Cf. AK 6.3.474: "If it is true that any part of matter, however small, contains an infinity of creatures, i.e., is a world, it follows that matter is actually divided into an infinity of points. But this is true, provided that it is possible, for it increases the multitude of existents and harmony of things, or, the admiration of the divine wisdom."

[10] "Further, perfection is not to be located in matter alone, that is, in something filling time and space, whose quantity would in any way have been the same; rather, it is to located in form or variety" (C 534/MP 146).

[11] In the Clarke correspondence, Leibniz generally uses the terms "bounded" and "unbounded" in a non-technical sense, according to which space and time are bounded if they are of finite magnitude, and unbounded otherwise. Strictly speaking, of course, space and time can be unbounded and of finite length – one has to think only of a finitely long line with no endpoint. Throughout this article, however, I adopt the more expansive sense of "bounded" that Leibniz employs in his exchange with Clarke.

In writings from his Paris period, Leibniz has this to say about the nature of compossibility:

> The immortality of the human mind is proved immediately by my method. For it is possible in itself, and is compossible with all other things; or, it does not impair the course of things. This is because minds have no volume. But my principle is: whatever can exist and is compatible with others, exists. For the sole reason for limiting existence, for all possibles, is that not all are compatible. So the sole reason for limitation is that those things should preferably exist which involve the greatest amount of reality (AK 6.3.581–582).

In an inversion of his standard argument, Leibniz states that there must be a sufficient reason for something not existing. One possible reason is that thing is not possible, i.e., that its complete concept, when completely analyzed, is seen to contain contradictory predicates. What sufficient reason is to be given for the nonexistence of some thing *X* whose complete concepts do not contain contradictory predicates? Leibniz claims that there is only one such reason: *X*, possible in itself, is not compatible with some set *S* of other things the existence of which maximizes reality. Were *X* compatible with those others, then *X* would exist, and it is only because of the incompatibility – law-like, or otherwise – of *X* with *S* that *X* does not exist. Or, as Leibniz will say in a later piece, "*Everything possible demands that it should exist*, and hence will exist unless something else prevents it, which also demands that it should exist and is incompatible with the former" (G 7.194).

Enlisting these principles in December of 1676, Leibniz argues that space must be "absolutely infinite". Of however great a magnitude space

> is assumed to be, there is no reason why it should not have been made larger. But it is evident that no reason can be given, since there is in space the greatest homogeneity, and its existence does not impede other things … since there is no reason that determines or limits its size, it will be as big as it can be, or, absolutely infinite (AK 6.3.585).

The addition of new "parts" of space is always compatible with – does not impede – the existence of whatever other parts of space are assumed to exist already. Whatever magnitude *N* units space is assumed to have, it is possible for that world's space to have a magnitude of $N \pm 1$ units. Hence, it does.[12] Not simply a youthful speculation, this argument recurs forty years later in the Clarke correspondence. As early as the second letter, Leibniz argues that a greater quantity of matter affords God greater opportunity to exercise his wisdom and power (LC 2.2). Initially, this principle is employed to argue against a vacuum:

> I had observed that by lessening the quantity of matter, the quantity of objects on which God may exercise his goodness will be lessened. The author answers that instead of matter, there are other things in the void of space on which God may exercise his goodness. That may be so … I answer that more matter was consistent with those same things, and consequently the said objects will be still lessened (LC 3.9).

[12] Leibniz's use of the phrase "absolutely infinite" should not be taken as a commitment to space forming an infinite whole, or a magnitude than which none is greater. Given Leibniz's views on the infinite, it is best read as claiming the magnitude of space is greater than any assignable value.

In this passage, Leibniz aims to show only that, whatever the size of the universe, it is inconsistent with the principle of the best that it contain void space. By itself, this conclusion has no implications for the magnitude of extension, for it leaves open the possibility that we live in a small, closed cosmos filled throughout with a material plenum. By the fourth letter, however, Leibniz, as he had in the *De Summa Rerum*, employs compossibility and the principle of the best to argue for the infinite extension of matter, stridently asserting that

> There is no possible reason that can limit the quantity of matter, and therefore such limitation can have no place.
>
> And supposing this arbitrary limitation of the quantity of matter, something might always be added to it without derogating from the perfection of those things which do already exist, and consequently something must always be added in order to act according to the principle of the perfection of the divine operations (4.21, 4.22).

Later in the correspondence Leibniz repeats that God is "unlikely" to "limit the extension of matter" (5.73). As in his earlier writings, Leibniz holds that there must be a sufficient reason for the non-existence of something. Assuming the total quantity (or extension) of matter to be fixed at N, it is possible to add more matter such that the new quantity is $N + 1$. In this sense, more matter is compossible relative to the preexisting matter. Is there a sufficient reason for not adding to preexisting matter new matter that is compossible with it? Leibniz suggests that there is not, for in adding more matter one does not "derogate" from the perfection of the existing matter. Moreover, given the new magnitude of matter (whose quantity is $N + 1$) resulting from this addition, it is possible to add more matter to it, without derogating from its perfection, such that another quantity, $N + 2$. The addition of this new matter does not only not detract from the perfection of preexisting matter, but increases the net perfection of the world.[13] This process, Leibniz asserts, is repeatable ad infinitum, extending matter to a magnitude greater than any assignable value. In short, more matter is always compossible with however much matter exists, and does not derogate from but adds to the world's perfection, so there is "no possible reason" for the limitation of matter. Consequently, the extension of matter is unlimited. As Leibniz says early in his correspondence with Des Bosses, the "magnitude" of the world is infinite in that at exceeds any assignable number (G 3.304–305). For Leibniz, it is an empirically contingent matter of fact that the actual world does not have spatial limits, and that space is, in Leibniz's sense, "absolutely infinite"

The above has shown that, on Leibniz's reckoning, considerations of compossibility and maximization of perfection require that the quantity of matter be unlimited and that space be infinite in magnitude. Since more matter is possible in itself and is compatible with a finite quantity of matter, and since an increase in matter yields an increase in reality, the quantity and extension of matter is infinite. A strong argument can be made that, by parity of reasoning, the duration of matter should likewise be infinite. Advancing exactly this claim, Clarke calls on Leibniz

[13] Presumably, Leibniz is operating on the tacit assumption that new matter is rendered diverse by dissimilar forms.

to admit the analogy between the infinitude of space and the beginninglessness and endlessness of time. Thus, in his fourth letter to Leibniz, Clarke writes

> That God cannot limit the quantity of matter is an assertion of too great consequence to be admitted without proof. If he cannot limit the duration of it neither, then the material world is both infinite and eternal necessarily and independently of God. This argument, if it is good, would prove that whatever God can do he cannot but do, and consequently that he cannot but make everything infinite and everything eternal … This argument (if it is good) proves that the material world must be infinite and that it must have been from eternity and must continue to eternity, and that God must have always created as many men and as many of all other things as it was possible for him to create and for as long a time also as it was possible for him to do it (LC 4.21–22, 4.40).

As Clarke sees it, the requirement that God act in accordance with the principle of the best, and the further assertion that this requires the extension of matter to be unlimited, implies that God is determined to eternally produce creatures. Given some duration *D*, it is always possible to add to that duration to reach another duration $D + 1$. Additionally, adding to *D* does not derogate from the perfection of things existing during *D*. As in the case of space, this process can repeated without end. If God is to act in accordance with the principle of the best, he must create a world infinitely extended in both space and time. Infinitely many things necessarily and eternally flow forth in infinitely many ways from the will of God, a will that is determined to act by the necessity of the divine the nature – as Clarke puts it, "whatever God can do he cannot but do."

Clarke's charge surely would have resonated with Leibniz, for there are some texts that indicate that he openly espouses the world's eternity, and that he does so on the basis of the kinds of reason Clarke has in mind. In the same study in which he concludes from compossibility considerations that "space is infinite" Leibniz writes that "Spatium *et tempus esse infinita*, quaerenda demonstratio perfecta", and further adds that "the order of creatures cannot have begun at some time, but there was always something besides God, or, God has always created something" (AK 6.3.584, emphasis added). The clear implication of these passages is that the world, though created, is eternally generated by God. The world, therefore, has no beginning.

In most other texts, however, Leibniz is more cautious. In a carefully crafted argument from earlier in 1676, Leibniz writes only that it is possible for the world to be eternal:

> Given that our sensation will be the more consistent the more carefully studied it is, it follows that space is infinite, as is the world; and if sensation has always been consistent, if carefully studied, then it follows that the world will be eternal. So the thesis of the eternity and infinity of the world rests on the probability of the perpetual consistency of things as far as we are concerned (AK 6.3.512).

Leibniz's reasoning is admittedly opaque. In referring to the "consistency" of perceptions, he appears to re-invoke compossibility considerations. As we have seen, the compossibility of additional "parts" of space with preexisting parts of space implies that the world's extension is without limit. In the above text, this argument is reformulated as the coherence of perceptions, presumably perceptions representing

different spatial regions. For any perception P_a that perceives some body *N* units away from the perceiver, there is another perception P_b that coheres with P_a and perceives another body *N* + 1 units away. From this, "it follows that space is infinite". Applying this to time, for any perception P_a that perceives some event occurring at moment M_n, there is some other perception P_b that coheres with P_a and perceives some other event occurring at an earlier moment M_{n-1}.[14] Hence, the world is eternal. Or rather, *if* there is some such perception P_b, *then* the world will be eternal. There is a possible set S_1 of cohering perceptions such that for any perception that perceives an event occurring at any moment M_n there is another perception in S_1 that perceives something occurring at moment M_{n-1}; if S_1 is the actually existing set, then the world has no beginning.

Leibniz's conditional wording in this passage indicates his reluctance to assert the eternity of the world based solely on compossibility considerations. And in fact, while he readily grants that S_1 is a possible set of perceptions, Leibniz also holds that there are sets of cohering perceptions that are consistent with the world having a beginning. The

> eternity of the world is not necessary; indeed it cannot be proved from what we sense … it is always intelligible that this world should have begun at some time; that is, that there are sensations which cohere in this way (AK 6.3.512).

There is some set of perceptions S_2 such that those perceptions cohere with one another and there is a perception P_a that perceives an event at M_n and there is no other perception P_b that perceives an event at any time earlier than M_n. Any perception that perceives an event at M_{n-1} is incompatible with the perceptions that are elements of S_2.

It is therefore highly probable that Leibniz held both types of series to be possible. There are possible sets of compossible perceptions that have a first perception and possible sets of compossible perceptions that have no first perception. Or there are possible worlds with a beginning and possible worlds without a beginning. Compossibility considerations by themselves are incapable of determining which kind of set is realized in the best of all possible worlds. Yet compossibility considerations alone did not establish the infinitude of extension either. Recall Leibniz's claim that "something might always be added to [the extension of matter] without derogating from the perfection of those things which do already exist, and consequently something must always be added in order to act according to the principle of the perfection of the divine operations" (LC 4.22). The operative

[14] Leibniz famously holds that at each moment monads distinctly or indistinctly perceive the entire temporal span of their worlds (see, for example, G 1.382–383). Given this, Leibniz could mean that at some moment M_n two perceptions P_a and P_b perceive, respectively, events occurring at M_n and M_{n-1}, or alternatively, that for any perception P_a that occurs at and perceives an event occurring at M_n, there is at least one other perception P_b that occurs at and perceives an event occurring at M_{n-1}.

principles in this argument are compossibility considerations conjoined with the principle of perfection. Modeling our argument for the eternity of the world along these lines, the eternity of the world is a consequence of God acting in the best possible manner. More fully, in the same way that God adds to the perfection of the world by increasing its extension, so too does he add to the perfection of the world by extending the duration of creatures. To the duration of the world "something might always be added" and "consequently something must always be added in order to act according to the principle of perfection". Hence, the world is eternal. Hence, the principle of the best causes God to eternally generate a world infinite in extension.

Leibniz, however, rejects the above arguments, holding, in opposition to Clarke, that there are crucial disanalogies between the infinitude of extension and the eternity of the world. "From extension to duration, *non valet consequentia*":

> Though the extension of matter was unlimited, yet it would not follow that its duration would also be unlimited; no, even in the direction of the past it would not follow that it had no beginning. If it is the nature of things in the whole to grow uniformly in perfection, the universe of creatures must have had a beginning. And therefore there will be reasons to limit the duration of things, even though there were none to limit their extension. Besides, the world's having a beginning does not derogate from the infinity of duration *a parte poste*, or in the direction of the future, but bounds of the universe would derogate from the infinity of its extension. And therefore it is more reasonable to admit a beginning of the world than to admit any bounds of it, that the character of its infinite author may be preserved in both respects (LC 5.74).

Leibniz provides two reasons for blocking the inference from the infinitude of extension to eternity of the world. First, whereas no sufficient reason can be provided for limiting the extension of matter, a sufficient reason can be given for postulating a beginning of time. This sufficient reason is the uniform increase of perfection exhibited by creatures. Leibniz is referring here to a set of theories investigated earlier in his exchange with Bourguet, and that we will turn to later in this chapter.[15] For now I will note only that on one of the theories considered by Leibniz, the world's perfection across time might be thought to increase uniformly, i.e., at a uniform and constant rate. If so, then the world will have a beginning. The reason that a uniform increase in perfection entails a first moment is that a regression in time from the present moment, when the degree of the world's perfection is equal to some finite value *n*, requires the subtraction of a constant value *z*. On Leibniz's assumption that the degree of perfection of any world state is limited, when *z* is subtracted from *n* some finite number of times, the perfection of the world will equal zero. Hence, the world has a beginning. Accordingly, in contradistinction to the limitation of the extension of matter, Leibniz believes that he has available an intelligible metaphysical principle that is a sufficient reason for the limitation – *a parte priore* – of the duration of creatures.

[15]The passages on which I draw can be found at G 3.572–576.

The second reason Leibniz furnishes is that, even with the beginning of the world assumed, it is still possible that creatures enjoy infinite duration. Leibniz argues that space and matter cannot be infinitely extended if one sets bounds to space, so if one wishes to hold that the extension of matter is infinite, then one cannot place bounds on it. To set such bounds would be to "derogate from the infinity of [matter's] extension". If God is to maximize his opportunities to act in accordance with the principle of perfection, then the extension of matter must be infinite, and this in turn implies that matter can have no limits. Thus, the extension of matter must be unlimited in order for God to act according to the principle of perfection. Not so in the case of the duration of creatures. It is perhaps true that God cannot act in accordance with the principle of perfection if the duration of creatures is finite, but it is untrue, according to Leibniz, that this requires that the world have *neither* a beginning nor an end. Even if there is a first instant of creation and the world has a beginning, it is still possible for time to have no end, and to be eternal *a parte posteriore*. If time is without an end, then, Leibniz thinks, he need not hold that time is without a beginning in order for the duration of matter, like its extension, to be unlimited and infinite. As Leibniz sees it, the endlessness of a world with a beginning would allow God to act in accordance with the principle of perfection.[16] Leibniz's rejoinder to Clarke thus depends on his willingness to acknowledge that the world is without end. Leibniz's adherence to the endlessness of has already been canvassed in Section 4.1. Given that the world has an "infinite future" (Grua, 554) and will proceed "into eternity, to be sure *a parte posteriore*, that is, into the future" (G 2.362), it is eternal at least in the sense that it is without end. Whether or not it has a beginning, the duration of creatures, like the extension of matter, is infinite in that there are more days than any assignable number. This enables God to act in accordance with the principle of plenitude because, on Leibniz's view, as much variety and diversity can be realized in a world with a beginning and no end as can be realized in a world with neither a beginning nor an end.

Let us pause and summarize our conclusions to this point. There is no conceptual or mathematical absurdity inherent in the notion of a world with an infinite past. Strictures against the possibility of an actual infinity or the possibility of traversing infinitely many elements are not, for Leibniz, compelling, and thus do nothing to disprove that the world can be eternal in the direction of the past. At the same time, Leibniz does not think that two of his most important metaphysical principles – compossibility and plenitude – provide us with a priori grounds for asserting that the past is necessarily infinite in extent. According to Leibniz's response to Clarke, God can act in accordance with the principle of perfection even if duration of the world is unlimited, and the duration of the world is unlimited if and only if either it has no beginning or it has no end. Since the world has no end, its duration is unlimited; a world with a beginning but not an end affords God the

[16] The weakness of Leibniz's attempt to establish a disanalogy between spatial and temporal infinitude is noted by Vailati, 168.

opportunity to maximize perfection.[17] Leibniz has argued that a world with a beginning but no end enables God to act in accordance with the principle of perfection in a way that a world with both a beginning and end does not. The tacit assumption here is that, *ceteris paribus*, an increase in temporal duration increases the variety of diverse forms instantiated in a world, and that this in turn increases a world's net perfection. This tacit assumption is expressly stated in an April 1716 letter to Bourguet:

> Each state of the universe is always limited in perfection, even though the prior state may be equal in perfection to the following state: for the two together envelop more perfection than one alone. It is for this reason that change is fitting, so that there might be more types or forms of perfection, though they are all equal in degrees of perfection (G 3.592–593).

At each moment of time the world is limited in the amount of perfection it realizes, Leibniz argues, because to each moment can be added another that, in conjunction with the first, realizes a greater degree of reality. The realization of a greater degree of reality is brought about by the instantiation of more "types" and "forms" of perfection. From this argument we can extract the operative general principle: the greater the number of a world's days the greater the variety of forms. A world whose duration is a thousand years contains less variety because less duration than a world whose duration is two thousand years (on the assumption that they are equal in other respects). A world with a beginning and no end contains an infinite variety of forms, and thus maximizes perfection.

4.3 The World's Increase in Perfection

Leibniz's most extensive and direct discussion of the world's (possibly) infinite past occurs in a correspondence, with the Venetian merchant Louis Bourguet, initiated late in his career and that continued to the end of his life, and that is therefore likely expressive of his most measured and thought-out opinion. In this series of exchanges, the topic of the world's beginninglessness is framed in terms of the world's change in perfection. As Leibniz explains to his correspondent, the finitude of the world's past can be established on *philosophical* grounds only if it can be shown (1) that the world's perfection increases, and (2) that it increases at an arithmetic rate. Absent either one of these two conditions, one is forced to conclude that

[17] Responding to Leibniz's rejoinder, Clarke writes, "Whether my inference from this learned author's affirming that the universe cannot diminish in perfection, that there is no possible reason which can limit the quantity of matter, that God's perfections oblige him to produce always as much matter as he can, and that a finite material universe is an impractical fiction, whether (I say) my inferring (according to these notions) the world must necessarily have been both infinite and eternal is a just inference or not, I am willing to leave to the learned, who shall the compare the papers, to judge" (LC 5.103).

the world's history is characterized by an infinite temporal regress. It is with this correspondence, and other relevant texts from the middle and late period, that I will conclude. Specifically, I seek to uncover Leibniz's reasons for maintaining that the extent of the world's past cannot be ascertained by reason alone.

Throughout the correspondence, Leibniz endeavors to refute Bourguet's attempted demonstrations that the world cannot be eternal, and the general tone of his comments show that he is quite prepared – at least much more so than his correspondent – to countenance seriously the possibility that the world is actually without a beginning. In any case, Leibniz denies in no uncertain terms that one can prove that it must have a beginning. The first argument proposed by Bourguet in favor of the world having a beginning draws what Leibniz sees as an inapt analogy between the series of instants and the series of numbers. Bourguet starts by arguing that just as there is a fundamental number from which compound numbers are composed, so too must there be a primary instant into which a temporal series is resolved. This analogy is inapt because it attributes to an essential order of particulars (temporally ordered events) a feature possessed only by an essential order of universals (numbers). Though it is true that in a series of numbers, as in any natural order of abstract, incomplete beings, i.e., universals, a first term is reached, or "the concept of numbers is finally resolvable into the concept of unity," it is untrue that "the concepts of different instants can be resolved finally into a primitive instant" (G 3.582). The difference between the two, Leibniz explains, involves "the difference between an analysis of necessities and the analysis of contingents" (ibid.). Invoking his famous doctrine of infinite analysis, Leibniz writes that whereas in the former one can effect a complete analysis in finitely many steps of any compound number, in the latter "this analysis from the posterior by nature to the prior by nature proceeds to infinity without ever being reduced to primitive elements. Thus the analogy between numbers and points does not apply here" (ibid.) There need not be a fundamental instant into which the world's duration is resolvable in the way that there is a fundament number – unity – from which compound numbers are constructed.

With these replies exposited, Leibniz enumerates what are intended to be necessary and sufficient conditions for the world either having or not having a beginning. According to Leibniz, the world had a beginning if and only if it increases in perfection *and* if the rate of increase is always uniform. Leibniz seems to think that this provides a sufficient reason for the world's beginning since a regression in time from the present moment, when the degree of perfection is equal to n, requires the subtraction of a constant value z. On Leibniz's assumption that the degree of perfection of any world state is limited, when z is subtracted from n some finite number of times, the perfection of the world will equal zero. Hence, the world has a beginning. On the other hand, the world had no beginning if it always increases in perfection and the rate of increase is non-uniform, e.g., if the increase is isomorphic to a hyperbola asymptotically approaching zero as it approaches the "beginning":

> if [the world] always increases in perfection (assuming that it is impossible to give to it its whole perfection at once), there would still be two ways of explaining the matter …

> According to the hypothesis of the hyperbola, there would be no beginning, and the instants or states of the world would have been increasing in perfection from all eternity.[18]

Rather than subtracting *z* from each world state to reach an earlier world state, as one goes back in time, one subtracts an increasingly diminishing part of *z*, e.g., ½ *z*, ¼ *z*, 1/8 *z*, etc. With this kind of regression one never reaches *n* – *n* units of perfection, i.e., zero perfection, and so the world has no beginning. The third possibility enumerated by Leibniz also entails that the world is without a beginning. Instead of the world increasing in perfection with either a geometric[19] or arithmetic rate, each world state may remain "always equally perfect" to each other world state. Labeling this the "rectangle hypothesis," Leibniz continues that "if the rectangle should prevail in the order of things, it would be necessary to admit that the productions of the Divine Wisdom are coeternal with it, and that each substance has been eternal *a parte ante*, as I believe that they all are a parte post" (G 3.595). The world is eternal if and only if either its perfection increases and has always increased at a geometric rate or the perfection realized in each state is the same as the perfection realized in every other state; the world has a beginning if and only if its perfection increases and has always increased arithmetically.

Within the context of the Bourguet correspondence Leibniz is generally skeptical of the claims of reason to settle beyond dispute which of the above theses is true. Indeed, early in the discussion Leibniz concedes his failure "yet [to] see any way of demonstrating by pure reason which of these we should choose" (G 3.582). Moreover, in April of 1716 at Bourguet's prompting Leibniz considers only to reject an argument the aim of which is to demonstrate the hypothesis of the rectangle. Bourguet reasons as follows: Since at each moment there are infinitely many substances each of which has some degree of perfection, it follows that no moment can differ from any other with respect to the perfection the world exemplifies. This line of reasoning does not withstand Leibniz's closer scrutiny. Noting that one infinity can surpass another,[20] Leibniz concludes that "while there are infinitely many finite beings it does not follow that their system receives all at once all the perfection of which it is capable. For if this consequence were valid, the hypothesis of the

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[18] ibid. Trying to allay Bourguet's concern that the eternity of the world makes it a necessary emanation from God, Leibniz writes that "as for the hypothesis of the hyperbola, it does not follow that what has no beginning exists necessarily; for it could have always been produced voluntarily by the sovereign being." Leibniz elaborates on this at G 3.589.

[19] Or, more exactly, rather than earlier moments of the world asymptotically approaching zero units of perfection.

[20] "Mais un infini, pour parler selon notre portée, est plus grand qu'un autre, par exemple, la somme de cette serie 1 + ½ + 1/3 + ¼ etc. à l'infini est infinie et surpasse tout nombre assignable; mais cependent la somme de cette autre serie 1 + 1 + 1 + 1 etc. à l'infini est infiniment plus grand que la precedente" (G 3.592). The point of the analogy, I take it, is that at time T_1 all substances could express ½ n units of perfection, and at time T_2 all substances could express n units of perfection, and thus there has been an increase in perfection from T_1 to T_2.

rectangle would be demonstrated" (G 3.592). The consequence not being valid, it cannot serve to establish that the world's perfection remains constant and that the world therefore is eternal. Taken on their own, the principles expressed in the Bourguet correspondence fail to establish the probability or likelihood of any of the three hypotheses, and all remain equally viable options. In this exchange, Leibniz is content merely to call for "rigorous reasoning" and to insist that in matters metaphysical "it is necessary that exact thinking be supplied" (ibid.).

Other texts, however, offer less tentative conclusions. Most notably, the *Ultimate Origination of Things* closes with characteristic Leibnizian optimism:

> We realize that there is a perpetual and a most free progress of the whole universe towards a consummation of the universal beauty and perfection of the works of God, so that it is always advancing towards a greater development … However, because of the infinite divisibility of the continuum, there are always parts asleep in the abyss of things, yet to be roused and yet to be advanced to greater and better things, advanced, in a word, to greater cultivation. Thus, progress never comes to an end (G 7.308)

And again,

> In nature, as in art, what is prior by time is simpler, and what is posterior is more perfect, for nature is the highest art (AK 6.4.181).

Perhaps Leibniz held that a temporally posterior world state is more perfect precisely because it is more complex, i.e., posterior by nature. If so, then despite his rebukes to Bourguet, it can be established *a priori*, not that one of the three hypotheses is correct, but that at least one of them is incorrect and not consistent with more general metaphysical principles. Whatever the reasons he has, and whatever their epistemological status, these two passages constitute an unqualified assertion by Leibniz of the continual increase in the perfection of the world. The hypothesis of the rectangle is thus disavowed. That still leaves as feasible options the two hypotheses according to which the perfection of the world increases. Since one of these entails bounded time and the other entails unbounded time, the elimination of the hypothesis of the rectangle is not especially informative for Leibniz's views on the world's beginning or lack thereof.

Are there other texts in Leibniz's corpus which offer some grounds for opting for one of these two remaining hypotheses? Richard Arthur has drawn attention to a passage that he interprets as arguing that "the world … approach[es] an asymptote temporally" (1999, 115). The passage, from Leibniz's correspondence with Queen Sophia Charlotte, states that "not only do immaterial substances always exist, but also their lives, progress, and changes are directed towards a definite end, or rather, directed so as to approach an end more and more, as asymptotes do" (G 2.507). I am disinclined to accept this as evidence that Leibniz viewed the world's progress as isomorphic to a hyperbola in the relevant sense. The kind of hyperbola envisioned here is one that asymptotically approaches an upper limit, one where substances get closer and closer without ever reaching a maximum of perfection. This kind of increase in perfection, however, does not entail that these substances, as one goes back in time, get closer and closer to without ever reaching a minimum of perfection. Perhaps substances also asymptotically approach a lower limit as one

goes back in time, but that doesn't follow from the kind of progress described here. Each substance – or the world – having a first moment is consistent with an asymptotic approach to an upper limit of perfection.

All of this strongly indicates that Leibniz allows for the possibility of an infinite temporal regress without positing the existence of one. In refraining from asserting the necessity or impossibility of the world's beginninglessness, Leibniz implicitly adopts an important approach to the topology of time: the extent of the world's history is not something to be decided on philosophical grounds alone. More rigorously, Leibniz disavows a priori, purely rational attempts to show what the world's history *must* be like, opting only to enumerate possible temporal structures that *can*, as a contingent matter of fact, be instantiated in a world. In so delimiting the scope of his claims, Leibniz rejects efforts to find conceptual or metaphysical incoherencies in competing temporal topologies. Perhaps the point is more perspicuously put like this: whatever temporal topology the world has (in terms of its past duration), it does not have necessarily. And since it does not of necessity have the kind of past that it does have, it is not for philosophy alone to pronounce on the world's temporal structure.

Chapter 5
Causal and Temporal Asymmetry

Recent philosophy of science has done much work underscoring the similarities between space and time. As George Schlesinger has observed, space and time as continua necessarily share many of the same features:

> Space and time are both continua and possess therefore all the properties continua in general possess; events, processes and objects, which are occupants of space and time, also have all the properties which are characteristic of occupants of continua in general (174).

Many spatial statements have temporal counterparts, just as many temporal statements have spatial counterparts. "Extension," "overlap," "congruency," and "adjacency" are only a few of the many terms that are meaningful in both spatial and temporal statements. Yet there are properties unique to time that differentiate it from other continua, properties in virtue of which time is a temporal continuum and not a spatial continuum.[1] Hence, some concepts involved in space are not involved in time, and vice-versa. Foremost among the former is temporal directionality: " 'Time has a direction and time has order' is not merely true but necessarily true for if we deprived time of all those properties which lent it direction and order we would destroy the concept of time altogether" (Schlesinger 1975, 171). Variously referred to as the directionality, arrow, asymmetry, or anisotropy of time, this property of time – the intrinsic differences from one direction to another – is both its singular most important and most baffling characteristic.[2]

Like his more recent counterparts, Leibniz holds that space and time have much in common. To De Volder he writes that the concept of (spatial) "extension is resolvable into plurality, continuity, and coexistence … continuity is also found in time" (G 2.169/AG 171). Qua continuous magnitudes – indeed, qua ordering concepts – space and time share many of the same features. Again agreeing with his

[1] Richard Taylor (1979) contains an extended discussion of these points.

[2] For now, I will ignore the distinction between the asymmetry of time itself and the asymmetry of events and processes occurring during a time. I will also set aside the differences, if any, between time having a direction and time having an arrow (which is often taken to imply the flow of time, or temporal becoming).

M.J. Futch, *Leibniz's Metaphysics of Time and Space*,

more recent counterparts, Leibniz also holds that there is a crucial dissimilarity between time and space in that time has a directional order that has no spatial equivalent: "one point of the universe has no advantage of priority over another, while a preceding instant always has the advantage of priority, not merely in time, but in nature" (G 3.581–582/L 664). The temporal order has a direction in that (some of) the relations constitutive of it are intrinsically structurally different.

Is time's directionality an ontologically basic fact about it? Or can we instead offer an analysis of temporal anisotropy that explains it by more analytically basic facts? Those opting for the second approach often advocate what has come to be dubbed the "causal theory of time." This attempts to explain temporal asymmetry in non-temporal terms: the direction of time is not an irreducible, sui generis feature of reality, but is grounded on a more basic set of facts. The non-temporal facts on which time's direction is grounded are causal facts. More fully, a causal theory of time is one that avows "a reduction of assertions about temporal relations among events … to assertions about relations among these events which are not prima facie spatiotemporal at all … all temporal relations, at least of a certain kind, can be founded upon a structure that is not spatiotemporal in its intrinsic features at all" (Sklar 1977, 319). By extension, the structure of time, and in particular temporal anisotropy, are thought to depend on the causal order.

It is the aim of this chapter to show that in his most systematic writings on time and time's direction, Leibniz seeks to provide a reductive analysis of temporal directionality by defining qualitative temporal relation such as "prior to," "posterior to," and "simultaneous with" in non-temporal terms. For Leibniz, these putatively temporal facts are really only causal facts. By adhering to the causal theory of time, Leibniz's philosophy of time identifies temporal asymmetry with causal asymmetry. In expositing Leibniz's theory of temporal directionality, I begin with an extended investigation of his analysis of causal asymmetry. This undertaking is of fundamental importance for defending Leibniz against a charge commonly leveled against causal theories of time: causal theories of time are circular, and they are circular because specification of the causal order requires specification of the temporal order. Writes Sklar:

> [W]e can't "independently" establish causal priorities without first already knowing the temporal priorities … If Hume is correct, or if an analysis anything like this is correct, then at least a major component of the meaning of any assertion about the causal relationship holding among events will be a component describing the spatiotemporal relations holding among the events (340–341).

The first sections of this chapter demonstrate that Leibniz believes the direction of causation is given independently of the direction of time. In no uncertain terms, Leibniz disavows a Humean analysis of causation according to which "the cause and effect must be contiguous in space and time … [and] the cause must be prior to the effect" (*A Treatise of Human Nature*, 1.3.15). Yet if Leibniz's disavowal of this analysis of causal asymmetry is apparent enough, much less obvious is how he explains the asymmetry by which an effect follows from its cause. By way of illuminating this obscure component of Leibniz's thought, I examine how he uses what he, in line with a tradition dating back to Aristotle, terms "natural order" and its

accompanying relations of "natural priority" and "natural posteriority" to ground causal asymmetry. For Leibniz, causal relations are defined in terms of more primitive relations of natural priority and posteriority, and it is the asymmetry in these latter kinds of relations that accounts for the asymmetry of the former. It may be that no causes are temporally subsequent to their effects, but, for Leibniz, this is neither a defining characteristic of "cause," nor a fact to which we must have epistemic access in order to determine that something is a cause. This understanding of causation provides Leibniz with the conceptual resources to set forth an atemporal account of causal asymmetry, thus enabling him to explain temporal asymmetry by reference to causal asymmetry.

With this hurdle cleared, I take up Leibniz's analysis of qualitative temporal relations in terms of non-temporal causal relations. Causal theories of time are often divided into two kinds: (1) those that identify time with causation on purely philosophical or semantic grounds, and (2) those that identify time with causation on empirical or scientific grounds. What quickly becomes apparent is that Leibniz's causal theory of time is philosophical through and through. The relation between temporal and causal relations for Leibniz is invariably established on semantic, or, better yet, metaphysical, and not merely empirical grounds. In Leibniz's causal theory of time, we are given a *philosophical* analysis of what temporal terms mean, and what temporal facts are. Even so, this causal theory of time is not fully congruent with more orthodox variants. Like standard causal theories of time, Leibniz's identifies time with a structure that is non-temporal; unlike standard causal theories of time, this structure is not causation alone. The causal theory of time adopted by Leibniz more closely resembles what Michael Tooley has recently termed a "spatio-causal theory of time," a theory of time that identifies temporal facts with spatial and causal facts, not mere causal facts. While such an interpretation might prima facie seem like a distorting rational reconstruction, it is solidly supported – indeed, entailed – by a wide range of texts from the middle and late period. On the basis of his explanation of casual asymmetry and his spatio-causal theory of time, I show how Leibniz provides a non-circular and comprehensive reduction of temporal facts to causal facts.

The chapter concludes by examining a final topological feature of time, its linearity. Given the kind of analysis of causal and temporal asymmetry advanced by Leibniz, he is committed to ruling out the possibility of non-linear time.

5.1 Causation

On many accounts of causation, causal asymmetry is grounded in temporal asymmetry. We have seen above that Sklar, along with many others, maintains that only by establishing the temporal priority of one event to another can we identify it as a cause. As widespread as such an assumption may be in current philosophy of science, it is one that is wholly foreign to Leibniz's thought. In several studies from the middle period, Leibniz holds that the categories of cause and effect are logically

prior to change, and change in turn is logically prior to time. A representative piece states that "from order and consequence taken together arises cause and effect. From them, in turn, comes change [*Mutatio*], and then time… For from order and consequence cause comes to be (AK 6.4.398, AK 6.4.399). Causal relations, therefore, are logically prior to temporal relations. Accordingly, not only are they not grounded on temporal relations, but they themselves ground temporal relations. This raises an important question: Without invoking temporal asymmetry, how does Leibniz explain causal asymmetry?

Leibniz's writings are replete with studies on the nature of causation, and in particular with explications of the defining characteristics of "cause." In a quintessentially Leibnizian fashion, these texts meticulously elaborate upon what is involved in the notion of causation by enumerating all of those concepts entering into the concept of "cause." The most important ingredient of causation is what Leibniz refers to as "order." In its broadest sense, an order is any relation among many *relata* by which one is distinguished [*discriminatur*] from others (C 476). To designate something as a cause therefore is a way of distinguishing the thing so designated from others, while positing systematic and law-like connections between it and the other things from which it is distinguished. It is important at this point to distinguish between two conceptions of order found in Leibniz's texts. In the above definition, no assumptions are made about any kind of *serial* order. Consequently, it is consistent with this expansive definition of order to include the spatial arrangements of the parts of a geometrical figure. Even space is a species of order conceived broadly: "Space is the order of coexisting things, or the order of the existence for things which are simultaneous" (GM 7.18/L 666) – this in spite of the fact that "one point of the universe has no advantage of priority over another" (G 3.582/L 664). Frequently, however, Leibniz reserves the term "order" for relations that are non-reciprocal and asymmetrical. In this narrower sense, an order is a serial progression in which the elements of the ordered class stand in relations of priority and/or posteriority to one another.

It is to order so understood that causation belongs, and the following discussion will be restricted to this type of order. In writings ranging from the earliest to the latest periods of his philosophical career, Leibniz defines a cause as either a "requisite" (a necessary condition prior by nature to its effect), an "*inferens*" (a sufficient condition prior by nature to its effect), and a "*co-inferens*" (a condition that, with other conditions, forms a sufficient condition prior by nature to its effect). The underlying commonality in all of these approaches to causation is that causes are prior by nature to their effects. In fact, causal relations have as one of their ingredients relations of order, and relations of order (in the relevant sense) just are relations of natural order (order understood in the strict sense *is* the order of nature). Being grounded on relations of natural order, causes as such are naturally prior to their effects. From his earliest writings Leibniz occupies himself with investigating the conditions something must meet in order to be prior by nature, initially identifying it with what has fewer elements or parts. As we will see, this understanding of natural priority generates difficulties for Leibniz, difficulties that lead him to reconceptualize the criteria for natural priority. What emerges from his later studies is the

fairly weak criterion that something is prior by nature if it is more easily distinctly understood than that to which it is prior.

In employing the ordering relation of natural priority, Leibniz is drawing from a conceptual repertoire whose origins can be traced back to various passages scattered throughout Aristotle's corpus. In *Categories* 12, Aristotle outlines five different conditions under which something can be designated as being "prior by nature." The most obvious sense of "prior" is temporal precedence, when one thing is said to be older or "more ancient" than another (14a27). In addition to the standard meaning, "prior" can also connote that which does not reciprocate as to implication of existence. *Physics* 8.7 provides an elaboration of this sense of prior, one that construes it as a necessary condition. X is prior to Y, Z … just in case "if it [X] does not exist, the others will not exist, whereas it can exist without the others" (260b17). In Aristotle's example, the number one is prior to two because the latter implies the former whereas the former does not imply the latter (hence the non-reciprocity as to implication of existence). It is this kind of priority, according to *Metaphysics* 1019a3, that constitutes priority of nature: prior are "those things that can be without other things, while the others cannot be without them." Not only is this definition void of any assumptions about reciprocity of implication of existence, but it in fact seems to preclude it, since that which is prior by nature can exist without that which is posterior. However, in the *Categories* Aristotle stipulates that if X and Y do reciprocate as to implication of existence, then X is prior to Y just in case X is the cause of Y (or the truth of X grounds the truth of Y). The truth of there being a man implies, is implied by, and explains the truth of the sentence "There is a man" (14b10).

From this it is a short step to infer what it means, according to Aristotle, for two things to be simultaneous by nature. Two things are simultaneous "without qualification" if they come into being at the same time. Simultaneous *by nature* are those things which "reciprocate as to implication of existence," without thereby standing in a causal relation to one another. A double and a half are simultaneous by nature since each implies the other though neither is the cause of the other. Similarly, coordinate species of the same genus are simultaneous by nature, whereas the genus is prior by nature to its species.

Repeated references to the order of nature are found throughout medieval philosophy as well. Duns Scotus, one of the most important theorists of natural order, explains that

> what is eminent is said to be prior, whereas what is exceeded in perfection is posterior. Briefly stated, whatever is more perfect and noble is, according to this order of essences, prior … the dependent is said to be posterior whereas that on which it depends is prior. I understand prior here in the same sense as did Aristotle when … he shows that the prior according to nature and essence can exist without the posterior, but the reverse is not true. And this I understand as follows. Even though the prior should produce necessarily the posterior and consequently could not exist without it, it would not be because the prior requires the posterior for its own existence, but it is rather the other way about … anything which is essentially posterior depends necessarily upon what is prior by nature but not vice versa, even should the posterior at times proceed from it necessarily (*Tractatus de Primo Principio*, 1.2–1.8).

This passage is closely modeled after *Metaphysics* 5.11: an essence A is prior by nature to another essence B if B's being has as an ontologically necessary condition the being of A, and A does not have as one of its necessary conditions the being of A.

The concept of natural order is pervasive in Leibniz's philosophy, figuring prominently in his earliest and latest texts, ranging from his metaphysics to his political philosophy. As is already obvious from the above passages, natural priority is a kind of logical or ontological priority; it is not a species of temporal priority. Leibniz's expositions of natural priority serve to underscore this point even more. In a passage that closely resembles Aristotle's *Categories*, Leibniz writes that a reason, which is prior by nature to that for which it is a reason (AK 6.4.940), is a known truth that causes us to give our assent to a less well-known truth to which it is connected, and is also the cause of the truth itself (AK 6.6.475). Despite this last addition, Leibniz's characterizations of natural priority, unlike those of most of his predecessors, generally do not emphasize or explicitly make reference to an order of existence or essence. Rather, they most often focus upon the simplicity of the analysis of the essence's concept. In the early *Elements of Natural Law* Leibniz asserts that A is prior by nature to B if it is "able to be more clearly conceived than [B], and [B] not more than it" (AK 6.1.483). This statement sets the tone for many of Leibniz's later writings, which include the following definitions:

> A is prior, B is posterior (that is, in the order of nature) if A is simpler with respect to the intellect than is B, or if its possibility is more easily demonstrable than B's (AK 6.4.402).
>
> Prior by nature is that whose notion is simpler (AK 6.4.872).
>
> Prior by nature is what is less derivative, and so what enters into the concept of another is prior by nature to it (AK 6.4.937).
>
> Prior by nature is what is more easily distinctly understood. Distinctly understood, however, is that whose possibility is able to be demonstrated (Grua, 527).

In the above quotations we find an assemblage of closely interrelated concepts. Most obviously, greater simplicity of concept is a defining mark of natural priority. As the first passage makes clear, for a concept to be simpler is for its possibility to be more easily demonstrable. A concept is possible if it does not contain a contradiction, or have as one of its "ingredients" A and not ~A (AK 6.4.930). To effect a demonstration of its possibility requires a resolution of the concept into its constituent components, or what Leibniz terms its "requisites," which themselves must be known to be possible and not to be incompatible with one another: a concept is possible only if its requisites are compossible. Leibniz's views on the analysis of concepts and the nature of adequate knowledge insert themselves here. In short, demonstrating the possibility of a concept requires that one attain clear, distinct, and adequate ideas. This in turn demands that the decomposition of a concept be carried to completion. This done, one has arrived at a real definition of the concept, a definition where all the requisites are enumerated and which thereby removes all doubt about the possibility of the thing defined (AG 26). A concept's possibility is *more easily* demonstrable if the required decomposition has fewer steps, and the required decomposition has fewer steps if the concept has fewer parts, i.e., if it is simpler (AK 6.4.937, AK 6.4.939–940). From this we may aver that a concept is prior by nature if it has fewer component parts or fewer requisites.

Leibniz often writes as if greater simplicity, where simplicity is typically equated with a concept having fewer parts, is both a necessary and a sufficient condition for a concept being prior by nature to another. Insofar as priority of nature requires that the concept be more easily analyzable, and insofar as a concept is more easily analyzable just in case it has fewer parts, a concept is prior by nature only if it has fewer parts. As we have seen, this implies that if something enters into the concept of something else, it is for that reason prior by nature to it: "prior by nature is what is less derivative, and so what enters into the concept of another is prior by nature to it" (AK 6.4.937). This view generates deep problems for Leibniz's philosophy. It is a fundamental tenet of the middle and late metaphysics that the present state of a substance involves its future and past states, that its future states involve its past and present states, and that its past states involve its present and future states: each substance is confusedly omniscient insofar as its states express the entire world into which it enters. The result is that "each [state] can be known from the other" (AK 6.4.180), and that for any two states those states "involve the same things" and a certain "equality exists between them" (ibid.). The envisioned equality is an equality of complexity among different states. This consequence seems to preclude any natural ordering of temporally prior and posterior states; since all states are equally complex, no state is prior by nature to another. On the assumption that the state of one substances is part of a complex causal condition of its subsequent states, Leibniz's philosophy is faced with two rival and apparently mutually exclusive demands: (1) since all states of a substance involve all other states, each has precisely the same number of elements and none is simpler, or has fewer parts, than the other, and (2) one state of a substance (that which is a cause) is prior by nature to another state.

This dilemma forces Leibniz in at least one study to abandon the tenet that a concept (or its designatum) is prior by nature only if it has fewer parts. It does not, however, lead him to reject the claim that for something to be prior by nature it must be more easily understood, or have its possibility more easily demonstrated. Leibniz's argument centers around the idea that "many properties often are of the same subject, of which one is more easily discovered and demonstrated, and nonetheless they are all reciprocal, and thereby involve the same things" (AK 6.4.180). In no uncertain terms Leibniz here rejects the connection between a concept's simplicity with respect to the intellect, i.e., simplicity with respect to being understood or having its possibility demonstrated, and simplicity with respect to its parts, i.e., having fewer elements or ingredients. More precisely, a concept can be simpler in the former sense without being simpler in the latter sense. It is for this reason that we are given a reinterpretation of what it means to be simpler: "Simpler is that whose possibility is more easily demonstrable" (AK 6.4.936). Under this more liberal criterion, a concept is prior by nature to another if it is simpler (1) in terms of the number of steps it takes to resolve it into its elements, or (2) with respect to the understanding. Meeting the second of these criteria is both necessary and sufficient for *any* concept to count as prior by nature; meeting the first is sufficient but not always necessary for a concept to be prior by nature to another concept.

It is only with this ordering relation in hand that Leibniz sets forth to analyze the nature of causation. In broad outline, Leibniz identifies causes with what he terms "*requisites*" and "*inferens*," where the former is defined as a condition prior by nature and the latter is defined as a producer prior by nature. More fully, a requisite is a necessary condition that is prior by nature to that for which it is a condition, and an *inferens* is a sufficient condition prior by nature to that for which it is a condition. So construed, causes are either necessary or sufficient conditions prior by nature to their effects. But causes are a particular kind of requisite or *inferens*. Leibniz draws a distinction between conditions which are absolute and those which are "relative to a certain mode of producing or existing" (C 471–472).[3] The mark distinguishing immediate from mediate conditions is that the former "are in" the things conditioned by them. This means that if A is a condition prior by nature to B, and the existence of B by itself without the addition of auxiliary premises is sufficient to establish the existence of A, then A is an immediate requisite of B. A's being involved in the existence of B is dependent on nothing other than the nature of B itself. Put differently, it is a metaphysical necessity true in all possible worlds that A is a requisite of B. Leibniz offers as examples of immediate requisites parts of a whole and the termini of lines. Such conditions are not causes properly speaking, for Leibniz's writings associate causes with things only mediately related to their effects. Disavowing the view that a cause is metaphysically necessary for its effect, Leibniz is careful to take note of the fact that some "requisites of things are mediate, which must be investigated through reason, *such as causes*" (AK 6.4.627, emphasis mine).[4] A particular cause is not in its effect in the strong sense according to which the nature of the effect by itself entails that particular cause. Consequently, causes do not relate to their effects as parts to wholes. If we apply this conception of cause to the identification of causes with requisites, then we should expect to find Leibniz identifying causes with requisites that are mediate. This is precisely what he does, defining a cause not as a requisite *simpliciter*, but as a requisite *secundum quid*: "A cause is … a requisite, according to that mode of producing, by which the thing is actually produced" (AK 6.4.563). The relation of cause to its effect, then, can be established only on the basis of some principle of order in virtue of which they are connected. This limitation as to what kind of a requisite or condition counts as a cause will play an important role in Leibniz's causal theory of time.

As we have seen, Leibniz often defines a cause in such a way that it is more closely aligned with a sufficient condition rather than a necessary condition.

[3] Elsewhere, Leibniz writes that "this [difference between immediate and mediate conditions] is able to be applied to requisites, and certain requisites are *secundum quid*, *non simpliciter*" (C 471). In a study from 1685, Leibniz notes that some requisites are "immediate, such as parts, extremities, and generally things which are in [*insunt*] other things" (AK 6.4.627).

[4] A similar point is expressed in the *Specimen Dynamicum*: "all truths about corporeal things cannot be derived from the logical and geometrical axioms alone, namely, those of great and small, whole and part, figure and situation, but… there must be added those of cause and effect" (L 441).

Additionally, Leibniz allows for the possibility that there are "various grades" of causally sufficient conditions (AK 6.4.403). These various grades include full causes, causes that are partial in virtue of producing a requisite of the effect, and causes that are partial in virtue of being only part of a complex causal condition but that themselves do not involve all of the effect's requisites. At the apex of this hierarchy is a principle prior by nature, i.e., a producer, which is a sufficient condition prior by nature to an effect: "it is obvious that every producer is a cause" (ibid.). In this study, Leibniz pursues a line of reasoning which leads to the identification of a producer with a full cause, i.e., a cause that involves all the sufficient requisites of the effect. Leibniz writes that (a) a principle is a determiner, (b) a determiner is what involves all the conditions of an outcome, and (c) a producer is what involves all the conditions, or rather requisites, of the effect. What involves all the conditions of the effect is, by definition, a full cause. Hence, "a principle prior by nature can be called a … full cause" (AK 6.4.404).[5] Since the principle referred to here is one that involves mediate requisites, it too is mediately connected to its effect. In any event, the simple conclusion that results from this labyrinthine line of reasoning is that some causes are sufficient conditions for their effects, sufficient conditions that, on pain of not being sufficient, involve all of the effect's requisites.

Leibniz also allows that something can be a cause if it is a cause not of the effect itself but rather of a necessary condition of the effect. For example, teachers are causes of happiness in that they produce knowledge, which, for Leibniz, is a necessary condition of happiness:

> We say that a teacher contributes to the fact that human beings are happy, since he produces something that is necessary, namely knowledge from one experienced in some of the things necessary for happiness. However, the contributing itself is not immediately a requisite. For, to stay with the same example, we can learn the same things even without a teacher (AK 6.4.403–404).

It is clear that the cause is connected to the effect not directly, but rather by being a sufficient cause of one of the effect's necessary causes. This means that the cause is neither necessary nor sufficient for the effect: not necessary because it is a sufficient condition of a necessary condition of the effect, and not sufficient because it is such a condition for only one of the effect's necessary conditions.

[5] See also Leibniz's remark in "Primary Truths" that causes are merely "concomitant requisites" ([1903], p. 521). In the earlier *Specimen* Leibniz defines the "full reason" of a thing as the "aggregate of all primitive requisites" (C, 310). Finally, in a still earlier piece (1676) a "*causa plena*" is identified as the "aggregatum omnium requisitorum… rei" (Grua, 267). Hobbes, with whose works Leibniz was intimately familiar, defines a "Cause simply, or an entire cause, [as] the aggregate of all the accidents of both of the agents how many so ever they be, and of the patient, put together, which when they are all supposed to be present, it cannot be understood but that the effect is produced at the same instant; and if any one of them be wanting, it cannot be understood but that the effect is not produced" (AG, 71).

What is perhaps Leibniz's most important understanding of causality is one that identifies a cause with a member of a complex causal condition. This much is stated in Leibniz's definition of a cause as a co-principle prior by nature to an outcome (C 471), where this in turns means that a cause is something that, in conjunction with others, forms a causally sufficient condition of the effect. In another passage, Leibniz explicates this conception of causality in the following terms: "A *co-principle* is what with others comprises a *principle* … A full cause is a principle prior by nature. A per se cause is a principle prior by nature, if nothing impedes it" (AK 6.4.869). In this text, it is the per se cause that is identical with a co-principle and that is being differentiated from the full cause. Thus, we have a full cause that, by itself, involves all of the effect's requisites or necessary conditions. But we also have a per-se cause, a cause as co-principle, which is only one element in the full cause, and which does not involve all of the effect's requisites. If it did, it would not be a co-principle at all, but rather a principle. Hence, for some principle P1 to count as a cause on this definition, there must be some other principle P2 such that it is only the combination of P1 and P2 that produces the effect. P1 and P2 are co-principles prior by nature to the effect, and jointly they form a principle P3 that is prior by nature to the effect. P3, as the whole complex causal condition, is itself sufficient for the effect, and is on that account itself a full cause. Contrariwise, neither P1 nor P2 is individually sufficient. By way of illustration, Leibniz writes that

> whatever impels is the cause of impelled motion, if nothing impedes it. For it acts in such a way that from this an effect follows, if nothing prevents it. But if, in this case, the outcome is in fact the effect, it is necessary also that nothing should have prevented, and thus that the outcome would have been the effect (AK 6.4.404).

What is being identified as the cause here is the impelling thing P1. It is not, though, being identified as a full cause, for it is merely part of a larger complex causal condition that involves other co-principles. In this case, the additional co-producer (P2) is the non-impediment of other things.[6] To repeat the above, the positive co-principle P1, the impelling thing, and the negative P2 co-principle, the absence of impediments to P1 producing an effect, jointly form a full cause. There is not, however, any requirement that either of them individually be a full cause. To the contrary, were they full causes then they would not be causes as co-principles, but simply causes as principles.[7]

It is easy to become lost in the intricacy of Leibniz's philosophy of causation, but what I wish to draw attention to is that, throughout all of these studies, Leibniz

[6] This shows that Leibniz allows that the auxiliary principles, the other co-producers, are sometimes nothing more than negative conditions. This is made explicit at AK 6.4.404, where Leibniz allows as causes producers that produce their effects only under a certain hypothesis, "especially if this hypothesis is merely negative, that is, if nothing is impeding the cause."

[7] The similarity of causes so conceived to J. L. Mackie's INUS conditions is striking. For an elaboration of these points of convergence, see Futch (2005).

attempts to provide an analysis of causation that does not invoke temporal concepts. While it is true that a cause is, by definition, prior *by nature* to its effect, it is not part of the definition of "cause" that it be temporally prior to its effect. The natural priority of a cause is explained without any reference to temporal priority as must be the case since temporal priority is partially defined by natural priority. In using the order of nature to explicate the asymmetry of causal relations, this conception of causation is entirely non-temporal. It is therefore possible to ground temporal asymmetry on causal asymmetry. How Leibniz does this is the topic to which we now turn.

5.2 Causation and Time

In the Introduction's preliminary characterization of causal theories of time, we saw that these theories attempt to ground the order of time on "a structure that is not spatiotemporal in its intrinsic features at all" (Sklar, 319). This structure is the causal order of the world. There is much to be said in favor of attempts to so ground temporal relations. Most obviously, temporal and causal relations share the same formal features: irreflexivity (A cannot be temporally prior to or the cause of itself), asymmetry (if A is prior to or the cause of B, then B is not prior to or the cause of A), and transitivity (if A is prior to or the cause of B, and B to C, then A to C). Additionally, it is often thought that, like time, causation has a direction, or that the causal order is anisotropic. Unless we hold that the coincidence of these features is only a coincidence, it is natural to seek an explanation of one in terms of the other, and since causes have properties not had by temporally prior events, it is again natural to ground the latter on the former.

There is an additional, perhaps more distinctively Leibnizian, reason militating in favor of the causal theory of time. Despite a metaphysics positing infinitely many substances with infinitely many perceptions mirroring the universe, the world theorized by Leibniz is austerely Spartan. By this I mean that the general tenor of Leibniz's philosophy, from his idealistic metaphysics to his elimination of absolute space and time, is thoroughly reductionistic, making few generic, in kind distinctions among *entia* and facts. Consistent with this programmatic reductionism, Leibniz's philosophy of time, as a causal theory of time, places a premium on conceptual and ontological simplicity. Rather than positing causal and temporal facts, Leibniz's philosophy of time seeks to provide a philosophical analysis of a world's temporal facts such that, in the end, there are only causal facts. This particular reduction further underscores the economy of Leibniz's metaphysics.

5.2.1 Modeling Leibniz's Causal Theory of Time

In Section 2.2 we will turn to Leibniz's myriad writings on time and causation. Before doing so, I would like to provide a synoptic overview of causal theories of time in general. This is a useful preliminary to approaching Leibniz in that it will

throw into relief the main features of causal theories of time, as well as help to chart the range of options available to Leibniz.

All causal theories of time agree that temporal facts are grounded on causal facts, or that statements about time have truth conditions that refer to causal facts alone. Beyond this basic point of agreement, there is a wide divergence with respect to what kind of grounding relation obtains between causal and temporal relations. According to a weak version of the theory, the identity between causal and temporal relations is established on scientific grounds and is a contingent feature of the world. This version, which I will label the "Scientific Causal Theory of Time," or ST for short, eschews the claim that one must offer an analysis of the meaning of expressions about temporal relations in terms expressions about of causal relations:

> **[ST]** The causal theory of time is a species of the relational theory of time which asserts that the temporal order of the events of the universe is given by their causal order. As I construe it this is not a claim about the meanings of terms but a theory about the nature of time (Von Bretzel, 173).

It is possible, on this version of the theory, for there to be worlds that have temporal relations that are not coextensive with and grounded on their causal relations.

More typically, however, causal theories of time advance a stronger claim about the identity of temporal and causal relations. Instead of holding that this identity is a contingent feature of the world, most theories hold that the very meaning of "temporal relation" is fully analyzable in causal terms, and that the reduction of temporal to causal relations would be true in all possible worlds. Since expressions about temporal relations are defined in terms of expressions about causal relations, there is a necessary identity between the two. Following Lawrence Sklar, I label this approach the "Philosophical Theory," and adopt his characterization of it:

> **[PT]** The "philosophical" version of the causal theory of time differs from the scientific version in that it attributes to the fundamental propositions relating certain temporal relations to their associated causal relations the status of *definitions or analytic propositions*. The claim here is not merely that the temporal and causal relations are coextensive, or lawlike coextensive, or even empirically established to be identical, but that they are necessarily coextensive where the necessity rests upon an analysis of the meaning of the predicates expressing temporal relations (Sklar, 333).

On a narrow reading of the philosophical version, two or more events are temporally related because they are *actually* causally related – "A is temporally prior to B" must be translatable as "A is the cause of B." This outcome follows from the insistence that causal theories of time make temporal and causal relations coextensive: "it is necessary for the reduction of *T* to *C* that whenever the *T*-relation holds among events the *C*-relation holds as well, and vice versa" (Sklar, 324). Failure to meet this demand, according to this version, undercuts any would-be causal theory of time.

If one were to accept such stringent restrictions as an essential ingredient of all causal theories of time, then it could be argued that no so such theory would be tenable. This is because the class of events that are actually temporally related is

significantly larger than the class of events that are actually causally related, and so temporal and causal relations are not coextensive.[8] Since many things are temporally related that are not causally related, temporal relations cannot be grounded on causal relations. As a response to this problem, several philosophers of science have opted to replace actual causal connectedness with the modal notion of "causal connectibility." In brief, for X to be temporally related to Y, one of the following two conditions must obtain: (1) X is actually causally related to Y, or (2) it is in principle possible that X be actually causally related to Y. More fully, for any X and Y, if Y is in the forward section of X's light cone, then Y is absolutely temporally posterior to X, and if Y is in the backward section of X's light cone, Y is absolutely temporally prior to X. If X and Y are non-identical events and Y is not located within X's light cone, they are absolutely simultaneous. Put differently, for any two events E_1 and E_2, if E_1 and E_2 cannot possibly belong to the same set of genidentical events (i.e., events belonging to or involving the same object, e.g., a light ray), then E_1 and E_2 are absolutely simultaneous. If E_1 and E_2 can belong to the same set of genidentical events, and part of that set contains genidentical events from E_1 to E_2, then E_1 is absolutely prior to E_2.[9] Call this the "Modal Theory":

> **[MT]** Two events are temporally related if they are causally connectible. If E_1 is potentially the cause of E_2, then E_1 is temporally prior to E_2.

While adequately amending the shortcomings of **[PT]**, which require that temporally related events be actually causally connected, **[MT]**'s introduction of modal terms generates almost as many problems as it solves. The notion of causal "connectibility" demands an account of what makes X and Y causally connectible or inconnectible. For most theorists, the proposition "X and Y are causally connectible" is equivalent to, or at least entails, the proposition "It is physically possible for X and Y to be actually causally connected." But in virtue of what is this possible? On the standard view, it is physically possible for X and Y to be causally connected only if they have the appropriate spatiotemporal relations to each other, i.e., the spatiotemporal relations that, relative to the laws of nature, enable them to stand in a causal relation. But herein lies the problem, for if the aim of a causal theory of time is to demonstrate that temporal order is grounded on causal order, then one cannot use temporal facts to explain what makes things causally connectible. Causal connectibility cannot be explicated apart from the spatiotemporal facts of X and Y, and therefore cannot be used to analyze those spatiotemporal facts.

It is in response to this difficulty that proponents of causal theories of time advance a modified version of it – the so-called spatio-causal theory of time (**[ST]**). Rather than providing an analysis of temporal relations in terms of (actual or

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[8] "… few temporally ordered facts and events are causally related. The causes and the effects of any such fact or event will include only the minutest fraction of all the world's earlier and later facts or events" (Mellor, 111).

[9] Sklar, 321.

possible) causal relations alone, spatio-causal theories construct the order of time from both the order of causation and the spatial relatedness of the relata. Hence, if A causes B, then A is prior to B, and if C is simultaneous with A, then it too is prior to B, even if it is not actually causally connected to B. In this form, this definition is patently defective in that it involves the temporal relation of simultaneity. One response might be to define simultaneous things as those that are not causally connectible, but this engenders the same problems as the construction of temporal priority and posteriority from the modal notion of causal connectibility. To secure the required asymmetry between the *definiens* and *definiendum*, simultaneity is therefore redefined (in non-temporal terms) as "spatially related": " 'A is simultaneous with B' means the same thing as 'A is spatially related to B' " (Tooley, 272). Thus, for any two events X and Y not actually causally connected, X and Y are simultaneous if they are spatially related, and X is prior to Y if it is spatially related to some event that actually causes Y. By not introducing the modal notion "causal connectibility," the spatio-causal theory of time does not implicitly presuppose the temporal relatedness of the spatially or causally related relata.

5.2.2 Leibniz's Causal Theory of Time

In the remainder of this chapter I hope to show two things: (1) Leibniz adheres to a causal theory of time, and (2) the kind of causal theory of time that we find in Leibniz closely approximates the spatio-causal theory of time. For Leibniz, the direction of time is given by the spatial and causal facts of the world. This interpretation of Leibniz is most strongly supported by a series of writings from the 1680's, but the range of texts in which we find Leibniz advancing this view can be found in both his early and late writings. With remarkable consistency spanning close to forty years, Leibniz provides a reductive analysis of temporal anisotropy.

Leibniz's adoption of a causal theory of time (or something like it) has long been recognized by philosophers of science and Leibniz scholars alike. By way of expositing my own interpretation of Leibniz's analysis of qualitative temporal relations, I will start with the two most detailed and insightful accounts, those of Richard Arthur and Jan Cover, both of which are conceived along the lines of John Winnie's more general construction of the temporal from the causal order.[10] According to Winnie, two or more distant events are simultaneous if and only if they are not causally connectible. From this we can construct an "acausal slice of the world" – a set of causally inconnectible events – and identify it with an instant of time I_1. I_1 will temporally precede some other instant I_2 if one of its members is "causally

[10] See Arthur (1985) and Cover (1997). My disagreements with Arthur and Cover in no way diminish my debt to them.

precedent" (or is possibly the cause of) one of the events contained in I_2 (Winnie, 138). Rejecting the language of causal connectibility, Arthur still retains the formal features of Winnie's construction.[11] Having substituted "provides a reason for" for "possibly the cause of," Arthur proceeds on the assumptions that simultaneous states are those that are logically compatible with one another, and that compatible states do not "provide a reason for" each other. In the language of the preceding section, temporally simultaneous states are those that are simultaneous by nature. Like Winnie, Arthur identifies a set of simultaneous states with an instant, and concludes by defining the temporal priority of one instant over another as the first including a state that provides a reason for a state in the second. Instants are maximal sets of compatible states, none of which provides a reason for the other, and to say that one instant is temporally before another is just to say that it includes a state that provides a reason for the a state in the later instant.

Cover's conclusions are closely connected to the above constructions. In line with Winnie and Arthur, Cover holds that in Leibniz's philosophy of time "simultaneity – temporal coincidence of states – is defined as the absence of incompatibility or of causal connection" (1997, 309). That is, some state S_1 is simultaneous with another state S_2 if and only if they are not (really or ideally) causally connected. An instant is a maximal set of simultaneous states, and it is prior to another instant if it contains at least one state that is the (real or ideal) cause of a state in the other instant. It should be noted that Cover's considerably more complex construction contains additional complications, but I will not delve into them here.

Even on this admittedly cursory exposition of Winnie, et al., one significant problem with these definitions emerges. All of the above constructions agree that two world states are non-simultaneous if one world state contains something that is a cause of or reason for something in the other world state. This, in fact, is precisely what it means for them to be non-simultaneous. Implicit in this claim is the assumption that causes and effects, and things that are reasons and things for which they are reasons, cannot be simultaneous. This assumption, however, fails to do justice to the complexities of Leibniz views on causes and reasons. Specifically, Leibniz denies that things prior or posterior by nature or causally related are *ipso facto* incompatible and non-simultaneous. As a result, a straightforward transposition of Winnie's analysis onto Leibniz inevitably leads to a fundamental error. 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). This is a principle that Leibniz adopted early on, writing that even though the action and passion of two substances may come to be at the same moment ("*eodem momento producanter*"), the former is still prior by nature – and therefore provides a reason

[11] Both Arthur's and Cover's expositions implicitly assume that one can directly assign to monadic states places in time, and their analyses are concerned exclusively with the relations among monadic states.

for the latter – even if it is not prior by time (AK 6.2.489).[12] This tenet is amplified at length in Leibniz's later writings where he claims that for one substance to act – in Leibniz's extended sense of the term "act" – on another is "to be a reason for change," or to be something prior by nature to the change (AK 6.4.940). Additionally, relations of action and passion are necessarily reciprocal and pertain to things co-existing (*Theodicy*, Sect. 66). 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. It is undoubtedly for these reasons that Leibniz says that "if one thing is the cause of another, *and they are not able to exist at the same time*, the cause is prior, the effect posterior" (AK 6.4.568, emphasis added). This is reiterated when Leibniz contends that "it is manifest that it is neither necessary that cause and effect be simultaneous nor is it necessary that they not be simultaneous" (AK 6.4.564). It is not the case, then, that two causally connected states are thereby incompatible with one another.

In support of their definitions, both Arthur and Cover cite the following passage from "The Metaphysical Foundations of Mathematics":

> *If a plurality of states is assumed to exist which involve no opposition to each other, they are said to exist simultaneously*. Thus we deny that what occurred last year and this year are simultaneous, for they involve incompatible states of the same thing.
> If one of two states which are not simultaneous involves a reason for the other, the former is held to be *prior*, the latter *posterior*. My earlier state involves a reason for the existence of my later state (GM 7.18/L 666).

In point of fact, this passage does not support the assertion that Leibniz views logically non-simultaneous states as being temporally non-simultaneous. Rather, it claims (1) that simultaneous states involve no opposition to each other, and (2) that a state is prior to another if it provides a reason for *and is incompatible* with it. The conjuncts of (2), however, are precisely that – conjuncts that are non-redundant and do not express the same proposition. This passage does not define "earlier than" as

[12] This is a commonplace theme in much early modern philosophy. Hobbes, for instance, defines a full cause, or entire cause, as one that "is always sufficient to produce its effect," from which he infers that "in whatsoever instant the cause is entire, in the same instant the effect is produced… whensoever the cause is entire, the effect is produced in the same instant" (*Metaphysical Writings*, 72). Moreover, on this point at least Kant and Leibniz appear to agree: "The great majority of efficient natural causes are simultaneous with their effects, and the sequence in time of the latter is due only to the fact that the cause cannot achieve its complete effect in one moment. But in the moment in which the effect first comes to be, it is invariably simultaneous with the causality of its cause. If the cause should have ceased to exist a moment before, the effect would never have come to be… If I view as a cause a ball which impresses a hollow as it lies on a stuffed cushion, the cause is simultaneous with the effect" (*Critique of Pure Reason*, A203/B248).

"providing a reason for," but as "non-simultaneous state that provides a reason for." Leibniz has already delimited to non-simultaneous states the things to which he is referring when he writes that the state providing a reason for another is the one that is temporally precedent.

There is yet another objection to the interpretation I am defending. Citing Leibniz's statement to Bourguet that one point of space has no priority of nature over another point whereas one instant of time is prior by nature to every preceding instant, Cover concludes that we cannot ascribe to temporally simultaneous states any priority of nature over one another. Since space "is the order of things simultaneous, then temporally coincident states have no priority in nature to one another precisely *because* none is the cause of another" (1997, 314). In light of copious textual evidence bolstering the claim that Leibniz holds temporally simultaneous states of different substances to be naturally prior and posterior to each other, and the centrality of this position to Leibniz's metaphysics, I find it implausible that Leibniz himself would be willing to dispense with it. Admittedly, this does not constitute a decisive argument against Cover. It is possible that Leibniz unwittingly holds two irreconcilable doctrines: given the lack of natural order among spatial points, coexisting states do not stand in relations of natural priority to one another, but, given the *commercio* of substances, coexisting states do stand in these relations. Before resorting to an attribution of inconsistency, we should scrutinize more closely an implicit assumption in Cover's argument. This argument appears to operate on the premise that a lack of priority among expressed spatial points entails a lack of priority among the expressions of those points. This, though, is a highly dubious assumption. No doubt, it is true that simultaneous expressions are not prior or posterior by nature to one another because they express logically simultaneous spatial points. But as many of Leibniz's texts, especially those concerned with his doctrine of expression, unambiguously declare, they may be prior or posterior by nature to one another because of the way in which they express logically simultaneous spatial points, i.e., more or less distinctly. For example, if a substance expresses its body as active relative to the body of another substance, then the former substance's expression, temporally simultaneous with the expression of passivity by the other substance, is logically prior to it.

Further evidence for the view I am imputing to Leibniz is furnished in some of his most important studies on the order of time. In one of these, dating from 1685, Leibniz stipulates that things are simultaneous if "one is absolutely the condition of the othr" (AK 6.4.628).[13] A conditional almost exactly similar to this is found in another study from the same period, where Leibniz again holds that "if from A, B follows [*sequitur*] absolutely, B is simultaneous with A. Likewise, whatever other things follow absolutely from the same thing are simultaneous" (AK 6.4.568).[14]

[13] "Simul sunt quorum unum absolute alterius conditio est."

[14] In his earlier *De Summa Rerum*, Leibniz writes that "it is generally admitted that, if two things are of such a kind that it is impossible for the one to be understood without the other, then they are 'simultaneous'" (AK 6.3.484).

If X is a condition of Y absolutely, then it is not a condition relative to some mode of production or existence; the connection between X and Y follows from the nature of X and Y considered in themselves, so that their connection is not mediated through, e.g., various principles of order or laws of nature. This means that X is an immediate condition of Y, and, if a condition prior by nature, an immediate requisite. As an *immediate* condition, it follows that X is compatible with Y. For example, the property of being circular has a variety of immediate conditions (many of which are prior by nature) with which it is compatible and temporally simultaneous. Similarly, God's continual conservation is an absolute condition of the existence of substance, and the existence of substances is an absolute condition of the existence of phenomena, but all three are temporally simultaneous:

> Let us assume that the creature is produced anew at each instant; let us grant also that the instant excludes all priority of time, being indivisible; but let us point out that it does not exclude priority of nature, or what is called anteriority *in signo rationis*, and that this is sufficient. The production or action whereby God produces, is anterior by nature to the existence of the creature that is produced; the creature taken in itself, with its nature and its necessary properties, is anterior to its accidental affections and to its actions; and yet all these things are in being in the same moment. (*Theodicy*, 388).

What all of this shows, I believe, is that a state that provides a reason for another state can be both compatible and temporally simultaneous with it. We cannot therefore attribute to Leibniz an identification of an instant with an "acausal slice of the world," for instants can contain many different states that are causes of and provide reasons for each other. However we reconstruct Leibniz's causal theory of time, it must allow for the simultaneity of causes with their effects.

Those who have accredited to Leibniz a causal theory of time look to his discussion of time and space in the late "Metaphysical Foundations of Mathematics." As we have seen, this piece holds that states are simultaneous if and only if they involve no opposition, that is, if they are not logically contradictory. Among those states that are opposed, whichever is prior in the order of nature is also prior in the order of time (GM 7.18/L 666). This study does provide a temporal order of all existents – one explained in terms of the "connection of all things" and my state expressing every other state in the universe. It does not, however, analyze this temporal order in causal terms, remaining content to ground it on the order of reasons, or the order of nature. On the basis of this text alone, we do not have sufficient grounds for ascribing to Leibniz a causal theory of time.

But there are other texts from the same period and later where Leibniz does employ explicitly causal language, and that can only be read as defending a causal theory of time. In one of these, from the early 1700's, Leibniz stipulates that one thing is temporally prior to another if it is incompatible with it and is its cause (C 480). This passage, unlike the later one from the "Metaphysical Foundations," provides a definition of "temporal priority" in terms of "causal priority." What it fails to do, though, is outline the conditions under which things not actually causally

connected can be conceived as being temporally related.[15] On the basis of this analysis alone, we can ascertain only the temporal connectedness of those things that stand in a relation of cause and effect to one another. For any two things that are not causally related, however, we have no grounds, on the basis of the world's causal facts, for asserting their temporal relatedness. In this respect, this analysis of "temporally prior" is markedly more deficient than the one from the "Metaphysical Foundations," failing, as it does, to provide a global ordering of events.

Fortunately, Leibniz's most important texts on time and causation do not share this drawback. In studies from the middle period Leibniz offers the following two explanations:

> Things are simultaneous if one is absolutely the condition of the other. But if one is the condition of the other with an intervening change, then one is prior, the other posterior. That is understood to be prior which is simultaneous with the cause, and posterior which is simultaneous with the effect. Or prior is understood to be that which is simpler or which is a requisite of the other (AK 6.4.628).

> If one thing is the cause of another, and they are not able to exist at the same time, the cause is what is prior, the effect posterior. Also prior is whatever is simultaneous with the cause (AK 6.4.568).[16]

Unlike the passage from his late "Metaphysical Foundations," Leibniz provides a semantic analysis of temporal relations in terms of causal relations. The first passage concludes by unequivocally associating that which is temporally prior with a cause. Having excluded things that are absolutely connected, i.e., things that are in or are immediate requisites of some *requirens*, Leibniz asserts that something is prior if it is a (mediate) requisite. And a cause, Leibniz continues, is a mediate requisite: "A cause is a requisite according to that mode by which the thing is produced" (AK 6.4.629). It is important to take note of Leibniz's added qualification

[15] But are not all things causally connected for Leibniz? This much is suggested by his doctrine of universal expression and interconnectedness, and is set forth in claims such as this: "For it must be known that all things are connected in each one of the possible worlds: the universe, whatever it may be, is all of one piece, like an ocean" (*Theodicy*, Section 9). It is true that Leibniz posits relations of ideal dependence among substances and their states (*Theodicy*, Sections 54 and 66 and NS 17). But in strict rigor, genuine causal relations do not obtain among created substances: "For in the strictly metaphysical sense no external cause acts upon us excepting God alone" (DM 28). This is true not only of souls – to which Leibniz is likely referring here – but bodies as well: "*every passion of a body is spontaneous or arises from an internal force*" (L 338). If one prefers to opt for the more expansive conception of causality, then the problem of accounting for temporal relations among things not causally connected is less pressing, if pressing at all. In the following pages, I try to show how, even on the narrower conception of causality, temporal relations can be reduced to causal relations.

[16] In a study dating from the later years, Leibniz writes that the "past is a state from which the present arises, and which is inconsistent with it. The future is what arises from the present, and is inconsistent with the present" (C 480). Earlier in this same study, Leibniz had observed that A "arises" from B if A is a sufficient condition prior by nature to B, and that a sufficient condition prior by nature is a cause (C 471).

that for A to precede B temporally there must also be an "intervening change," meaning that there must be an aggregate of contradictory states. We find this qualification repeated in the second passage, where Leibniz again analyzes "being temporally prior to" in terms of "being the cause of and not being able to exist at the same time, i.e., being incompatible with." Hence, A is temporally prior to B if it is the cause of B *and* is incompatible with it.

Restricting the definition of "temporally prior" to "what is a cause of and incompatible with" yields a temporal order only for those things actually causally connected. Given Leibniz's dictum that "whatever exists is either simultaneous with other existents or prior or posterior" (GM 7.18/L 666), the preceding account remains incomplete. To expand the scope of this analysis in a way that things not causally connected will nonetheless be temporally ordered, Leibniz introduces the notion of "being simultaneous" with a cause: "Also prior is whatever is simultaneous with the cause."[17] Needless to say, simultaneity figures prominently in Leibniz's construction of a temporal order for things not actually casually connected. Now, we have seen that the overriding aim of causal theories of time is to ground temporal relations on a non-temporal base, and that one cannot illicitly import temporal notions in the specification of the causal order grounding them. But this seems to be precisely what Leibniz has done in saying that A will be temporally prior to C if it is simultaneous with the cause B of C. Employing the qualitative temporal relation of simultaneity between A and B seems to undermine Leibniz's causal theory of time insofar as the grounding base – the causal structure of the world – must be supplemented by this specifically temporal relation in order to provide a comprehensive analysis of things that are temporally (but not causally) related.

How, then, can Leibniz construct the temporal order of phenomena without invoking the temporal relation "simultaneity"? In the process of modeling Leibniz's causal theory of time, we saw that contemporary spatio-causal theories of time respond to this objection by identifying things simultaneous with things spatially related. Using completely recognizably Leibnizian resources, we can attribute essentially the same solution to Leibniz, i.e., we can simply identify a class of temporally simultaneous events with a class of spatially related events. "Space," writes Leibniz, "is the order of coexisting phenomena (G 2.450/L 604), or the "order of existence for things which are simultaneous" (GM 7.18/L 666). Defining "simultaneous with" as "spatially related to" thus enables Leibniz to secure the required asymmetry between the grounding base (now seen as the causal and spatial order of the world) and time. From this we may conclude that if one thing A is spatially related to a cause B that is incompatible with its effect C, then both A and B are temporally prior to the effect C.

Given the introduction of spatial positions into the construction of the time order, the events in question cannot be monadic states or changes, for such states

[17] See also AK 6.4.390: "Also prior or posterior to another thing … is whatever is simultaneous with a thing incompatible with the other thing. So that if A is simultaneous with B, and B and C are incompatible, and C is, then A will be prior or posterior by time to C."

and changes do not in themselves have a place in the order of space. This, however, is not surprising, for as we will see in Chapter 7, the specification of the temporal order of monadic states can be made only by reference to the temporal relatedness of the phenomena they represent. In assigning to monadic states a place in time, we must bear in mind Leibniz's repeated claims that, to the extent that substances and their modifications "have a relation to time and place, [it] must be understood from the relation they bear to those things contained in time and place," and that simple substances have a relation to things contained in time and place "through the machine they control," i.e., through their organic body as represented in time and place (G 2.253/L 531). Hence, a monadic state's place in time is determined by the temporal relations its organic body has to other bodies. These temporal relations are themselves analyzable in terms of the causal relations among bodily states,[18] with the result that the temporal ordering among monadic states is given by the causal order of the world they represent. We are now in a position to deduce that one monadic state S1 will be prior to another monadic state S2 if and only if S1 represents something that is either (1) an incompatible cause of something represented in S2, or (2) is spatially related to an incompatible cause of something represented in S2. With these definitions, Leibniz has provided an exhaustive and comprehensive analysis of the temporal relations of all phenomenal and monadic events. On the basis of his analysis of causal asymmetry, Leibniz is able to provide definitions that are not only comprehensive but also non-circular. In Leibniz's philosophy of time, then, "all temporal relations … [are] founded upon a structure that is not temporal in its intrinsic features at all" (Sklar, 319) – the spatio-causal structure of the world.

In a letter to Des Bosses from 1712 Leibniz writes that all monads stand in relations of duration, position, and interaction, which are respectively orders of successive existence, coexistence, and "ideal mutual dependence" (AG 199). If the preceding is correct, the temporal order is simply the causal order of incompatible states, leaving us with two fundamental ordering relations through which monads are harmoniously related. This reduction is of a piece with the general frugality of Leibniz's metaphyics.

5.3 The Linearity of Time

Van Fraassen has written that "Leibniz and Kant … stated explicitly that the topological structure of time is that of a real line. That means that time has no beginning or end" (59).[19] Though Van Fraassen limits the implications of the isomorphism

[18] As Robert McRae has concluded, "it is the causal relations in the objects of perception which determine whether the objects are successive or coexistent" (1994, 108).

[19] Van Fraassen is unclear as to whether he is referring to mathematical time or the temporal structure of a particular world.

between a real line and time to the unboundedness of the latter, we have seen above that this analogy also means time is linear and not closed: "Time is linear if, and only if, instants of time are isomorphic to the collection of points on a line, and closed if, and only if, they are isomorphic to the collection of points on a circle" (Le Poidevin 1993, 158). Thus, on Van Fraassen's view, Leibniz, in line with the prevailing standard topology, holds that time is unbounded and linear. In what follows I will argue that the second part of this conjecture, largely unsubstantiated by Van Fraassen himself, is a correct interpretation of Leibniz. To be more precise, I will argue that time is linear for Leibniz in that relations of temporal priority and posteriority are neither reflexive nor symmetric.[20]

According to the standard topology of time, temporal relations such as "prior" and "posterior" are asymmetric and irreflexive. Given two moments T1 and T2, T1 is neither prior nor posterior to itself, and if T1 is prior to T2, then T2 is not prior to T1. Commonly dubbed "linear time," this topology is such that time is structurally isomorphic to the points on a straight line. In closed time, by contrast, the preceding temporal relations are symmetric and reflexive, and time is structurally isomorphic to the points on circle. In what follows I show that Leibniz holds time to be linear of necessity.

In his correspondence with Bourguet, Leibniz remarks that instants of time are similar to spatial points in that there need not be a "primary," or first, instant, but dissimilar to points of space in that, unlike the latter, "a preceding instant always has the advantage of priority, not merely in time but in nature, over the following instants" (G 3.582/L 664). This cryptic statement refers to a fundamental ordering relation that runs throughout Leibniz's metaphysics: the order of nature, and what is prior, simultaneous, or posterior by nature. Priority of nature as understood by Leibniz's predecessors means that what is prior by nature can exist without the existence of what is posterior by nature but what is posterior by nature cannot exist without the existence of what is prior by nature (Aristotle, 260b17). We have seen that Leibniz follows this precedent in holding that X is prior by nature to Y if and only if the possibility of X is more easily demonstrable than the possibility of Y, or if X is more easily distinctly understood than Y:

- Whatever is able to be more clearly conceived than another, and the other not more so than it, is prior, not by time, but rather by nature (AK 6.1.483).
- Prior by nature is that whose notion is simpler (AK 6.4.872).
- Prior by nature is what is less derivative, and so what enters into the concept of another is prior by nature to it (AK 6.4.937).

The above characterizations underline the asymmetry of the relation of natural priority. X is prior by nature to Y if it is more clearly conceivable than Y and Y not

[20] Throughout this and the next several chapters I will both refer to and quantify over spatial and temporal items such as places, moments, or durations. In doing so, I do not intend either to make or to impute to Leibniz any ontological commitments about the existence of such items. I use these terms as a convenient shorthand to refer to those things to which, on Leibniz's non-modal reductionism, these items are reduced.

more so than it, or if it enters into the concept of Y without Y entering into the concept of it. In short, if X is prior by nature to Y then Y cannot be prior by nature to X. Moreover, natural order is an irreflexive relation in that no thing or its accompanying concept is more easily conceivable than itself; a concept neither has itself as one of its own elements or proper parts, nor is it "less derivative" than itself since a thing's concept cannot be simpler than itself.

On the basis of the preceding, we can conclude that time for Leibniz is necessarily linear, i.e., that relations of temporal priority are necessarily irreflexive and asymmetric and that closed time is not possible. Let us assume that the world's temporal series is exhausted by three instants T_1, T_2, and T_3, and that these instants form a closed time in which each is both before and after every other instant, and both before and after itself. Qualitative temporal relations in this world are symmetric and reflexive: T_1 is later and earlier than T_2, T_3, and T_1, and so to with T_2 and T_3. Given Leibniz's dictum that each temporally precedent instant is by definition naturally prior to any instant with respect to which it is temporally precedent, each of these instants must be both naturally prior and posterior to every other instant, and both naturally prior and posterior to itself. Thus, like the qualitative temporal relations "later" and "earlier," relations of naturally priority would be in this world symmetric and reflexive. This, however, violates Leibniz's requirement that relations of natural priority be asymmetric and irreflexive. As a temporally closed world entails the symmetry and reflexivity of natural priority, a world with this kind of temporal topology is not possible. As in the case of the unity of space and time, Leibniz has promulgated purely philosophical reasons for asserting the necessity of this topological feature of time.

Chapter 6
Leibniz on Past, Present, and Future

The objective of the preceding chapter has been to show that temporal relations such as simultaneity, priority, and posteriority are, according to Leibniz, neither basic nor irreducible. In arguing that Leibniz advances a causal theory of time in which temporal relations are analyzed in terms of causal relations, we have also advanced the claim that such temporal concepts are not analytically primitive. The causal facts about possible worlds ground those worlds' temporal facts, which means that there are no *sui generis*, irreducible temporal facts about worlds. According to one recent commentator, Leibniz possibly promulgates a theory of time that is fundamentally at variance with the foregoing interpretation. Vailati has written that Leibniz can be seen as opting for what is commonly referred to as an "A-theory" of time in that he "seemed to adopt the tensed view that only the present instant, the 'now,' is real." (121). To ascribe to Leibniz an A-theory of time in full is, at a minimum, to assert that in Leibniz's metaphysics events or states have the properties of being future, past, or present, and that they have these properties independently of being conceived or thought in a certain way. These are not merely ego-centric fictions that we impose upon events and objects. Furthermore, because standard A-theories of time hold that such tensed temporal properties are sui generis, tensed properties are not definable in terms of non-tensed relations; rather, the former are analytically basic and may themselves be used to define the latter. Such an ascription is clearly inconsistent with construing Leibniz's philosophy of time as a causal theory of time, for it is the aim of such theories to provide some kind of analysis of temporal facts in terms of non-temporal facts, or to show that temporal relations result from non-temporal relations. Yet if earlier-than and later-than relations must be grounded in tensed temporal properties, and these monadic properties are analytically basic, then Leibniz can hardly be seen as having espoused a causal theory of time. A causal theory of time holds that an event's temporal location is given by its causal relations, and an A-theory holds that it is given by its primitive A-properties. It is the aim of this chapter to show that there are facets of Leibniz's philosophy of time that are more consonant with the claims of B-theorists, and that he is not unambiguously committed to the key tenets of the A-theory. In particular, there is some reason to maintain that Leibniz denies that future, past, and present are analytically basic properties that truly characterize

M.J. Futch, *Leibniz's Metaphysics of Time and Space*,

times and events. Similarly, many texts provide grounds for attributing to Leibniz a conception of change that does not invoke tensed A-properties.

6.1 Tensed and Non-tensed Times

Before turning to Leibniz, I will first provide a brief overview of the major tenets of the A- and B-theories, an overview that will be amplified as necessary in the following three sections. In its simplest form, the A-theory of time views the properties of being past, present, and future as mind-independent monadic properties that truly characterize events or times. That is, our division of time into past, present, and future corresponds to divisions within time itself. These are not merely egocentric fictions that are nothing more than part of our subjective phenomenological experience of time. Rather, there is something intrinsic to time itself that answers to these divisions.[1] Moreover, an event's place in the A-series is always changing from being in the far future, to being in the near future, the present, and ultimately the past, and these changes too occur independently of our experience of time. Indeed, change at the most fundamental level consists in just this: an event successively acquiring the properties of being future, present, and then past. Were events not to change with respect to these monadic tensed properties, there would not be change at all. This kind of change is often referred to as "temporal becoming," a designation that is intended to underscore another key element of the A-theory. This additional elemental is usually labeled "presentism": only what is present is real, and only what is in the present exists. The future and past do not exist, and things in the future and past do not exist. Things in the future come into existence as they become present, and then pass out of existence as they become past. Just as the now is constantly changing, so too is what exists, since only what exists now exists. If it doesn't exist now, then it doesn't exist period. On this view, time is often likened to a river, constantly moving and never staying the same. Reality is transitory, it is always fleeting.

On the other hand, B-theorists hold that the only temporal facts about events are to be characterized in terms of polyadic non-tensed temporal properties, viz., non-tensed temporal relations.[2] These are the relations of earlier than, simultaneous with, and later than. Thus, past, present, and future do not exist, or rather they have no mind-independent existence. This is not to deny the reality of time *simpliciter*, but only time conceived along certain lines. Dividing time into present and future is roughly analogous to dividing space into here and there. There is, of course, nothing inherent in the structure of space that so divides it; it is divided into here and there only from the perspective of a particular observer. Similarly, the division of

[1] Le Poidevin nicely summarizes this, writing, "*Nowness* is something that times have, independently of people, or thoughts or language" (2003, 123).

[2] See Smith, 4.

time into past and present is a function of the way we experience reality, and is just as much dependent upon the perspective of a particular observer as is the division of space into here and there. At the most basic level of reality, the only temporal divisions that exist are those that can be cashed out in terms of non-tensed polyadic relations, and tensed temporal facts have non-tensed truth conditions. Furthermore, unlike an event's location in the A-series, an event's location in the B-series is unchanging and remains constant throughout time; Truman's presidency is always later than Hoover's, earlier than Kennedy's, and simultaneous with the construction of the Berlin wall, but it is not always past, present, or future. Finally, and most counterintuitively, against the A-theory's view that there is an ontological asymmetry among past, present, and future, the B-theory holds that, in a sense to be specified in Section 6.4, all times are equally real. As already mentioned, we will have occasion to return to each of these tenets in the sections below. Section 6.2 that Leibnizian change is B-change. Section 6.3 exposits Leibniz's truth-functional and translational analysis of tensed terms and sentences. Section 6.4 examines Leibniz's views on the reality of the past and future, and whether or not there is any sense in which they are on ontological par with the present.

6.2 Leibniz on Time and Change

As briefly indicated in Section 6.1, A- and B-theories of time lead to or presuppose markedly divergent accounts of change. Change, for an A-theorist, consists in the same event successively acquiring different A-properties; there is change if and only if some event E or time T successively has the A-properties future, present, and past. This appears to be the view of change and time Augustine has in mind when writing the following:

> if nothing passes away, there is no past time, and if nothing arrives, there is no future time, and if nothing existed there would be no present time … if the present were always present, it would not pass into the past: it would not be time but eternity. If then, in order to be time at all, the present is so made that it passes into the past, how can we say that this present also 'is'? The cause of its being is that it will cease to be (*Confessions*, XI 14.17).[3]

It has often been thought that B-theorists can provide no account of change, or that, on the B-theory, there is no change: since events do not change their location in the B-series, there is no change at all. (This criticism perhaps has its origins in

[3] See also Aristotle's comments that "it is not possible for the 'now' to remain always the same" (218a21) and the "now in time … is thought to be ever different, which shows that it is not a substance" (1002b8). The importance of this understanding of change to the A-theory is underscored by Mellor: "Change for A-theorists is the successive presence of different events, which in turn determines their time order: one event is earlier than another if and only if it is present first" (71). This highlights the fact that, for the A-theorist, an event possessing tensed-temporal properties – being present, being past when something else is present – is indispensable for both change and establishing a temporal order.

McTaggart's argument that time is unreal because the A-series leads to irresolvable contradictions, and that change requires the A-series.[4]) Čapek, with many others, introduces this criticism, holding that the B-theory of time is tantamount to a "spatialization of time" with the result that "the universe with its whole history is conceived as a single huge and timeless bloc, given at once" (1961, 163). This is among the more regrettable misinterpretations of the B-theory of time, and a misinterpretation that, if uncorrected, might be seen as supporting the contention that Leibniz adopts an A-theory. Change, after all, figures centrally in Leibniz's metaphysics:

> unless there is change in simple things, there will be no change in things at all. Nor must every change be from without; on the contrary, an internal tendency to change is essential to finite substance, and no change can arise naturally in the monads in any other way … all individual things are successions or are subject to succession, and so your view coincides with my own. For me nothing is permanent in things except the law itself which involves a continuous succession (G 2.252/L 531, G 2.263/L 534).

If only the A-theory of time allows for change, then the A-theory Leibniz must adopt, and, in adopting that theory, disavow a causal theory of time.

There is, however, no reason to think that all change must be conceived within the framework of tensed theories of time. While it is true that under the B-theory events do not change in virtue of successively acquiring different tensed properties – future events becoming present and slipping into the past – it is untrue that that theory renders change *simpliciter* illusory or unreal. Rather, change on the B-theory (B-change) consists simply in "a thing having incompatible real [i.e., non-tensed] properties at different times" (Mellor 1998, 89).[5] A poker that is hot at some time T_1 and cold at a later time T_2 will have undergone a change from T_1 to T_2. The poker does not change by having its coldness move from the future to the present and then to the past. Similarly, time does not flow in the sense that B-facts (the poker being hot at T_1) change from being future to present to past; B-facts and B-times do not move along an A-series.[6] According to Schlesinger's conception,

> No event has the monadic property of being in the future, as such, to begin with. Consequently, it can never shed this property. An event, E_1, may occur later that some other event E_0, but if this is so at all, then it is true forever that E_1 occurs later than E_0. Neither can any event be in the past. E_1 may occur earlier than E_2, but once more, if this is so, then the fact that E_1 occurs earlier than E_2 is an eternal fact. Indeed, all the temporal properties of events and moments are permanent (215).

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[4] McTaggart, 1908.

[5] Writes Grunbaum: "The mind-dependence thesis does deny that physical events themselves happen in the tensed sense of coming into being apart from anyone's awareness of them. But this thesis clearly avows that physical events do happen independently of any mind in the tenseless sense of merely occurring at certain clock times in the context of objective relations of earlier and later. Thus, it is a travesty to equate the objective *becominglessness* of physical events asserted by the thesis with a claim of *timelessness*" (1967, 22). A more succinct formulation is provided by Le Poidevin: "Change in the B-universe just *is* the fact that objects have different properties at different times" (2003, 143).

[6] Mellor, 84.

This, though, means only that an event's temporal location does not change, not that there is no change in the thing itself. As Mellor writes, facts need not change (their A-properties) in order for there *to be* changes (84). A poker tenselessly being cold at T_2 has undergone a change if there is another time T_1 at which it was cold, even though the event *poker-is-hot* does not change its location in the B-series.

With these clarifications in hand, we are in a better position to evaluate Leibniz's account of change vis-à-vis the accounts provided by A- and B-theorists. Does Leibniz accept that events have the monadic properties of being future, present, and past, and that change consists in the change of these A-facts about events? If so, then we have strong grounds for attributing to Leibniz a tensed theory of time, an attribution that provides us with equally strong evidence against a causal theory of time. We have already encountered one passage that supplies some evidence that Leibniz adheres to a tensed account of time. Recall from Chapter 4 Leibniz's claim that

> whatever is future will be present, whatever is future will be past, whatever is past will always be past, whatever is future up to this time will be future, but not always, whatever is past was future, and whatever is past was present (AK 6.4.908).

Taken at face value, this study assigns to events monadic tensed properties, and suggests that events undergo a genuine change with respect to these properties, i.e., that they have an ever-changing position in the A-series. There is change, then, insofar as a future event becomes present and recedes into the past. This is a remarkable passage, but one that is of a piece with many of Leibniz's other pronouncements. It is a refrain of Leibniz's philosophy that "the present is big with the future." As Leibniz puts it to De Volder, "it is essential to substance that its present state involve its future states" (G 2.282/L 539). And from an earlier piece:

> it is the nature of a created substance to change continually in accordance with a certain order, which conducts it spontaneously (if one may use the word) through all its states, in such a way that someone who saw everything would see in its present state all its past and future states (NS 80).

Though not explicitly confirmed, these texts appear to assume that events (monadic states) are locatable in the A-series, or that states have A-properties, and that change is, in part, explained by the A-properties of these events changing. A state is either past, present, or future, and changes from being future to being present to being past. In line with an A-theory of time, change is conceived as the successive presence of diverse events.

Their *prima facie* implications notwithstanding, the above passages cannot be taken as conclusive warrant for ascribing to Leibniz an A-theory of time. A B-theorist no more need disavow A-talk than a Copernican need dispense with references to the rising and setting of the sun. More generally, the surface level semantics of Leibniz's studies should not be taken as an indication of his deep metaphysical commitments. While perfectly happy to employ tensed predicates such as "past" or "future," it remains open to Leibniz to give a translational analysis of the meaning of these terms, an analysis that defines them by more fundamental, non-tensed terms. Alternatively, Leibniz might remain content with a truth-conditional analysis

that "involves a specification, in conceptually simpler terms, of the conditions under which statements involving [tensed concepts] are true" (Tooley, 176). The above statements – "whatever is future will be past," "whatever is past was future" – are true, not because they refer to genuine tensed properties of events, but because the non-tensed facts of the world are sufficient for conferring on them a truth-value. We will return to these possibilities in Section 6.3. For now I wish only to underscore the absence of ontological commitments in these texts.

The most compelling evidence against Leibniz's adherence to an A-theory of change is the fact that, without exception, his most considered and systematic explanations of change are void of any reference to events having transient A-properties. When speaking in metaphysical rigor, Leibniz adopts a quasi-Russellian theory of change in which change is associated not with events having different locations in the A-series, but rather things having different contradictory properties. Below is but a brief sample of Leibniz's many definitions of "change":

> A change is made if … two contradictory propositions are true (AK 6.4.568).
>
> Change is an aggregate formed from two contradictory states (Grua, 512).
>
> Change is a complex of two contradictory states that are immediate to one another (AK 6.4.569).
>
> Change is a complex of two contradictory states, where these two states are immediate to one another (AK 6.4.869).
>
> If A is B, and A is not B, A is said to have changed (AK 6.4.629).
>
> While a thing is able to remain, it is fitting that it change, if from the very nature of that thing it follows that the same thing has successive diverse states … Change (*Mutatio*) is an aggregate of two contradictory states. It is necessary, however, that these states be understood as immediate, since between contradictory things a third is not given (Grua, 323).

"Diverse," Leibniz explains, refers to those predicates or things that cannot be substituted in a proposition *salva veritate* (AK 6.4.867). The first definition of "change" does not by itself rule out the possibility of A-change. "Event E is future" and "Event E is past" are contradictory propositions, and it may be that Leibniz has these kinds of propositions in mind when explaining change: there has been a change because at T_1 "E is future" is true and at T_2 "E is past" is true. But the ensuing quotations show that this is not what Leibniz intends, for all of these formulations are unequivocal in their assertion that *things* change with respect to their *states*. On the above definitions, then, change is not explained by the *states* of things changing with respect to their A-series locations or tensed properties. Rather, there is change in a thing when contradictory propositions about that thing are true.

Further evidence for this view is found in Leibniz's ordering of the "primitive concepts of thought," an ordering that we have examined Chapters 2 and 5 but that will repay brief reconsideration within the context of our analysis of change. Recall Leibniz's contention that "almost all of our concepts [*notiones*] are contained in these few: … Variety …. Consequence [*Consequentia*] … Order … from order and consequence taken together, cause and effect are born. From these comes change, and then time" (AK 6.4.399). And in another similar study, Leibniz adds that "all

[concepts] seem to be reducible [*revocari*] to these: … Consequence, Order, Causality, Change" (AK 6.4.873). We have interpreted these enumerations to mean that relations of consequence and order are ontologically prior to causal relations, which are constructed entirely from some combination of the first two. Similarly, in claiming that change "comes from" cause and effect, and time from change, Leibniz holds that change can be conceived prior to and independently of temporal relations, tensed or non-tensed. More fully, relations of consequence are logical relations that enable one, e.g., to infer the existence of an *illatum* from an *inferens*, or a *requisite* from a *requirens*. Relations of order – natural order – are ontological relations that establish an asymmetric relation of being (and knowing) among concepts and *entia*. Causal relations obtain among things ordered both by relations of consequence and order, but that are related to one another relative to a mode of production, such as the laws of nature. Finally, there is change when a causal relation obtains between incompatible things. This analysis of change invokes neither tensed nor non-tensed temporal concepts, but only the logically prior relations of consequence, order, and causality. Thus, Leibniz writes that "it is obvious that [temporal] priority and posteriority do not enter into [*ingredi*] the definition of change" (AK 6.4.569).

In sum, there are strong reasons for believing that, if presented with the options, Leibniz would adopt a B-theory account of change. Though he does allow that "whatever is future will be past, etc.," this is an unambiguous commitment neither to the existence of monadic tensed properties nor to the kind of change in which events change their location in the A-series. In his more careful deliberations on change, we are provided with an analogue of more recent B-theory accounts of change: objects change if and only if they possess incompatible properties.

6.3 Meaning and Truth

Leibniz's doctrine of truth is equally relevant for another dissimilarity between A- and B-theorists. According to B-theorists, tensed statements either are translatable into non-tensed statements or have non-tensed truthmakers. That is, statements such as "Tomorrow is Tuesday" are given a translational or truth-conditional analysis in terms of non-tensed statements or B-facts. In the former case, the meaning of "Tomorrow is Tuesday" is translated into, e.g., "Tuesday is one day after the day simultaneous with this utterance." In the latter, we need only specify conceptually more basic non-tensed facts in virtue of which "Tomorrow is Tuesday" is true. If a translational analysis is possible, then so too is a truth-conditional analysis, but a truth-conditional analysis does not presuppose a translational analysis. Mellor outlines the differences between the A- and B-theories in the following manner:

> [According to the B-theory] there is in reality no such thing as being past, present, or future. By this I do not mean that it is never true to call an event *e* past, present or future: that would be absurd. The question is, what makes a statement like "*e* is past" true when it is true, namely at any time later than *e*? There are two answers to this question. One is that

> any event *e* has the property of being past. This is what, in McTaggart's now standard terminology, I call the 'A-theory' view. My own 'B-theory' view is that what makes "*e* is past" true at any time *t* is the fact that *e* is earlier than *t*. Similarly, what makes '*e* is present' true at any time *t* is *e*'s being located at *t*, and what makes '*e* is future' true at any *t* is *e*'s being later than *t* (2).

Event *e* being later than some time *t* is a B-fact about *e* that does not change. This B-fact about *e* is the truthmaker of the A-statement "*e* is future." It is thus not the case that there is some A-fact – *e* having the tensed monadic property "future" – that serves as an A-statement's truthmaker. What I would like to show in this section is that Leibniz's complete concept theory, especially as interpreted by Mates, is more consonant with the B-theory view of truthmakers than with the A-theory of truthmakers.

Before turning to the truth conditions that Leibniz provides for (tensed) statements, a series of definitions from 1702–1704 merits our attention. After defining "time" as a "continuous order of existing things according to change," Leibniz further observes that a "past state" is one "from which the present arises [*oritur*], and which is incompatible with the present" (C 480). Similarly, a future state "arises from the present, and is inconsistent with the present" (ibid.). Earlier in this list Leibniz notes that "something is said to arise [*oriri*] from another thing, if the latter is an *inferens* prior by nature … or a primary cause" (C 471). Consequently, a past state is one that is a causally sufficient condition for a present or future state, and a future state is one that has as its causally sufficient condition a present or past state. These definitions are remarkable (and, to the best of my knowledge, unique in Leibniz's corpus), for they provide analyses of two monadic tensed properties – past and future – partially in terms of a polyadic, i.e., relational non-tensed property. To this extent, Leibniz can be read as attempting to provide at least a limited translation of A-statements into non-tensed statements.

This interpretation is not without problems. Both past and future are partially defined by reference to the present, and what is present, Leibniz writes, "is not able to be explained through a definition, but can be known by perception alone" (C 480). This comment is open to at least two interpretations. First, Leibniz might be arguing that "present" cannot be defined, and, since past and future are defined partially by reference to the term "present," a translational analysis of tensed statements is not possible. Alternatively, and more plausibly, rather than claiming that *what the present is* cannot be defined, this statement could be signaling the more modest proposal that *what is present* cannot be defined. This interpretation is more concordant with the claim that what is present ("*quis vero præsens sit*") can be known through perception alone ("*sola perceptione cognosci potest*"). Surely we are not to interpret this as holding that the *meaning* of "present" can be known through perception. Rather, what is present – what things or phenomena are simultaneous with a reflective act of consciousness – can be determined through perception alone. This reading leaves open the possibility that Leibniz provides, or can provide, a translational analysis of "present" in non-tensed terms. According to Grunbaum, for instance, to say that something is present means that it is simultaneous with a reflective act of awareness of that thing. If Leibniz pursues this line of investigation, then his definitions

of "past state" and "future state" do not invoke tensed temporal concepts, and he has given us a complete translation of A-statements into B-statements.

Unfortunately, these arguments cannot be taken as definitive evidence for the presence of a translational analysis of A-statements in Leibniz's philosophy of time. We have seen, though, that B-theorists need offer only a truth-conditional analysis of A-statements, and the evidence that Leibniz offers this kind of analysis is considerably more compelling. Central to Leibniz's theory of truth is the assertion that every true proposition is true in virtue of the concept of the predicate being contained in the concept of the subject:

> It is agreed that every true proposition has some basis in the nature of things, and when a proposition is not identical – that is, when the predicate is not contained expressly in the subject – it must be contained in it virtually. This is what philosophers call "*in-esse*", when they say that the predicate is "in" the subject. The subject term, therefore, must always include the predicate term, in such a way that a man who understood the concept of the subject will also know that predicate pertains to it. This being premised, we can say that it is the nature of an individual substance or complete being to have a concept so complete that it is sufficient to make us understand and deduce from it all the predicates of the subject to which the concept is attributed (DM 8).

"Alexander is king" is true only if the complete concept of Alexander contains the predicate (or some set of predicates that enables one to infer the predicate) "king." Now it is obviously untrue that at all times Alexander is king. Rather, it is true at all times that at some time(s) Alexander is king. But if Alexander's complete concept timelessly contains the predicate "king," then it would seem to be true at all times that Alexander is king. Or rather, it would seem to be timelessly true that, at all times, Alexander is king. How, then, are we to construct complete concepts and their predicates in a way that allows that at some times substances have predicates true of them that are not true of them at other times? That is, how does Leibniz's complete concept theory of substance allow for the possibility that substances change their predicates from one time to another?

Mates has proposed what I take to be the most viable reconstruction of Leibniz's complete concept theory, a reconstruction that bears directly on Leibniz's truth-conditional analysis of A-statements. Mates starts by noting the above problems that Leibniz's unreconstructed theory generates. According to Mates,

> King is included in the complete individual concept of Alexander the Great. But this inclusion cannot be exactly the same as that which holds between Animal and Man or between Plane Curve and Circle … It is not absolutely impossible for something to be Alexander without being king; indeed, before 336 B. C. such was actually the case. The concept of Alexander seems to be a temporally ordered series of states, each of which is itself a "complete" property or concept … Thus, the property King is not, strictly speaking, contained in the concept of Alexander, but rather it is contained in some elements of the series of states that constitutes that concept (87).

Two alternatives are open to the Leibniz exegete. The first is to add the temporal specification to the predicate: A is (B at t_1) (Rutherford 1995, 140; Mates, 91). On this reading, properties have temporal designations built in, i.e., properties are in part temporal designations. The second alternative, and the one accepted by Mates, is to add the temporal qualification not to the predicate but to the copula: (A is B)

at *t* (Mates, 91). Accordingly, the property king is timelessly included in Alexander's complete concept, but only in some phase, or what Mates terms "*t*-stage" ("the state of a monad *M* at time *t*"[7]), of that concept. More fully, the *t*-stage of a monad is the state of that monad at some time *t*, and a complete concept is an ordered series of *t*-stages. Contingent properties such as king or conqueror are contained in a substance's complete concept, but unlike essential properties such as rational and animal, they are contained in some but not all *t*-stages of that concept. It is untrue that every *t*-stage of Alexander contains the property king, and that Alexander is always king. Instead, there is some *t*-stage (the 336 B. C.-stage) that contains this property, and it is only sometimes true that Alexander is king, though it is always true that Alexander is king at the *t*-stages including the property king.

With the above in hand, we can provide a recognizably Leibnizian non-tensed analysis of the truth conditions for any proposition, including those that contain tensed predicates (or verbs). In what follows, we limit our discussion to singular existential propositions, but the account can be made to apply to all statements. Let us start with the statement "Leibniz is (now) in Paris". On the complete concept theory of truth as we have interpreted it, a minimal requirement for this statement to be true is that some t-stage of Leibniz's complete concept contains the predicate "in Paris". That is, there must be some time *t* such that it is true that Leibniz is in Paris at *t*: (Leibniz is in Paris) at *t*. Yet it is obvious that "Leibniz is (now) in Paris" is not always true – the truth value of tokens of type tensed statements varies in that a token uttered in, e.g., 1674 is true, while another token uttered in 1764 is false. According to the tenseless date theory, a token of the sentence type "Leibniz is (now) in Paris" is, if tokened at *t*, true if and only if Leibniz's presence in Paris occurs at *t*. Similarly, the sentence type "Leibniz was in the past in Paris" has tokens that are true only when those tokens are uttered some time *t* such that *t* is later than the time of Leibniz's presence in Paris. What I would like to suggest is that Leibniz's complete concept theory is most reasonably read as espousing an analogue of the tenseless date truth-conditional analysis of tensed statements. Some *t*-stage of Leibniz's complete concept contains the predicate "in Paris." Some time *t* is part of the *t*-stage containing the predicate "in Paris." Some token of the sentence type "Leibniz is (now) in Paris" is true if and only if it is tokened at a time *t* included in the relevant *t*-stage of Leibniz's complete concept, that relevant *t*-stage being one that contains the predicate "in Paris." Some token of the sentence type "Leibniz was in Paris" is true if and only if it is tokened at a time *t* that is later than any time *t** included in the relevant *t*-stage of Leibniz's complete concept. Finally, a token of the sentence type "Leibniz will be in Paris" is true if and only if it is tokened at a time *t* that is earlier than any time *t** included in the relevant *t*-stage of Leibniz's complete concept. This account of Leibniz's complete concept theory provides a way of grounding the truth of tensed statements that does not make any ontological commitments about primitive tensed facts or properties.

[7] For this interpretation and what follows, see Mates, 88–92.

6.4 Leibniz and Presentism

I will conclude this chapter with an examination of a facet of Leibniz's philosophy of time that is not so easily squared with either a B-theory of time or a causal theory of time. This is Leibniz's apparent adherence to some form of presentism. It cannot be denied that there is prima facie evidence for attributing this view – that only the present is real, and that the past and future do not exist – to Leibniz. What is more, this evidence is quite direct, and is based on a number of texts that cover a wide span of Leibniz's career. In his last letter to Clarke, Leibniz, denying the absolute reality of space and time, informs the English Newtonian that "whatever exists of time and duration, being successive, perishes continually" (LC 5.49). This bears striking similarities to Augustine's famous dictum that we cannot truly say that time exists except in the sense that it tends towards non-existence. It is also a reiteration of statements found throughout Leibniz's writings:

> For like time, motion taken in an exact sense never exists, because a whole does not exist if it has no coexisting parts (GM 6.235/L 436).
>
> Movement is a successive thing, and consequently never exists, any more than time does, since the entirety of its parts never exist together (Robinet, 281).
>
> Motion is no more a being than time, not having coexisting parts (G 3.457).
>
> One can thus well see that time is not a substance, since an hour, or whatever part of time one takes, never exists in its entirety and with all its parts together (G 7.564).

In each of these passages Leibniz is concerned above all to deny that time is an *ens*. This he does by assuming a necessary condition on something counting as a being: it must have coexisting parts, or, to express the same point differently, it cannot have temporal parts. A being or substance lacks temporal parts in that, though it may endure from one time to a later time, it is wholly present at each moment of its duration. Since motion and, more obviously, duration have temporal parts, they cannot be things. Though the arguments are chiefly aimed at showing that time cannot be a substance, they reach this conclusion by taking for granted that, in some unspecified sense, only the present is real, or only the present exists.

Or so it seems upon a cursory inspection. It is true that in his letter to Clarke, Leibniz observes that time "perishes continually," which surely means that the future becomes present for only a fleeting moment before passing into non-existence. This does indeed look to be a straightforward espousal of the unreality of future and past, restricting existence to only what is present, and this in turn might reasonably be taken as evidence for Leibniz being a kind of A-theorist. Leibniz's wording in the four other texts, however, is importantly different, and different in a way that does not commit Leibniz to either presentism or the A-theory. Notice that in these texts, Leibniz argues not that time continually perishes, but only that it has no "coexisting" parts or, what is likely the same thing, that it has "parts [that] never exist together." To say that it has no coexisting parts or parts existing together means nothing more than that, for any two moments of time, those moments are non-simultaneous: one is either earlier or later than the other. The duration of time that we designate by "the

twenty-first century" has no coexisting parts in that, for example, 2015 is later than 2004 and earlier than 2026. So too with any other time span that we might take: its parts stand in relations of priority or posteriority to one another.

It might be thought that this by itself still suffices for construing Leibniz as a proto-presentist or A-theorist. Once again, a clarification is in order. B-theorists, we have seen, deny an ontological asymmetry between past, present, and future. Kiernan-Lewis, an opponent of such theories, outlines the position as follows:

> According to advocates of tenselessness, all temporal items are stretched out in a tenseless array, and all are on equal footing with respect to existence. Hence, all past and future items exist in the same way that present items exist – tenselessly and changelessly *at some time* (322, emphasis added).

The import of this thesis has been widely misconstrued. Čapek takes it to mean that "successive moments already *coexist*" (163). Likewise, in his *The Natural Philosophy of Time* Whitrow interprets the B-theory as implying that "past (and future) events co-exist with those that are present … According to this theory external events permanently exist and we merely come across them" (88). The picture that allegedly emerges from a B-theory of time is that of a *totum simul* in which, to use Boethius' phraseology, one has "embraced the whole of everlasting life in one simultaneous present." Events, as coexisting in the same present, have no temporal separation from one another, and at each moment in the B-series each event exists in the same way that it does at any other moment. But this represents a basic confusion about what the B-theory maintains. B-theorists do not claim that events exist tenselessly at *each* moment of time, but only that they exist tenselessly at *some* moment of time. On the B-theory, it is always true that the poker is hot at T_1, but it most definitely is not true that *the poker is always hot*. There is a key distinction between claiming that an event tenselessly exists at the moment that it does, on the one hand, and, on the other hand, claiming that it tenselessly exists *at each moment*.[8] The B-theory of time stipulates only the former, and in no uncertain terms disavows the latter; it is a cardinal tenet of the B-theory that events and instants stand in relations of priority and posteriority to each other, and consequently do not coexist.

With this clarification in hand, we are in a better position to assess the merits of ascribing to Leibniz some version of the A-theory on the basis of the passages quoted above. In arguing against the substantiality of time by pointing to the obvious – time does not have coexisting parts – Leibniz denies that all times exist at once, or that time forms a *totum simul*. But since, contrary to some prevalent misinterpretations, B-theorists do not assert the coexistence of all parts of time, Leibniz's renunciation of this strawman is not a renunciation of the B-theory. The non-simultaneity of the parts of time is a thesis that is just at home in the B-theory as it is in the A-theory. Having said this, we should also recognize that if time not having coexisting parts does not commit him to the A-theory, neither does it commit him to the B-theory, for A-theorists, no less than B-theorists, insist that

[8] Oaklander writes, "On the tenseless theory, all events exist tenselessly at the moment they do, but this does not imply that they are everlasting or exist at every moment in the time series" (326).

time has parts that do not coexist. The preceding, then, has done little more than neutralize an objection to construing Leibniz as a B-theorist; it has not provided positive evidence in favor of that interpretation.

Are there positive reasons for thinking that Leibniz disowns the A-theory? For these, one might look to Leibniz's writings on the determinacy of future contingents and the principle of bivalence. On the standard formulation of the B-theory, statements about the future are either now true or now false. This is not the trivially true claim that they are now either true or false. To elucidate, not only does the disjunctive statement "Either there will be a sea fight tomorrow or it is not the case that there will be a sea fight tomorrow" have a determinate truth value right now (it is true), but so too do each of the disjuncts individually. If in fact there will be a sea fight tomorrow, then it is true right now that there will be a sea fight tomorrow and false right now that there will not be a sea fight tomorrow. For some B-theorists, the reality of the future comes to nothing more than this. According to Dorato, the B-theory postulation of the symmetry between the present and future (what he labels the "full view") advances only the modest proposal that "the future is as real and as fully determinate as the past; future-tense statements have now and always a determinate truth value" (15). This follows in the footsteps of Williams' claim that future "events are determinate if and only if the future is real *in the sense that there is truth about the future*" (293). On this explication, the reality of the future is associated with, or just is, the determinateness of truth value of statements about the future. If this is right, then we do have grounds for inferring that Leibniz was a B-theorist *avant la letter*. Given his theory of truth as set forth in Section 6.3, it will come as no surprise that Leibniz affirms the determinateness of future contingents:

> But if God had not foreknown or preordained the entire series of actual things, then it would follow that he would have made a judgment without a reason insufficiently understood by him, and that he would have chosen something insufficiently clear to him. The actions of free minds cannot be excepted from this … But this does not eliminate freedom in minds. For infallible certainty is different from absolute necessity … Certainly the truth or falsity of future contingents, even those that are free, is determined, even if we imagine that they are unknown (F de C 318/AG 102).

If there is going to be a sea fight tomorrow, then, according to Leibniz, it is now true that there is going to be a sea fight tomorrow. If one accepts this as evidence for Leibniz's postulation of an ontological symmetry between the present and future, then there are positive reasons for attributing to him a B-theory of time.

I am not wholly convinced that the above considerations place us in a position to conclude that Leibniz disavows presentism. To be sure, if the B-theory's views on the reality of the future come to nothing more than that future contingents have determinate truth values, then Leibniz accepts one of the key claims of the B-theory. The determinateness of the truth value of future contingents, though, is equally compatible with the A-theory. Even as staunch a B-theorist as Grunbaum concedes that physical determinism implies, though is not implied by, the determinateness of the future, or what he calls its "attribute specificity."[9] Given that physical determinism is consistent

[9] 1967, 28–36. Dorato also makes the same point (69).

with presentism, presentism is consistent with the determinateness of the future. But if this is so, then in accepting that future contingents have determinate truth values, Leibniz is accepting a thesis that is compatible with both the A- and B-theories. In sum, Leibniz's views about the determinateness of future contingents do not provide us with positive reasons for seeing him as disclaiming presentism.[10]

Even worse for the interpretation being defended in this chapter is Leibniz's claim to Clarke that the successiveness of time is such that time "perishes continually" (LC 5.49). The continual perishing of time would seem to be Leibniz's way of saying that what is present becomes past, and that when it does become past, it passes out of existence. While it does not follow from this that the future is also non-existent, it would be surprising to find Leibniz granting it reality while holding that the past is unreal. Those who have posited an asymmetry between past and future have done so in a way that posits an existent past and non-existent future, not the other way around.[11] I have tried to minimize the impact of Leibniz's statement to Clarke by observing that Leibniz usually argues against the substantiality of time by denying that it has coexistent parts, a claim compatible with the B-theory. I cannot, though, minimize it to the point of making it disappear. How large it looms in Leibniz's corpus I leave for the reader to decide.

What I think can be asserted with some degree of confidence is that the overall architectonic of Leibniz's philosophy of time, on balance if not uniformly, favors key elements of the B-theory. This is especially true given the reductionistic fervor of Leibniz's approach to time: time is not an independently existing substance, but a system of relations that depends upon the existence of the *relata*, and it is a system of relations that can be analyzed in terms of more analytically basic causal relations, where these relations themselves supervene on purely intrinsic denominations. It is not easy to see where, within this ontologically austere framework, there is room for irreducibly tensed temporal facts, or even irreducible temporal facts. Moreover, Leibniz's conception of change is not in terms of events changing with respect to monadic tensed properties but rather of things having incompatible properties at different non-tensed times, and he provides an analysis of the truth conditions, and perhaps also the meaning, of tensed statements. These are not decisive considerations in favor of seeing Leibniz as an early proponent of a prototypical version of the B-theory, but I do think that they show him moving in that direction.

[10] While the three preceding sections are largely taken from Futch, 2002, this fourth represents a retraction of some of what is said there. I am indebted to an anonymous referee for pointing me in the right direction, though I alone am to blame if I have continued to stumble.

[11] As, for instance, Broad, Chapter 2.

Chapter 7
Space, Time, and Harmony

Leibniz's mature metaphysics takes as its guiding assumption the thesis that "there is nothing in things except simple substances, and in them perception and appetite" (G 2.270/L 537).[1] These simple substances are characterized as unextended, soul-like entities, and, more notoriously, as entities without "windows through which something can enter or leave" (Mon. 7). Moreover, simple substances are not in space and time, and consequently are not in themselves temporally or spatially ordered with respect to other simple substances: "For in themselves monads have no situation with respect to each other … Each is, as it were, a separate world" (G 2.444/L 602). Bereft of "windows" and not directly spatially, temporally, or causally ordered, each "substance is like a world apart, independent of all other things, except for God" (DM 14). Yet at the same time, within every possible world "all things are connected" and "'all things conspire,' as Hippocrates says" (*Theodicy*, 9; C 14–15 /MP 176). In one especially strong formulation of this tenet, Leibniz writes that

> In my opinion there is nothing in the whole created universe which does not need, for its perfect concept, the concept of everything else in the universality of things, since everything flows into [*influat*] every other thing in such a way that if anything is removed or changed, everything in the world will be different from what it now is (G 2.226/L 524).

Giving greater specificity to this claim, Leibniz informs De Bosses that, although they are without windows and like worlds unto themselves, individual monads stand in relations of duration (*duratio*), position (*situs*), and interaction (*commercio*) to one another (G 2.438/AG 199). Were monads not so related, they would not form a world, but would instead be "divorced from the universal connection, like deserters of the general order" (G 6.545/L 590; see also G 2.234).

The challenge for Leibniz, and by extension the Leibniz exegete, is to explain the consistency of these seemingly opposed doctrines. How can monads, which unlike "points in a real space, [do not] move, push, or touch each other" have a

[1] Cf. G 2.250: "I consider the explanation of all phenomena solely through the perceptions of monads functioning in harmony with each other, with corporeal substances rejected, to be useful for a fundamental investigation of things."

M.J. Futch, *Leibniz's Metaphysics of Time and Space*,

position with respect to one another (G. 3.623)? Some commentators, apparently despairing of finding any way of explaining such texts, have simply denied precisely what Leibniz asserts, viz. that simple substances have, in any sense, a position. On this view, monads cannot be said to have any kind of spatial properties or position in space, even second-order spatial properties and derivative positions in space that arise from the phenomena they represent: "Leibniz's considered view is one of foreswearing any commitment to spatial position for monads" (Cover and Hartz 1994, 296).[2]

If it not is readily apparent how monads can have a position, their relation to time seems less obscure. It was commonly held in Leibniz's time that there is a key disanalogy between space and time in that the former pertains only to bodies whereas the latter includes both material and mental changes. Bodily states are both spatial and temporal, mental states only temporal. Because of this dissimilarity, it is tempting to conclude that monads are temporal in a way that they are not spatial, for the considerations that militate against making monads spatial do not appear to apply to their temporality.[3] Thus, Lois Frankel concludes that "each monad has an individual temporal sequence … while nothing is (really) spatial or extended, real things (monads) are really temporal and enduring" (93). Not all have been content to accept such an interpretation, though. Opposed to this view, other Leibniz scholars (most notably Jalabert) have asserted that neither spatial nor temporal concepts have any direct application to ultimate reality.[4] As a sometimes-student of Leibniz will later say, space and time do not pertain to noumenal things in themselves, but only to the phenomenal appearances of these things. On this reading, Leibniz holds that there is a similarity between the spatial and temporal status of monads: they are equally neither. Monads are intrinsically neither temporal nor spatial.

In the case of space, I argue that while monads are intrinsically non-spatial they nonetheless have second-order spatial properties. Against the view sketched above, I develop Leibniz's affirmation that monads "have something of the nature of position in extension, i.e., they have a certain ordered relation of coexistence" (G 2.253) to show that monads are derivatively, if not intrinsically, spatial. In short, they are spatial in virtue of representing themselves as being embodied in spatial phenomena. Following my discussion of the relation of monads to space I show that monads are intrinsically atemporal in much the same way that they are intrinsically non-spatial.

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[2] By a "second-order" or "derived" spatial position, I mean one possessed by a monad in virtue of having a body, or representing itself as having a body, with a spatial position. More simply, the second-order spatial position is the position of the monad's body. This will be further developed in Section 7.2.

[3] Hence, Russell writes, "There is, moreover, in all monadisms, an asymmetry in regard to the relation of things to space and time, for which there is, so far as I know, nothing to urge except the apparent persistence of the Ego. It is held that substances persist through time, but do not pervade space" (128).

[4] See Jalabert, Chapters 4 and 5.

In defending this claim, I undertake an examination of Leibniz's theory of monadic perception and appetition, arguing that this commits him to the view that monads have only second-order temporal properties, and that a monad has a position in time only by representing temporally ordered phenomenal bodies. Monads are intrinsically atemporal, and have a derived location in time, in the same way that monads are intrinsically non-spatial, and have only a derived position in space.

Harmony plays an important role across the spectrum of Leibniz's philosophy, form his metaphysics, to his account of the mind-body problem, his theology, and his moral and political philosophy. Leibniz's views on space and time are but a part of this more general theory of harmony. As we have seen above, Leibniz contends that monads must stand in relations of duration and position to be ordered to one another. In this sense, space and time serve as world orders, for "order is simply the distinctive relation of several things" (C 535/P 146).[5] Monads, that is, must, in some sense to be specified below, be spatially and temporally related to one another in order to be connected, and they must be connected in order to form a possible or actual world. Space and time thus provide two ordering relations that account for the harmonious ordering of distinct substances. More to the point, space and time are two of the three fundamental ordering relations (relations of *commercio* being the third) that account for the world-hood of a group of monads. Before turning to Leibniz's writings on the spatiality and temporality of monads, Section 7.1 examines Leibniz's conception of harmony, and its relation to his conception of world-hood.

7.1 The Harmony of Worlds

The world, according to Leibniz, is "the aggregate of limited existences," the "composite of all creatures" (AK 6.4.567), or "the whole succession and the whole agglomeration of all existent things" (*Theodicy*, 128). Furthermore, all existents must be "connected in each one of the possible worlds: the universe, whatever it may be, is all of one piece" (*Theodicy*, 9). This had earlier been recognized as one of the "most marvelous secrets of nature":

> Further, each possible series of the universe rests on certain primary free decrees appropriate to it, considered under the aspect of possibility. For just as no line can be drawn with however casual a hand, which is not geometrical and has a certain constant nature, common to all its points, so also no possible series of things and no way of creating the world can be conceived which is so disordered that it does not have its own fixed and determinate order and its laws of progression – though, as in the case of lines, so also some series have

[5] Leibniz goes on to add that "confusion is when several things are indeed present but there is no ground for distinguishing one from another." A principle of order serves at once to distinguish diverse things, and to unite those things distinguished.

> more power and simplicity than others, and so they provide more perfection with less equipment (G 7.312/MP 78–79).[6]

All possible worlds, ordered by some law of progression and containing substances that are interconnected, exemplify some degree of what Leibniz terms "harmony." In this section I turn to an examination of how windowless substances from which nothing flows out and into which nothing flows can harmonize to form a world, possible or actual.

7.1.1 The Harmony of Phenomena

Harmony for Leibniz has two key ingredients: unity and variety. The early *Elementa veræ pietatis* tells us that there is harmony

> when many things are gathered into a certain unity. For where there is no variety, there is no harmony … In turn, where variety is without order, without proportion, there is no harmony. Hence it is obvious that however much greater is both variety and the unity in variety, so much the greater is the harmony (Grua, 12).

Leibniz's texts are replete with characterizations of variety at the level of phenomena. In describing how God realizes any given variety of phenomena, Leibniz identifies time and place with the "receptivity" or "capacity" of the world which must be filled by matter "according to certain rules" (G 7.303/MP 138). The realization of a variety of phenomena is in part explained by the actual infinite division of matter. First, such division insures that "there is everywhere actual variety and never perfect uniformity, nor are there two pieces of matter entirely resembling one another" (G 7.563). Second, the actual infinite division of matter implies that "there is no last little body" and that "a particle of matter, however small, is like a whole world, full of an infinity of still smaller creatures" (GM 2.157). These are perhaps not features of all possible worlds – Leibniz writes that the infrangibility of material atoms would require a perpetual miracle (GM 2.145), but, by itself, this is not enough to preclude the metaphysical possibility of worlds with such atoms. What these passages do suggest is that a world's phenomenal variety is directly proportional to the variety of forms that this matter takes, a suggestion confirmed by Leibniz's statement that "matter is not everywhere alike, but is rendered dissimilar by forms … otherwise no diverse phenomena will arise" (G 7.290/MP 146). A perfectly uniform material plenum contains less variation than a plenum with matter divided into diverse forms.

Variety is also more readily achieved if the "receptacles" of the world are, so to speak, occupied wherever possible:

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[6] Cf. DM 6: "everything [in the world] is in conformity with respect to the universal order. This is true to such an extent that not only does nothing completely irregular occur in the world, but we would not even be able to imagine such a thing … Thus, one can say, in whatever manner God might have created the world, it would always have been regular and in accordance with a certain general order."

> From the infinity of possibles, God chose, in accordance with his wisdom, that which is most appropriate. However, it is obvious that the vacuum (and likewise atoms) leaves sterile and uncultivated places, places in which something additional could have been produced, while preserving everything else. For such places to remain contradicts wisdom (GM 3.565/AG 171).

As in his rejection of the existence of atoms, Leibniz invokes the principle of the best, denying the *actual* existence of the vacuum on the grounds that it violates the wisdom of the God. As we have seen in Chapter 2, this *by itself* does not rule out the metaphysical possibility of vacuums, showing only that worlds with empty space are, all other things being equal, less harmonious because less variegated than worlds without voids. But as we also saw in Chapter 2, Leibniz often argues against the existence of a void because it would violate the principle of the identity of indiscernibles, a metaphysically necessary principle that applies to all possible worlds. Either view entails that a minimal condition for harmony at the phenomenal level is the presence of some plurality of matter, if only two material atoms in empty space.

Plurality apart from unity is not sufficient for harmony. For there to be a harmonious set of existents, those existents must be unified according to some principle of order. Order is a species of relation among many things by which one is simultaneously distinguished [*discriminatur*] from and connected to others (C 476; AK 6.4.868). Order in this expansive sense does not entail any commitment to the serial ordering of the ordered elements. On some occasions, this conception of order is equated with the "distinct cogitability" of things, the ability of the mind to conceive clearly a set of elements *as a set*, i.e., as an *ordering* of elements, in virtue of the properties of those elements (G 7.290/MP 146). The unification of diverse phenomena under a consolidating principle of order is largely unproblematic. As phenomenal, material plurality has ordered spatio-temporal relations, orders that Leibniz repeatedly defines as the orders of coexistence and successive existence, respectively, and that obtain in all possible worlds (GM 7.18/L 666). Additionally, material objects stand in causal relations with each other, albeit (ideal) causal relations of a rather unique sort. We will have occasion to return to these orders in due course, but we may let it stand as a working hypothesis that any set of harmonious phenomena must be causally, spatially, and temporally related to each other.

Setting these general kinds of order aside for now, we may turn to Leibniz's more specific thesis that, beyond mere spatio-temporal or causal relatedness, there is harmony among phenomena when they instantiate "general properties." To Wolff Leibniz writes that "the more there is worthy of observation in a thing, the more general properties, the more harmony it contains" (GM 7.171/AG 233). Leibniz goes on to identify harmony with order, and order with regularity. A system of elements is regular to the extent that it admits of "more general rules or more general observations" (ibid.).[7] Plainly, generality figures prominently in Leibniz's account

[7] See also *Theodicy*, 211: "Rules are the expression of general will: the more one observes rules, the more regularity there is …"

of the harmony of phenomena. A property will be general if it can be nomologically subsumed under a general rule, and a rule will be general insofar as it nomologically subsumes many instances of at least one kind of property. A general rule is what Leibniz elsewhere identifies with a *simple* rule. The simplicity of a rule is not necessarily a function of the complexity of the proposition or fact that it expresses, but of its domain of applicability: "a hypothesis … is like the key to a cryptograph, and the simpler it is, and the greater the number of events that can be explained by it, the more probable it is" (LH XXXVII iv 3/L 283). Phenomena harmonize with one another only on the condition that they exhibit general properties which admit of "general observations," i.e., observations which enable one to relate the observed particular to a simple universal covering law, or to think that particular in relation to a universal. Since no possible world is without order, and since order is the same as regularity, the phenomena in all possible worlds must exhibit some properties that enable them to be brought and thought together under a unifying law. Less harmonious phenomena will exhibit relatively few general properties, and properties that are less general than those exhibited by maximally harmonious phenomena.

7.1.2 The Harmony of Substances

Variety at the substantial level is achieved through the actualization of multiple substances, which in turn is achieved through the realization of substances with varying degrees of perfection, or varying degrees of different perfections.[8] Early in his career Leibniz held that for something to be a perfection it had to be "a simple quality that is positive and absolute, i.e., that expresses without any limits whatever it expresses" (A 6.3.478/L 167). This theme is revisited in the *Discourse*'s test for something to count as a perfection: all and only those things that admit of a highest degree count as perfections (DM 1).[9] This excludes things such as size, shape, motion, and number, and includes the qualities omnipresence, eternity, power, will, and knowledge (A 6.3.520). As *absolute* qualities, they are possessed by God alone. Created substances, variously characterized as expressions or fulgurations of or emanations from the divine substance, are finite exemplifications of a combination of these perfections. The reality of creatures "is not that very reality that in God is absolute, but a limited reality, for that is of the essence of a creature" (AK 6.4.990). In the *De Summa Rerum* Leibniz argues that because "the requisites of all things are the same … so also is their essence, given that an essence is the aggregate of all

[8] See Rutherford (1995, 32). Adams takes up this line of thought as well, writing that "the mature Leibniz seems to have maintained that it is precisely in degrees of perfection, in various respects, that finite substances differ from each other and from God" (1994, 122). For an exhaustive treatment of Leibinz's views on perfections, see Adams, Chapter 4.

[9] Adams (1994, 120–122) notes the omission of simplicity from this and other later criteria.

primary requisites" (A 6.3.573). There are elements of this position that will remain in the later philosophy, including the judgments that "the full reason for a thing is the aggregate of all primitive requisites" and that "the cause of things can be reduced to the attributes of God" (G 7.310/MP 77). Both this and the earlier piece propose that any creature must finitely exemplify all perfections since each perfection is a requisite for the existence of any possible creature. Leibniz, however, will flatly deny that all creatures share the same essence: "The essences of things are like numbers. Just as two numbers are not equal to each other, so no two essences are equally perfect" (BH 74). The inequality in the essence of creatures is explained not by their exemplification of different perfections but by their exemplification of the same perfections in different degrees:

> There are in God three primacies, power, knowledge, and will, and from these there results the operation or creature, which is varied according to the different combinations of unity and zero, or rather of the positive with the privative, for the privative is nothing but the limit and there are limits everywhere in creatures (Grua, 126, translated in Rutherford 1995, 25).[10]

All possible (and not only compossible) substances finitely exemplify precisely the same properties – power, knowledge, and will among others – but no two possible substances exemplify all properties to the same degree.

The consensus of diverse substances is more difficult to explain. In fact, Leibniz at first glance seems to hold patently contradictory positions. On the one hand, as we saw in the introduction, he regularly promulgates the proposition that at least some possible worlds, including the actually existing one, contain substances not in space and time and not standing in direct causal relations to one another. Each of these possible simple substances is, as it were, "a world apart." On the other hand, in every possible world "all things are connected" (*Theodicy*, 9). The question at hand is how those worlds containing "windowless" substances are, properly speaking, worlds at all, i.e., how those substances harmonize by having relations of position and duration to all other substances, and by "[acting] on all others and [being] acted on by all others."

The beginnings of a resolution of this tension can be found in Leibniz's remark to Bayle that "God could have given to each substance its own phenomena independent of those of others, but in this way he would have made as many worlds without connection … as there are substances" (G 4.519/L 493). This indicates that the harmony of substances is explained in terms of the harmony of the phenomena they represent, an indication reinforced by Leibniz's theory of relations. Leibniz insists that relations among or relational properties of substances result from and supervene on intrinsic accidental denominations of those substances – they are second-order facts constructed from first-order facts, viz., substances' perceptions and

[10] In an earlier piece, Leibniz gainsays that the divine perfections alone are sufficient for the production of creatures, adding that they constitute creatures only in combination with a subject: "Things are made, not by the combination of forms alone, in God, but with a subject too … Various results from forms combined with a subject cause particulars to result" (AK 6.3.523).

appetitions. Moreover, the obtaining of a relation between two or more substances is explicable only in terms of the content of their perceptions. To use one of Leibniz's examples, Paris is the lover of Helen only if Paris represents to himself an individual with all of the qualities of Helen whom he loves and there is some substance corresponding to this representation representing an individual with all the qualities of Paris whom she loves.[11] It is part of Leibniz's thought about relations that simple substances can be conceived as being related to one another only insofar as they are correlated with a particular "organic machine." Leibniz often phrases this doctrine in terms of the consensus of substances being a consensus among the phenomena that they represent.[12] More directly,

> every simple substance has an organic body which corresponds to it – otherwise it would not have any kind of 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 them a certain relation of perceptions or phenomena, through which it can be discerned how much their modifications differ from each other in space or time … Each soul will represent proximately the phenomena of its own organic body, but remotely those of others which act on its own organic body (C 14/MP 176).

For any two simple substances x and y, if x and y are to stand in some kind of order or relation to each another – and therefore harmonize – there must be a "relation of perceptions" among x and y. This relation can result only on the assumption that x and y represent, through their representation of their respective "organic machines," the same spatio-temporal matrix and phenomenal array, from their own point of view. Under this condition, the states of x and y can be brought together under some unifying principle of order, if only a second-order spatio-temporal one, that enables them to be nomologically connected. What is important to emphasize is that it is only because their represented bodies harmonize with one another that the representing substances stand in relations of harmony.[13]

The details of this account are filled in by Leibniz's theory of expression. In general, one thing is said to express another when "there is a certain constant law of relations, by which the singulars in one can be referred to the corresponding singulars in another" (C 15), or, more concisely, "when there is a constant and regulated relation between what can be said of the one and of the other" (G 2.112). Given that harmony is unity in variety, and that unity is the "cogitability" of diverse things under a rule, we should expect Leibniz to propose that diverse substances

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[11] LH IV vii B 3 26r.

[12] "The perceptions or expressions of all substances mutually correspond in such a way that each … coincides with the other … they all express the same phenomena" (DM 14).

[13] That monads must express themselves as embodied in order to have an ordered existence vis-à-vis other monads is made clear in Leibniz's comment that "creatures free or freed from matter would at the same time be divorced from the universal bond, like deserters from the general order" (L 590). For a discussion of Leibniz's theory of relations that bears on the points made above, see Mugnai, especially Chapters 1 and 7.

harmonize only if they express one another. What are the mechanics of this inter-substantial expression? Leibniz's theory of preestablished harmony holds that it is the essential function of an indivisible substance "to represent what happens in its body" (NS 80; cf. NS 139), and, conversely, that the body expresses whatever transpires in the soul.[14] For every mental state there is some bodily correlate, and every bodily state is (admittedly usually indistinctly) represented by the soul. Equally importantly, the states of different phenomenal bodies in the same world express one another: "each corpuscle is acted on by all the bodies in the universe" (C 15/MP 176). Weaving together these strands of thought, Leibniz concludes that, given the "representational nature of the soul, which must express what happens, and indeed what will happen, in its body, and, because of the connection and correspondence of all parts of the world, it must also express in some way what happens in all the others [i.e., all the other bodies]" (NS 85). Furthermore, because the states of other phenomena expressed by a substance's body and perceived by that substance are themselves expressions of the perceptual states of other substances, that substance must express the perceptual states of other substances. To each perception of one substance corresponds a perception of another substance, so that there is, for any plurality of monads existing in the same world, a "constant and regulated relation" among their perceptual states by which the singulars in one can be referred to the corresponding singulars in the others.

Applying this general theoretical framework to illustrative examples, Leibniz asserts that a seen thing "really" differs from the same thing unseen, and that the emperor in China "as known by me differs *in intrinsic* qualities from the emperor as not known by me" (VE 1086, emphasis added). That is, something seen and something known differ intrinsically from the same things not seen or known – they do not differ only by having the relation properties "being seen" or "being known." If two substances differ intrinsically, they must differ with respect to their perceptions or appetitions, for the only intrinsic qualities of simple substances are their perceptions and appetitions. It follows from this that the intrinsic quality in virtue of which the seen thing and known emperor differ from the unseen thing and unknown emperor must be a perception or appetition. In explaining how a seen thing differs internally from when it is unseen, Leibniz observes that the radii reflected by the seen thing "bring about a change in the thing itself." With Leibniz's theory of expression now in hand, we have the conceptual resources to unravel fully this explanation. The radii reflected from the seen thing produce a change in the seen thing itself in the first instance by producing a change in the states of the substance's phenomenal body: "each corpuscle is acted on by all the bodies in the universe" (C 15/MP 176). It is a consequence of the pre-established harmony that this new bodily state is at

[14] This last point follows from the facts that (1) the mind expresses the body and (2) expression is an inherently symmetrical relation. In the *New Essays*, Leibniz expostulates that "the body has counterparts of all the thoughts of the soul" (AK 6.6.116).

least indistinctly perceived, yielding a perception that the substance would not have had had its body not been seen and the reflected radii not brought about a change in its body. The case of the Chinese emperor, though less obviously explained in this fashion, is essentially no different. If I come to think about the Chinese emperor, that thought, like even the most abstract idea, necessarily has some bodily correlate, a correlate that, in virtue of the interconnection of bodies, is expressed by the body of the emperor, and from there indistinctly perceived by the emperor. Reiterating the above point, these explanations show that the harmony of substances not standing in first-order relations to one another is identified with their representation of harmonizing phenomena, and that phenomena harmonize with one another, as we have seen, when they can be brought under a rule.

With this backdrop in hand, we may now turn to the relation of monads to space and time. I believe that an answer to our guiding question – How, if at all, are monads related to space and time? – is implicit in the above, but it still remains to make explicit and coherent Leibniz's account.

7.2 Monads and Space

Leibnizian idealism holds that ultimate reality is composed of mind-like, immaterial monads, and that bodies are aggregates of monads and thus ontologically dependent upon them: "Body is an aggregate of substances, and is not a substance properly speaking. It is consequently necessary that *everywhere in body* there should be indivisible substances" (G 2.135, emphasis added).[15] There is thus a relation between monads and bodies such that the former are the ontological ground of the latter: the existence of a compound entity presupposes the existence of simple entities that ground its reality. From the fact that monads are unextended, one might straightaway conclude that they are *ipso facto* non-spatial, and that however they ground the reality of bodies, it is not as spatial elements of them. Cover and Hartz are correct in rejecting this line of reasoning, wrongly assuming, as it does, that what is spatial must be extended (1994, 297). The unextendedness of monads does not, by itself, entail their non-spatiality. Additionally, in the explication of this grounding relation, Leibniz often employs terminology that suggests that monads are spatial, and that the relation of a monad to a body is much like, if not precisely the same as, the relation of material atoms to a body. Such texts include the following:

> Since, therefore, primitive entelechies are dispersed everywhere throughout matter – which can easily be shown from the fact that principles of motion are dispersed throughout matter – the consequence is, that souls are also dispersed everywhere throughout matter (G 7.329).

[15] See also G 3.606: "Monads or simple substances are the only true substances, and … material things are only phenomena, though well-founded and connected."

> There are of necessity substances which are simple and without extension, scattered throughout all Nature (*Theodicy*, 10).
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> Compounds, or bodies, are pluralities; and simple substances … are unities. And there must certainly be simple substances everywhere, for without simples there would be no compounds (PNG 1).
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> It is true that the number of simple substances which enter into a mass, however small it be, is infinite (G 4.491–492).
>
> It is consequently necessary that everywhere in bodies there should be indivisible substances (G 2.135).

"Dispersed," "scattered" throughout nature, "in" bodies – all of these terminological conventions paint a picture of monads as being spatially located in the bodies whose reality they ground. This reading is underscored by Leibniz's repeated pronouncements that monads "are in" the bodies that are their aggregates: "there are therefore indivisible unities in things, since otherwise there will be no true unity in things" (G 2.267). Once again, we find Leibniz employing distinctly spatial language to explicate the relation between monads and bodies. In an even more striking passage, Leibniz goes so far as to assert that "each simple substance or distinct monad, which forms the center of a compound substance … is surrounded by a mass composed by an infinity of other monads" (P 196). If ever a passage suggested that monads enter into bodies as their spatial constituents, surely this is it. For how can a monad be at the center of a body, or be surrounded by other monads, unless it is spatial? Taken at face value, these passages are consonant with, and seem to imply, the thesis that monads, no less than the bodies whose reality they ground, are in space – in space just as bodies are in space. While monads might not be parts of bodies (just as, for Leibniz, points are not parts of lines), they nonetheless have first-order spatial positions within those bodies.

Is this language in fact intended to be spatial? The answer lies in a more careful reading of the full range of Leibniz's texts. In an important statement from 1690, Leibniz writes that

> It must not be said that indivisible substance enters into the composition of a body like a part, but like an essential internal requisite; just as a point, it is granted, is not a part contributing to the composition of a line … There is an infinity of simple substances or creatures in any particle of matter; and matter is composed from these, not as from parts, but as from constitutive principles or immediate requisites (FC 324).[16]

Here we find Leibniz contending both that monads are "in" matter, and that they are not parts of matter. Denying that monads are parts of matter does not by itself establish the non-spatiality of monads, for points can have a spatial location without

[16] See also AG 103: "Monads should not be confused with atoms … they are not parts of bodies, but requisites." To De Volder, Leibniz explains that "granted these divisions [within matter] proceed to infinity, they are nonetheless all the results of fixed primary constituents or real unities, though infinite in number. Accurately speaking, however, matter is not composed of these constitutive unities, but results from them … Substantial unities are not parts but foundations of phenomena" (L 536).

being parts of lines. It does, though, establish that bodies are not compounds of monads, i.e., that monads are not parts of bodies in the way that material atoms are parts of bodies. Monads are not qualitatively homogeneous with bodies, and for that reason are not parts of them. Beyond this, in characterizing monads as requisites of matter, Leibniz intends to make plain that monads are "in" bodies in a way that does not confer upon them any first-order spatial position. That is, the "in-ness" of monads being in bodies is not the kind of "in-ness" of fish being in a pond. As we have seen from Leibniz's discussion of "requisites" in earlier chapters, a requisite is an *ontological* or *logical* precondition of that for which it is a requisite. For instance, unity is a requisite for multiplicity, the concept of a genus is a requisite for the concept of a species, and the existence of a necessary being is a requisite for the existence of contingent beings. As these examples make clear, requisites can be, and typically are, non-spatial preconditions. This understanding of "requisite" points to a very different sense in which monads are "in" bodies, a sense made explicit by Leibniz himself: "We say that an entity is in [*inesse*] or is an *ingredient* of something, if, when we posit the latter, we must also be understood, by this very fact and immediately, without the necessity of any inference, to have posited the former as well" (GM 7.19/L 667). One thing is "in" another if and only if the existence of the former is presupposed by the existence of the latter, and if a clear and distinct understanding of the former is necessary for understanding the latter. Monads are requisites that are in bodies only in the minimal sense that bodies cannot exist without monads: "In real things, unities are prior to multitudes, and there cannot exist multitudes except through unities" (G 2.279).[17]

With this conception of "being in" and "requisite" in hand, Leibniz repeatedly cautions against ascribing to monads any first-order spatial properties. "There is no spatial or absolute nearness or distance between monads," Leibniz writes,

> And to say that they are crowded together in a point or disseminated in space is to use certain fictions of our mind when we seek to visualize freely what can only be understood (G 2.451/L 604).[18]

To be sure, much of Leibniz's own inexact talk encourages precisely the free use of misleading visual fictions that he here scorns. A distinct understanding of the intelligible nature of monads, however, shows them to be unextended and non-spatial. In spite of how they confusedly appear in sensory perception, monads are not to bodies as fish to ponds. Having clarified what Leibniz does and does not mean in contending that monads are in bodies by being requisites of them, we can conclude that monads do not have first-order spatial properties or positions. Monads per se, in themselves, are intrinsically non-spatial. To use the more exact phraseology of

[17] For an extended analysis of the way in which monads are "in" bodies and bodies "result" from monads, see Rutherford (1990). Rutherford rightly observes that "*inesse* expresses something other than the literal notion of spatial containment" (543).

[18] "We can no more say that monads are parts of bodies, that they touch each other, that they compose bodies, than we can say this of points or of souls" (G 2.436/L 600).

Cover and Hartz, Leibniz denies that monads have a "basic" or "non-derived" spatial position.

Can we conclude from this that Leibniz abjures from assigning any kind of spatial position to monads? No. Monads, even as intrinsically non-spatial, can be the bearers of derivative, non-basic spatial positions. Are they? Cover and Hartz have offered a penetrating criticism of any interpretation that would ascribe to monads non-basic spatial properties. In the remainder of this section, I will defend a modified version of what they label the "Definitive Ubiety Argument" against their objections.

On the Definitive Ubiety Argument, monads have no first-order, basic spatial positions, but they do have second-order, derived spatial positions. These second-order spatial positions are derived from the spatial position of a monad's body. If a monad has a body with a spatial position P1, then, derivatively, the monad will have the second-order spatial position P1. Monads are thus spatially related to other monads, not in that they are "disseminated in space" – a free and inaccurate visualization of what is only an intelligible notion – but in that they express themselves as having a body that is spatially related to the bodies expressed by other monads as their own. In denying that monads are spatially related, Leibniz is denying that they stand in *first-order* spatial relations, or that, in themselves, monads are spatially related. In maintaining that substances do stand in relations of position to one another, Leibniz holds that this relatedness is a *second-order* fact obtaining in virtue of a monad's intrinsic denominations, i.e., its representations of a spatially located body. Endorsing this thesis, Robert Adams states that "Although monads do not have any primitive spatial properties, Leibniz assigns them, in a derivative sense, the spatial positions occupied by their organic bodies" (1983, 242).[19] Also adopting this position, Rutherford adds that Leibniz "can exploit the spatiotemporal order inherent in the perceptions of monads to define an order of coexistence and succession among those monads themselves" (1995, 192).[20]

Leibniz's own adherence to this understanding of the spatiality of monads is unambiguously broadcast in several texts. In the De Volder correspondence we find Leibniz stressing that monads are themselves not in extension (by which he means space), only to add immediately that

> every change, spiritual as well as material, has its own place, so to speak, in the order of time, as well as its own location in the order of coexistents, or in space. For although monads are not extended, they nevertheless have a certain kind of situation in extension, that is, they have a certain ordered relation of coexistence with others, namely, through the machine which they control. I do not think that any finite substances exist apart from a

[19] Adams (1994, 250) repeats this claim: "We can assign to each simple substance the spatial position of its organic body, for, according to Leibniz, each simple substance has an organic body."

[20] Rutherford amplifies this account as follows: "Similarly, then, to say that a monad *a* stands in a certain relation of coexistence with respect to a monad *b* is just to say that *a* expresses its body as standing in a certain spatial relation to the body of *b*, and that *b* expresses its body as standing in the inverse relation to the body of *a*" (1995, 194–195).

> body and that they therefore lack a position or an order in relation to the other things coexisting in the universe. Extended things involve a plurality of things endowed with position, but things which are simple, though they do not have extension, must yet have a position in extension (GP 2.253/L 531).

The machine that a simple substance controls is its organic body, an organic body that is extended and that has direct spatial relations to other organic bodies. This, I take it, is the force of the contention that extended things are "endowed with position." Granted that monads – "things which are simple" – are not endowed with position in the same way that their bodies are, they still "have a position in extension." How? Precisely by representing a body that is endowed with position. It is through the phenomena that they represent that monads come to have a position in the spatial order of the world, or an order of coexistence with other simple unities. As Leibniz more perspicuously puts it, "monads do not have a position except through harmony, i.e., through an agreement with the phenomena of place, which arises from no real influx but from things spontaneously" (LH IV, I, 1, a, Bl. 9/Rutherford 1994, 77).[21]

What the above texts underscore is that monads do have an ordered relation of coexistence with other monads, and that they have such a relation in virtue of having derived spatial positions. These, in turn, are attributable to monads because the perceptual states of monads represent them as being embodied in organic machines that have basic spatial properties. So far is this a proposal at odds with his deep monadological metaphysics, it would be astonishing to find Leibniz not embracing it. We have seen in Section 7.1 that Leibniz holds that in all possible worlds all things are connected: "the universe, whatever it may be, is all of one piece" (*Theodicy*, 9). It is one piece in that monads stand in second-order relations to each other, relations, as Leibniz notes to Des Bosses, of duration, position, and interaction (G 2.438/AG 199). These relations obtain among monads only on the condition that monads are embodied,[22] and but for this embodiment and these relations, monads would not be parts of worlds: "To remove [monads] from bodies and place is to remove them from the universal connection and order of the world, which relations with respect to time and place produce" (G 2.234). A precondition of the harmony of worlds is the harmonious ordering of monads, a derivative ordering of monads based on the phenomena they represent.

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[21] Cf. G 2.444: "Monads have no position [situs] with respect to one another, that is, no real position which extends beyond the order of phenomena. Each is, as it were, a separate world, and they agree with each other through their phenomena, having no other intercourse or connection *per se*." This is precisely what we should expect to find Leibniz saying: in themselves, monads have no connection, and thus no position, but they do have one on the basis of the order of phenomena.

[22] "[E]very simple substance has an organic body which corresponds to it – otherwise it would not have any kind of orderly relation to other things in the universe … Hence it is necessary that there is between them a certain relation of perceptions or phenomena, through which it can be discerned how much their modifications differ from each other in space or time" (C 14–15/MP 175–176). It is noteworthy that in this passage Leibniz refers to the states of monads – their perceptual modifications – as differing from each other in space and time.

Cover and Hartz have rejected this account as misrepresenting Leibniz's intentions. For them, "the cumulative effect of the arguments in favor of ascribing spatial positions to monads is remarkably weak" (1994, 311). Before turning to the question of monads and time, I will attempt to defuse these objections to the position that I have outlined.

The first objection raised by Cover and Hartz is that assigning to a monad the position in space of its body is "ontologically backwards" in that it explains a fact about monads in terms of a fact about phenomena. This is backwards because monads are ontologically prior to bodies,[23] and facts about monads are supposed to explain facts about bodies, not vice-versa. On the preceding account, however, we have a fact about a body explaining a fact about a monad, an explanation that reverses the proper order.

A beginning of a response to this objection is to be found in Leibniz's statement that "there is nothing in things except simple substances, and in them perception and appetite" (G 2.270/L 537). Perceptions are "in" monads, and thus facts about perceptual states are facts about the substances in which they inhere. In a proto-Kantian fashion, Leibniz will later define perception "as the representation of the external in the internal, of the composite in the simple, of multiplicity in unity" (W 505). To be more precise, a perception is a representation of bodies: "the essence of the soul is to represent bodies" (W 161).[24] What I wish to emphasize with respect to these passages is that bodies *as represented* are the intentional objects of the perceptual states of monads. More generally, bodies can be conceived in two ways:

[23] In Leibniz's own succinct formulation, "spiritual things are prior by nature to material things" (G 7.501).

[24] See also WF 104: "My notion of the soul is the same: I think of it as an immaterial automaton whose internal constitution contains in concentrated form, or represents, a material automaton, and produces in the soul representations of its actions." I tread into the turbid waters of the ontological status of phenomena and aggregates in Leibniz's late metaphysics with some trepidation. This trepidation is mitigated, however, by the fact that I need not tread too deeply, for I think that I can sidestep the more controversial interpretative issues surrounding the precise nature of phenomena and aggregates. This is because the claims in this chapter depend only on the rather thin distinction between bodies as represented and bodies as real, i.e., as aggregates of monads whose unity is mind-dependent. That there is some distinction between bodies conceived in these two different manners is evident from texts such as the one just quoted in this footnote. What is contained in "concentrated form" in the "immaterial automaton" is surely not an aggregate itself, i.e., not the body considered realistically as some plurality of monads. Rather, Leibniz explains that the "material automaton" is contained in the "immaterial automaton" (the soul) only insofar as the latter "represents" it. Leibniz utilizes the same distinction in a text that we will revisit later in this chapter: "it does not follow that [the soul] is not moved by objects: for it is the representation of the object within it which contributes towards the determination" (G 6.421/H 427). Here we find a sharp division between objects that do not affect the soul and representations of them that do: it is the body considered representationally, not realistically, that partially determines the soul. Absent a distinction between bodies as represented and bodies as real, it is hard to see how one can make sense of that claim, or how Leibniz could have made it. More elaborate, and oftentimes different, readings than that offered here can be found in Hartz (1992) and Lodge (2001).

realistically, as aggregates of monads, and representationally, as the intentional objects of monadic perceptions.[25] Considered representationally, bodies have objective reality (in the Cartesian sense) in the perceptual states of monads, and no assumption is being made about the external reality of such bodies. In particular, we are not assuming that there is some plurality of monads that underwrites the reality of the represented body. Restricting ourselves to the body considered representationally, we are referring only to the perceptual states that are modifications, i.e., intrinsic denominations, of substances; we are not referring to some set of monads that, in aggregate, is the represented body considered realistically.[26] In that the representational content of a monadic perception is a fact about that monad – "there is nothing in things except simple substances, and in them perception and appetite" – the body considered representationally is also a fact about that monad. To put the point more simply, represented bodies, *qua* represented, are features of monads themselves. Given this, it is not correct to say that assigning to a monad the position in space of its represented body reverses the proper order of explanation.

[25] This borrows from Rutherford, 1994. See especially 68 and 81: "It is necessary to assume a basic duality of perspective between what monads perceive of the world and the world conceived in itself. From the former perspective, we are limited to speaking of the phenomena perceived by monads … From the latter perspective, we may speak of the reality represented by those phenomena: for any body, some aggregate of monads" (81).

[26] These perceptual states are intrinsic denominations of substances even if they represent spatio-temporally related bodies. Such spatio-temporal relations, as represented, are intra-, not inter-, monadic relations, and are thus intrinsic, not extrinsic, denominations. This analysis draws on Mugnai's insightful work on Leibniz's theory of relations, and in particular the distinction between intra- and intermonadic relations. Intermonadic relations or relational facts are those obtaining between two or more substances and the reality of which requires intrinsic denominations from more than one substance. The relational fact "Paris is the lover of Helen" and the relational property "lover of Helen" require an intrinsic denomination from both Paris and Helen. An *intra*monadic relation is one that obtains between a substance and its representations and does not require another substance to ground its reality. This is what Mugnai labels the "subjective side" of the relation: Paris loves Helen *qua* object of representation, not Helen *simpliciter*. Or Paris loves Helen as she has objective reality in his expression. Paris' expression of Helen is "internal to the mind and cannot be considered [a term] of a real relation whatsoever," and for that reason it is a state "in itself perfectly intelligible without any appeal to something external to a given subject" (Mugnai, 125–126). This is not the case with extrinsic denominations, which belong to substances "only in virtue of the general connection of things" and which require the compresence of at least one other subject to be intelligible. It is not, in virtue of his expression of Helen, a fact about Paris that he is the lover of Helen; this is a fact about Paris only on the assumption that there exists a substance corresponding to Helen expressing herself as loved by Paris. Even on the assumption that Paris expresses himself as the lover of Helen, if Paris is a lonely monad inhabiting a world populated by no other substances, Paris does not have the relational property "lover of Helen," an extrinsic denomination that requires the existence of at least one other substance. Generalizing this point, any intramonadic relation will partially found a real relation if and only if the subject contained objectively within the expression has formal reality and expresses itself as standing in the relevant relation to the other subject. In this case, the intramonadic relation will found an intermonadic relation whose reality is contained in the divine intellect.

It is not correct because facts about the contents of monadic perceptions are facts about the "fundamental world of monads."[27]

The difference between bodies considered representationally and bodies considered realistically provides a basis for responding to another objection.[28] According to this objection, there is a vicious circularity involved in assigning to a monad the position in space of its body. This alleged circularity is born from the fact that the spatial positions of monads are used to determine which of those monads aggregate together to form a particular body. This principle of aggregation works in the following manner. Leibniz claims that a body considered realistically is an aggregate of monads. But an aggregate of which monads? On what basis are we to decide that these monads rather than those are part of an aggregate that is, e.g., my desk? Using the above theory of monads' spatiality, we can conclude that all and only those monads that stand in appropriate spatial relations to each other (whatever those are) aggregate together to compose my desk: "the grouping of substances into aggregates depends on the spatial appearances of the bodies" (Adams 1994, 250). Of the infinitely monads in the actual world, some subset of them will represent themselves as having bodies that are spatially related to the bodies of other monads in a way that enables us (or rather God) to identify that subset as being the group of monads that compose the aggregate that is my desk. The details of this theory are too complex to enter into fully here,[29] but what needs to be emphasized is that it is only because monads have a derived position in space that it is in principle possible to determine which groups of monads constitute which bodies. The circularity of this account, according to Cover and Hartz, is due to the fact that monads having a spatial position "is an essential part of the story about what it takes to have an aggregate," but having an aggregate with a spatial position "is an essential part of the story about what it takes to have spatially located monads" (1994, 308). The idea is that monads have spatial positions by being parts of aggregates that have spatial positions, but the existence of those aggregates with spatial positions depends upon the existence of monads with (derived) spatial positions. There are no aggregates to have spatial positions without already having monads with spatial positions, but monads cannot have spatial positions except by being associated with an aggregate with a spatial position. Assigning a monad the spatial position of its body thus involves Leibniz in a vicious circle.

The solution to this, I would like to suggest, is to see Leibniz as assigning a monad the position of its body considered representationally, not realistically as an aggregate. Leibniz, I have argued, draws a distinction between bodies as intentional objects represented in the perceptual states of monads and as aggregates of a plurality

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[27] As Adams observes, "there are no spatial facts at the ground floor level of Leibniz's metaphysics, *except insofar as facts about monads' perceptions having spatial relations as part of their representational content may belong to that level*" ((1994) 255, emphasis mine).

[28] This is taken from Cover and Hartz.

[29] See Rutherford (1994) and Adams (1994, Chapter 9) for extended discussions of this topic.

of monads. The preceding account of a monad's spatiality would be circular were it the body *as an aggregate* that gave a monad its position, for the very existence of the aggregate depends on already having monads with assigned derivative spatial locations. But it is the body as represented, as an intentional object, that confers on its representing monad a spatial position. The existence of the body as represented (and it having a position in the order of space) does not depend on the prior existence of monads that already have spatial positions. That is because the body considered representationally is only an intentional object, not an aggregate constituted from infinitely many monads. Put differently, having an aggregate with a spatial position is not an essential part of the story about what it takes to have spatially located monads, even though representing an intentional object with a spatial position is.

The second-order derived spatial position of a monad will be the position of the body that it represents as its own. An ascription to Leibniz of this position is solidly supported both by the widest range of texts and by the deeper theoretical principles of harmony and unity. I hope to have shown that objections to this interpretation are, on balance, not decisive, and that Leibniz is not involved in a vicious circle in advancing this view.

7.3 Monads and Time

It is a commonplace bit of currency in seventeenth-century philosophy that there are intrinsically non-spatial, intrinsically temporal entities: minds. The Cartesian mind is a prime example of such an entity. For Descartes, to be material is to be extended, for extension is the attribute, the essential property, of material bodies. From the extension of material substance follows modes such as shape, quantity, size, number, and place. Contrariwise, minds, as unextended entities, have none of these modes inhering them, but they do share one common mode with their material counterparts, viz. duration. This serves to underscore the point that the non-spatiality of a kind of substance cannot be taken as evidence for its non-temporality. Indeed, it is difficult to see in what sense minds could be anything other than temporal, and it is natural to infer that monads, like Cartesian minds, are precisely that. If so, monads are intrinsically non-spatial but intrinsically temporal. Yet this conclusion is one that is both precipitous and not universally accepted. The remainder of this chapter examines monads' relation to time with the aim of showing that they are intrinsically non-temporal in much the same way that they are intrinsically non-spatial. In defending this claim, I start by examining reasons for holding monads to be intrinsically temporal and for holding them to them to be intrinsically non-temporal. With this overview in hand, I turn to Leibniz's theory of monadic appetition, arguing that this commits him to holding that monads have only second-order temporal properties, and that a monad has a position in time only by representing temporally ordered phenomenal bodies.

7.3.1 Are Monads Temporal?

One reason to deny that monads are intrinsically atemporal is the fact that they undergo change, and what undergoes change, it might be thought, must be temporal. There can be no doubt that Leibnizian monads are subject to accidental change. The phenomenal world of representation presents to the mind bodies in motion, or, more generally, bodies undergoing changes: "Nature is beautiful because it changes" (WF 225). From this fact of experience, Leibniz infers that the ontological ground of these bodies must also undergo change:

> unless there is change in simple things, there will be no change in things at all. Nor must every change be from without; on the contrary, an internal tendency to change is essential to finite substance (G 2.252/L 531).[30]

As is well documented,[31] Leibniz comes to hold that it is a defining characteristic of substance that it be dynamic, and that it continually changes its states. Indeed, drawing on a tradition dating to Aristotle, Leibniz believes that it is of the essence of substance to be active. For some, this much would suffice to establish the temporality of monads. What changes, the argument goes, can change only in time, since time is a presupposition of change. In this vein, Kant's *Inaugural Dissertation* stipulates that "the possibility of changes is thinkable only in time; time is not thinkable through changes, but *vice versa*" (401).[32] Thus, monads can change only in time, and are on that account temporal. Whatever the merits of Kant's view on the priority of time to change, it is not one shared by Leibniz. As we have seen in Chapters 2 and 6, Leibniz advocates a theory of change according to which it is logically prior to time, such that the former can be conceived and can exist without the latter, but not vice versa. Change for Leibniz is an entirely atemporal concept: an aggregate of contradictory states, where one state is prior by nature to another. Monads change by having diverse and incompatible properties, but change so conceived does not render them temporal. Not, at least, on Leibniz's analysis of change.

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[30] See also *Monadology* 10: "I also take it for granted that every created being is subject to change, and in consequence the created monad also …" Cf. LW 149: "For monads, being in a state of flux, have force." Much of the material presented in this and the following section first appeared in *Idealistic Studies*.

[31] See Rutherford (1995, 148–154).

[32] This thought is repeated in the *Critique of Pure Reason*: "Here I may add that the concept of alteration, and with it the concept of motion, as alteration of place, is possible only through and in the representation of time; and that if this representation were not an *a priori* (inner) intuition, no concept, no matter what it might be, could render comprehensible the possibility of an alteration, that is, of a combination of contradictorily opposed predicates in one and the same object, for instance, the being and the not-being of one and the same thing in one and the same place. Only in time can two contradictorily opposed predicates meet in one and the same object, namely, *one after the other*" (A 32/ B 48).

Another possible reason for rejecting the intrinsic atemporality of monads is that they, as representers of temporally related bodies, must be temporal. Since the representational contents of perceptual states are temporally ordered phenomenal events, those perceptual states must themselves be temporally ordered. Being subjects of temporally ordered properties, monads themselves are temporal. Does this argument provide grounds for asserting the intrinsic temporality of monads? It is true that the representational contents of monads' perceptual states are temporally ordered: the successive states of the physical world stand in relations of temporal priority and posteriority to one another. Even with this granted, however, the intrinsic temporality of monads does not follow, for this line of reasoning erroneously assumes that perceptual states representing temporal phenomena must themselves be temporal. This need not be the case. J. M. E. McTaggart has argued that perceptual states are asymmetrically ordered according to relations of clarity and inadequacy, with the logically posterior perceptions being more adequate and distinct. Perceptions thereby form an asymmetrically ordered series, though the asymmetry is not temporal asymmetry. Inadequate and confused perceptions are perceptions *of* time, but not perceptions *in* time, i.e., the perception itself is not *temporally* related to any other perception.[33] This is an option that is at least open to Leibniz: monadic states can be ordered according to the asymmetric relation of natural priority in a way that makes them atemporally ordered, even though they represent phenomenal events that are temporally ordered. In the same way that monads have confused representations of other monads as being extended, so too do they have confused representations of other monadic states as being strung out in time. But the confused representations are not themselves temporally distended. At the level of substance, there is a mere logical ordering of states, an ordering by nature, that appears, at the phenomenal level, as a temporal ordering. Whether or not Leibniz endorses this position, its availability to him means that we cannot conclude that monads are temporal because they represent temporal events. These two arguments fail to establish that monads *per se* are temporal.[34]

The above considerations fail to supply us with compelling justification for concluding that monads have first-order temporal properties, but a more convincing defense of this thesis is propounded by Frankel, who avers that "temporal qualities, unlike spatial qualities, are original, not derived … While nothing is (really) spatial or extended, real things (monads) are really temporal" (93). Frankel's argument is

[33] This is what McTaggart dubs the C-series. For McTaggart's views, see sections 347–351 of *The Nature of Existence*.

[34] It is important to distinguish between two claims here: (1) Monadic states must themselves be temporal in order to represent temporal phenomena, such that their temporality is a precondition of (and logically prior to) having such representational contents, and (2) Monadic states are temporal to the extent that they represent temporal phenomena, i.e., their temporality is parasitic on their representation of the phenomenal level. In what follows, I will argue against the first, but endorse a position much like the second.

based on Leibniz's definition of time and his characterizations of the nature of monads. Time is the "order of existence of things possible successively" (G 2.269/L 536), or "the order of existence of these things which are not simultaneous" (GM 7.17/ L 666). These definitions establish a close connection between what is successive and what is temporal: to be temporal is to be successive, and to be successive is to be temporal. Put differently, the temporality of something just is its successiveness. Add to this Leibniz's statement to De Volder that "all individual things are successions or are subject to succession" (G 2.263/L 534).[35] This implies, Frankel reasons, that monads, *qua* successive, are temporal: "Each monad has an individual temporal sequence … As the states of monads have temporal positions, so do monads themselves enjoy duration or temporality" (93). The force of this claim, I take it, is that the temporality of monadic states (and hence monads) is ontologically independent of the temporality of the phenomena they represent. Moreover, the temporal ordering of these states can be conceived apart from the temporal ordering of phenomenal bodies. Monads are intrinsically temporal in that their connection to phenomena is not necessary for their temporality. Or, monads are intrinsically temporal in that they have non-derived, first-order temporal properties that do not result only from their representations of temporal bodies.[36] There is a disanalogy between the temporality of monads and the spatiality of monads precisely because monads "are really temporal" (Frankel, 93).

This reading is also endorsed by Dionysios Anapolitanos, who, in line with the above, thinks that there are important differences between monadic spatiality and monadic temporality. Anapolitanos speaks of a "monadic reality" which,

> although not contained in a metaphysical, spatial and absolute container, changes in an absolute sense by moving from state to state so that metaphysical simultaneity is as real as it can be … Metaphysical spatial relations are not to be found in the world of monads. However, because monadic change is real, monadic change relations are to be found in the world of monads. Monadic change is real … in the sense that metaphysical temporal specifications are already part of the world of monads as they really change and not as they merely represent one another as changing (143).

Monads are temporal in a way that they are not spatial because they change their states and are subjects of succession, a condition sufficient for making them intrinsically temporal.

One of the more important interpretations of Leibniz that sees him as positing the existence of atemporal monads is that advanced by Jacques Jalabert. According to Jalabert, "substance transcends the temporal existence of its becoming … It transcends [successive existence] because it dominates and produces it. It dominates

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[35] "God produced straightaway not all thoughts (for thoughts need to succeed one another), but a nature which produces them in sequence" (WF 47); "The soul's nature was made from the outset in such a way that it would represent in succession the changes in matter" (WF 81).

[36] Writes Frankel: "It is not necessary to be a part of matter in order to participate in temporal relations" (91).

it by its permanence and immobility, and it produces it by its causality" (140). In spite of the fact that a substance changes with respect to its states, it itself does not change. It is the sequence of the monadic states that is successive, but not the stages of the life of the substance. There is ostensibly a difference between permanence and successiveness, where the former is not to be understood simply as identity or persistence through time (the kind of permanence that Jalabert labels "temporal permanence"), but as "non-temporal transcendence" (142). Another way of putting this is that monads as substances do not change, i.e., monads undergo no substantial change, even though they undergo accidental change. Hence, monads are not temporal.[37]

Though provocative, this interpretation is less than fully persuasive. First, the textual case for an ascription to Leibniz of permanence conceived as "non-temporal transcendence" is unconvincing. Indeed, Jalabert relies almost entirely on two passages, neither of which bears the weight of his interpretation. One passage that he cites is the following from *De Ipsa Natura*: "For there can be no action without a force for acting, and, conversely, a power which can never be exercised is empty. Since, nevertheless, action and power are different things, the former successive, the latter persisting, let us look then at action" (G 4.509/AG 160). It is hard to see how this commits Leibniz to anything more than the claim that the force that is the ontological ground of action remains numerically identical across time. In describing it as "permanent," Leibniz appears not to have in mind anything as exotic as "temporal transcendence," but only the much more mundane distinction between a temporally enduring substance and its successive accidents. The same can be said for another passage adduced by Jalabert as evidence for his construal, this one from the *Theodicy* (*Theodicy*, 170): "The permanent or lasting act is nothing but the Substantial or Accidental Form: the substantial form (as for example the soul) is altogether permanent, at least according to my judgment, and the accidental only so for a time." As with the passage from *De Ipsa Natura*, the contrast drawn here is that between what is transient, lasting only instantaneously, and what endures, lasting throughout some temporal span; it is not a contrast between what it is temporal and what is atemporal.[38]

There are more purely philosophical reasons for not acceding to Jalabert's views, at least not on the grounds that he cites. Specifically, not everything that is temporal has to change, even if time cannot exist without change, so the changelessness of substances *as substances* does not by itself imply their atemporality. (To say that time requires change is to say that were there no change anywhere, time would not exist, not the much stronger claim that whatever does not change is not temporal.) Against this, it might be urged that everything temporal must change in the minimal sense that it exists in different parts of time, existing now in 2007, and

[37] Jalabert grants that substances have a kind of duration, but this an "absolute duration," not a duration "relative to change" or "successive" (149).

[38] For Jalabert's use of these passages, see 143–145.

later in 2008. Granting this for the sake of argument, Jalabert has failed to show that monads do not change in this way. To be sure, monads do not comprise distinct temporal parts the sum of which composes the substance. Rather than being different instantaneous objects occupying different temporal locations, the entirety of a substance occupies each temporal location. The substance *qua* substance remains identical from one moment to the next, being the self-same source of the various accidents that successively inhere in it. Insofar as the substance is the bearer of different accidents and qualities, it changes, but it is the substance considered with respect to its qualities, not its substantiality, that is altered. Yet to say that monads change not substantially but accidentally is, in the appropriate and relevant sense, to concede that monads change.[39] In this manner, monads can be both permanent (unchanging as substances) and temporal (substances with changing accidents). Jalabert would undoubtedly reject this conclusion, operating, as it does, with a notion of "temporal permanence." In the absence of both a more coherent account of a kind of permanence that involves "non-temporal transcendence" and textual evidence that Leibniz accepts such a notion, however, I am inclined to prescind from accepting the line of reasoning promulgated by Jalabert.[40]

If Jalabert's argument is less than wholly convincing, there is nonetheless ample textual evidence bolstering the case for the intrinsic atemporality of monads. In a letter to De Volder from 1703, Leibniz answers his correspondent's query about how monads are situated in extension in the following terms:

> [Y]ou wonder how time enters into all things, spiritual as well as corporeal, while extension enters only into corporeal things. I reply that the relations are the same in the one case as in the other … (L 531).

In the case of space, Leibniz goes on to explain, monads have a position in virtue of expressing a body with a position. Though monads are intrinsically non-spatial, they have derived spatial properties. If we are to take seriously Leibniz's contention that a monad's relation to time is the same as its relation to space, then it follows that monads have only derived temporal properties. That is, just as monads are intrinsically non-spatial but have second-order spatial properties (position), so too are monads intrinsically non-temporal while having only second-order temporal properties. Monads *per se* are no more temporal than they are spatial.

Several other texts from Leibniz's late philosophy sound a similar note. Nine years later to Des Bosses Leibniz writes that "in themselves monads have no

[39] This paradigmatic case of changes in substances dates back at least to Aristotle's *Categories*: "it is a distinctive mark of substance, that, while remaining numerically one and the same, it is capable of admitting contrary qualities, the modification taking place through a change in the substance itself" (4a10).

[40] My own views about the relation of monads to time will have some points of convergence with those of Jalabert. I do, however, disagree with him about how this relation is to be articulated and understood. More importantly, there are significant divergences between us about what motivates Leibniz to affirm the intrinsic atemporality of monads.

situation with respect to each other, that is, no real order which reaches beyond the order of phenomena" (G 2.244/L 602). Initially restricting his denial to the intrinsic spatiality of monads, Leibniz quickly generalizes his point, denying that monads "in themselves" have any order, and thus any temporal order, relative to one another. This may be an incautious generalization on Leibniz's part, but it is a generalization that is of a piece with numerous other statements on the topic. Returning to his exchange with De Volder, we find Leibniz reminding his correspondent that "the essential ordering of individuals, that is, their relation to time and place, must be understood from the relation they bear to those things contained in time and place" (GP 2.277–278/AG 183). Presumably, the things contained in time and place are bodies, phenomenal aggregates represented in the perceptual states of simple substances.[41] Again, Leibniz is positing an equivalence between the relation of monads to space and their relation to time. Monads have a derived position in space in virtue of representing themselves as being embodied by a body in space, and so monads have a derived location in time in virtue of representing themselves as being embodied by a body in time. Monads can be conceived as temporal entities only to the extent that they "project into a harmoniously ordered, common spatio-temporal … world of 'things'."[42] Texts such as his letter to De Volder provide partial justification for supposing that monads are intrinsically non-spatial and non-temporal, and have led some commentators to adopt precisely this reading. Defending this approach, Robert McRae has written that "in themselves mental states must be temporally indeterminate," and a monad having a body is "just as necessary for its changing states to have a location in time as it is for it to have a position in space."[43] Nicholas Jolley also appears to accept this interpretation, writing that "space and time belong to the realm of appearances only; they have no place at the ground floor of Leibniz's metaphysics, the level of monads" (2005, 87).

To this point we have considered two ways of construing the relation of monads to time. First, monads themselves have no first-order temporal properties, but have derived temporal properties in virtue of representing temporally related bodies. On this view, the relation of the monad to time is the same as its relation to space: a monad's location in time is determined by the location in time of the body it represents. Absent such a relation to a body, monads are not temporal. Alternatively, monads, insofar as they involve a succession of perceptions, are themselves in time, i.e., their perceptual states are temporally ordered without reference to the phenomenal realm that is perceived, thus making their subject temporal. Both interpretations

[41] "[Space] is that order which renders bodies capable of being situated, and by which they have a situation among themselves when they exist together, as time is that order with respect to their successive position" (G 7.376–377).

[42] The phrase, but not the thesis it is being put into the service of explicating, is taken from Wilson (2005, 115). For another instance of Leibniz's announcing this view, see *Theodicy*, 120: "If there were only spirits they would be without the required connection, without the order of time and place."

[43] (1994), 110, 108.

are supported by Leibniz's various pronouncements. Are there grounds for adjudicating between them?

7.3.2 The Atemporality of Monads

My aim in this section is to sketch an account of Leibniz's theory of perception and appetition so that we will be in a position to understand better the relation of the monad to time. It is my contention that Leibniz's account of how a monad passes from one perceptual state to another commits him to the view that the temporal ordering of monadic states is parasitic on the temporal ordering of the phenomena they represent. A monadic state has a position in time, and is temporally ordered to other monadic states, only in virtue of projecting into a spatio-temporal phenomenal world, a world in which phenomenal aggregates are temporally related to each other. This, I take it, reinforces Leibniz's own contention that "the essential ordering of individuals, that is, their relation to time and place, must be understood from the relation they bear to those things contained in time and place" (GP 2.277–278/AG 183). Monads, that is, are intrinsically non-temporal, and have a position in time, as they have a position in space, by being representationally connected to temporally ordered phenomena.

By way of approaching this thesis, let me start with an overview of Leibniz's account of perceptual succession. We have encountered above Leibniz's view that "all individual things are successions or are subject to succession" (G 2.263/L 534). This is a telegraphic formulation of his doctrine that monads are characterized by two different kinds of modifications, perceptions and appetitions,[44] where perceptions are "representations of the composite, or what is external, in the simple," and appetitions are "principles of change" and "tendencies to go from one perception to another" (G 6.598/AG 207). Leibniz believes that every substance continually undergoes change whereby one perceptual state passes into another, and he also holds that each perception is causally relevant in bringing about the production of the following perception: "Every present state of a substance occurs to it spontaneously and is only a consequence of its preceding state" (G 2.47).[45] This account of monadic change is amplified in a later text that explicitly assigns a role to both appetitions and perceptions in the production of a new perception. In this work, "appetition" is defined as a "conatus arising from cognition" leading to another

[44] I will sidestep the issue of whether perceptions and appetitions are different modifications or different facets of the same modification.

[45] At G 6.356–357, Leibniz writes, "For it is plain that every simple substance embraces the whole universe in its confused perceptions or sensations, and that the succession of these perceptions is regulated by the particular nature in the universe; and every present perception leads to a new perception, just as every movement that it represents leads to another movement." For the view that perceptual states are themselves causally efficacious, see Rutherford (2005), Jolley (1998), and Kulstad (1990).

state (C 491). When fully analyzed using Leibniz's immediately preceding definitions of "conatus," "arise," and "cognition," we are left with a definition of "appetition" according to which it is a set of contemporaneous mutable predicates that has as its sufficient condition a representation or idea, and that causes another such state. An appetition is thus the effect of a preceding perception and the cause of the following perception. What is important to observe here is that the original perceptual state is accorded causal primacy, for it is this perception that causes the appetition, and the appetition that causes the following perceptual state: the appetition "arises" from the cognition, from the representing idea, and is caused by that cognition to cause another state. Presumably, the succeeding perceptual state caused by the appetition is such that the appetition was caused to cause precisely that state and not another. But in what sense does the original perception – the perception from which the conatus arises – determine the appetite, and determine the appetite to determine another particular perception? Or rather, how is it that a perception causes an appetite to cause another perception?

Answering this question takes us to the heart of Leibniz's account of monadic change. In a series of writings from the late period, a close connection between change at the monadic level and change at the phenomenal level is posited: "The soul is stimulated to its next thoughts by its internal object, that is to say, by its preceding thoughts. For there is a sequence, or connection, as between moments of time" (WF 176). The internal object which is at the same time a perception is the object considered with respect to its objective reality,[46] i.e., a perception with respect to its intentional object. It is the perception which stimulates the soul to its next thought, but the perception as *objectively*, not formally, real. What is causally relevant is not merely, or even primarily, the perception as a modification of the monad – the perception *qua* formally real – but the perception as having a particular representational content. This means that the sequence of monadic perceptions and appetitions cannot be understood apart from the internal objects represented therein. An even more direct avowal of this system is found in the *Theodicy*, where Leibniz insists that "an active substance is determined only by itself," only to add immediately that "it does not follow that it is not moved by objects: for it is the representation of the object within it which contributes towards the determination" (G 6.421/H 427). Consistent with the requirements of his pre-established harmony, and in particular its proscriptions of mind-body interaction, Leibniz denies that bodies themselves directly cause changes in mental states. Even so, bodies as represented (bodies as objectively real, returning to the Cartesian scheme) are causally relevant to the extent that the representations of their states determines the monad to represent the successive state.[47]

[46] I am here using the term "objective" in its scholastic and Cartesian sense, to refer to the reality an object has as an idea. An object considered with respect to its objective reality is what, in Section 7.2, I referred to as an object considered representationally.

[47] "In truth, whatever is in the soul may be understood to be reduced to two things: the soul's harmonious expression, in accordance with its body, of the present state of external things, and the endeavor to a new expression that represents the endeavor of bodies" (GLW 56).

One additional formulation of this system merits our attention before returning to the question of time. Attempting to explain the basis of the connection among successive representations to Pierre Bayle, Leibniz contends that "*in a soul, the representations of causes are the causes of the representations of effects*" (WF 78). As with the above passages, we are to understand why one state follows from another in terms of the objects represented therein. It is in this way that the soul is stimulated to its next thought by its internal object. The perception giving rise to an endeavor towards another perception does so by representing the cause of an effect, an effect represented in the perception that results from the endeavor caused by the original perception. The represented cause is not itself the cause of the endeavor or the following representation; that role is assigned to the representation of the cause. To be exact, the representation of the cause, precisely insofar as it represents *a cause*, is the cause of the representation of the effect. For Leibniz, "the representation of the present state of the universe … [produces] the representation of the subsequent state of the same universe" (WF 78). The universe, as represented, explains the ordering of the representing representations.[48]

The foregoing analysis of monadic change bears directly on the question of the monad's relation to time. We have seen that the order of monadic states with respect to their formal reality is given by the order of those same monadic states with respect to their objective reality. Consequently, to understand something about the successiveness of monadic states is to understand something about the successiveness of the phenomenal world that they represent. If this is so, a strong case can be made that the temporal relatedness of monadic states cannot be understood apart from the temporal relatedness of their intentional objects; the temporality of the formal reality of monadic states is derived from the temporality of their objective reality. But for the fact that monads project themselves into a spatio-temporal phenomenal world, they would no more be temporally ordered than they would be spatially ordered:

> [T]here 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 them a certain relation of perceptions or phenomena, through which it can be discerned how their modifications differ from each other in space and time; for in these two – time and place – there consists the order of things which exists either successively or simultaneously (C 14/MP 175).

If time were real at the monadic level itself, then it should be possible to read off the order of monadic states *at the monadic level*, and for those monads in a common

[48] My reading of Leibniz closely tracks an interpretation recently defended by Robert Adams and Donald Rutherford. Rutherford explains that "Leibniz gives explanatory priority to a notion of lawful change in the physical world, for it is in terms of the latter that the effectiveness of appetitive force is understood … explanatory priority is given to the lawful evolution of the physical universe, and monadic perceptions tend toward representations of whatever the next best state of the universe is" (2005, 173). See also Adams (1994, 223–224): "In [Leibniz's] philosophy of body, the objective reality or representational content of a perception is treated for all working purposes as a primitive feature of that perception."

world it should likewise be possible to read off the temporal relatedness of those states to each other at the monadic level. This is precisely what Leibniz denies can be done: "it is necessary that between them there is a certain relation of perceptions or phenomena." 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. Additionally, the temporal location of the monadic states to each other – one state being before the other state – is also derived from the temporal location of the represented bodies. This conclusion should come as no surprise, for it is a clear consequence of Leibniz's repeatedly announced thesis that "the essential ordering of individuals, that is, their relation to time and place, must be understood from the relation they bear to those things contained in time and place" (GP 2.277–278/AG 183). It is thus not correct to say, as Anapolitanos does, that "metaphysical temporal specifications are already part of the world of monads as they really change and not as they merely represent one another as changing" (143). It is precisely these representations that confer on monadic states a location in time.

Chapter 8
Space, Time, and God

Within the context of early modern philosophy, questions about space and time inevitably raise and lead to a host of theological issues. Leibniz's metaphysics of space and time is no exception. One such theological issue, the beginninglessness of the world, has already been investigated in Chapter 4. In what follows I address how Leibniz conceives the relation between time and space and God. To this end, I begin with an exposition of the seventeenth-century context to which Leibniz is responding, focusing especially on those who maintain that God does not transcend space and time. These thinkers range from Hobbes, for whom God is extended and corporeal, to Locke and Newton, for whom God is immaterial but, in some sense, spatial and temporal. Writing in this vein, Newton contends that God "endures from eternity to eternity, and he is present from infinity to infinity … He endures always and is present everywhere, and by existing always and everywhere he constitutes duration and space … the maker and lord of all things will not be *never* or *nowhere*" (Newton 1996, 340). Whatever his actual intention, Leibniz took Newton's contention to imply that God is both spatial and temporal. In contrasting Leibniz's views with those of his contemporaries, I start with his understanding of the relation between God and space. This, in turn, will be approached from the standpoint of Leibniz's theory of divine omnipresence. Leibniz firmly rejects Newton's underlying "unequivocal theology" and "epistemological univocity", i.e., a univocity according to which terms such as "presence" or "immensity" apply univocally to God and creatures.[1] He instead opts for a more orthodox understanding of God's relation to space by returning to a more orthodox understanding of God's attributes. Leibniz draws on a tradition that asserts that terms such as "presence" and "immensity" apply only analogically – neither univocally nor equivocally – to God. Leibniz further draws on this tradition in explicating divine omnipresence in terms of God's knowledge, power, and essence.

The second focus of this chapter is Leibniz's theory of eternity, a topic that has received little, if any, attention from other scholars. Leibniz's conception of eternity, like the history of the concept generally, is one fraught with ambiguity and confusion. To clarify his views, I start by differentiating among three possible

[1] This phraseology is taken from Marion (289) and Funkenstein (89).

M.J. Futch, *Leibniz's Metaphysics of Time and Space*,

senses of the term: (1) eternity as sempiternity (everlasting time), (2) eternity as atemporal duration (infinitely extended duration without internal temporal succession), and (3) eternity as "point-like" atemporal existence.[2] With these distinctions in hand, I argue that Leibniz unequivocally rejects the first definition. Moreover, given his analyses of duration, the very notion of atemporal duration involves a conceptual contradiction. Leibniz thus disavows the second definition also. This leaves him with the third option, eternity as a point-like and atemporal existence. I argue that this is, in fact, the understanding of eternity best supported by the relevant range of Leibnizian texts.

My approach in this chapter will be more broadly historical, philosophical, and theological than in preceding chapters, which is to say that I will focus less on Leibniz exclusively. This is mostly due to the fact that Leibniz's views on God's immensity and eternity are much more intertwined with those of his predecessors than are his views on, e.g., the relational character of space and time. (As mentioned above, Leibniz's views on divine presence are virtually indistinguishable from those of Aquinas.) They are also more enmeshed in a broader range of philosophical and theological issues. To motivate Leibniz's views more fully, then, I will accordingly devote more attention to these varied frameworks

8.1 God's Omnipresence

8.1.1 The Names of God

Understanding God's relation to space and time, and to the created world more generally, requires understanding something about the existence and essence of God. This immediately raises a number of important questions: What can we know about God? What kinds of attributes can be predicated of God? And what is the meaning of these attributes when predicated of God? When, for instance, it is claimed that God is immense and present in creation, on the basis of what is this claim made? Just as important, what do "immense" and "present" mean as properties or names of God rather than creatures? Approaches to understanding the nature and essence of God broadly divide into two camps: apophatic, negative theology and what I will refer to simply as "positive" theology. Since any account of God's omnipresence, immensity, and eternity must be able to explain both how these names apply to God and what they mean when applied to God, it is with these two approaches – and various alternatives in between – that I will start.

Negative theology is so called because it maintains that nothing can be positively predicated of God. One cannot say what God is, but only what God is not. Any judgment about God is thus the denial that a particular name reveals the essential nature of God.

[2] For a recent discussion of each of these three views, see Martha Kneale (1973), Eleonore Stump and Norman Kretzmann (1981), and Paul Fitzgerald (1985), respectively.

These judgments can take a variety of forms: denying to God a "positive" predicate (God is not temporal), ascribing to God a "negative" predicate (God is timeless), or ascribing to God a "positive" predicate (God is simple) where one is really denying of God a "positive" predicate (God is not compound).[3] These linguistic dissimilarities notwithstanding, what all of these formulations have in common is the view that we can only say what God is not, not what God is. The God of negative theology is a God who is utterly incomprehensible and whose essence necessarily remains unknown to any finite mind. Though he does not adopt a thoroughgoing negative theology, Aquinas gives voice to this approach when contending that one's knowledge of God in this life reaches its fullest when one "knows that he knows not God, insofar as he recognizes that what God is exceeds everything that we understand of him" (quoted in Rocca 2004, 29).[4] Paradoxically, even this purely negative approach to God does enable us to augment our knowledge about him, for as Gilson explains,

> Failing to arrive at the essence of God, which has no quiddity distinct from the pure act of being, we can seek to determine what it is not. Rather than begin with an inaccessible essence and add to it positive differences which would make us know more and more about it, we can gather a more or less considerable number of negative differences which give us a more and more precise knowledge of what God is not … when we posit an unknown essence and distinguish it from an ever larger number of other essences, each negative difference determines with increasing precision the preceding difference and thus encircles ever more closely the outline of the central object (96–97).

God is in this sense known, viz. by knowing with greater and greater exactitude what God is not.

The importance of negative theology for articulating a theory of God's immensity and presence comes through its connection to the doctrines of equivocation and analogy. The doctrine of equivocation arises from the fact that there seem to be some statements that are true of God but that do not deny of him a certain property. Such statements might include "God is wise," "God is the first cause," "God is just," "God is being," and more important for our purposes, "God is omnipresent." The challenge confronted by the negative theologian is to explain how these statements can be true in spite of the fact that they positively attribute to God a particular property. Statements like "God is simple" or "God is eternal" can be reformulated as negations: "God is not compound" or "God is not temporal." They therefore pose no challenge to the basic tenet of negative theology, that tenet being that we cannot say what God is but only what God is not. Not so in the case of "God is wise" or "God is omnipresent," as these statements cannot simply be reworded as negations. How, then, are we to make sense of them within the framework of negative theology?

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[3] These examples are taken from Rocca, 12.

[4] In the introduction to Question 3 of the *Summa Theologica* ("Of the Simplicity of God"), Aquinas elaborates that "when the existence of a thing has been ascertained there remains the further question of the manner of its existence, in order that we may know its essence. Now, because we cannot what God is, but rather what He is not, we have no means for considering how God is, but rather how He is not … Now it can be shown how God is not, by denying of Him whatever is opposed to the idea of Him – viz. composition, motion, and the like."

One response is that terms such as "wise," "first," "being," or "present" apply only equivocally to God. This means that the meaning they have when applied to God is wholly different from the meaning they have when applied to creatures. It is true that God is wise, but wisdom in God is completely different from and dissimilar to the wisdom of humans. In this way, the incomprehensibility of God's essence is involved; positive terms that are affirmed of God can be affirmed of him only by emptying them of their regular meaning and not substituting an alternative meaning. They become void of any cognitive content.[5]

A more moderate response, though one that perhaps prescinds from some of the claims of a strictly negatively theology, is found in the works of Aquinas. When terms are used equivocally in different contexts, they have entirely different and unrelated meanings. In the case of negative theology, terms used in reference to God are stripped of their regular meaning without being given a new one. Though this serves to bolster the idea that God is unknowable, it does so at the expense of making talk about God utterly meaningless and foreclosing the possibility of knowing anything about God: "Neither, on the other hand, are names applied to God and creatures in a purely equivocal sense … If that were so, it follows that from creatures nothing could be known or demonstrated about God at all" (ST 1.13.5). Aquinas denies that terms predicated of God are used only equivocally, instead arguing that they are used analogically. We begin to understand God's existence through the existence of created things, and God's essence through the nature of created things. It is one's knowledge of the wisdom, power, or goodness of creatures that enables one to understand, however dimly, something about the wisdom, power, or goodness of God. To be precise, the original sense of these terms is derived from their use with respect to creatures, and then analogically transposed in reference to God. The transposition is analogical in that the properties referred to in God are both similar and dissimilar to the properties referred to in creatures. God causes creatures to exist and to have the natures that they have; the perfections of creatures are derived from the perfections of God, and are in some sense "proportionate" to them. As Aquinas puts it, "Thus, whatever is said of God and creatures, is said according to the relation of a creature to God as its principle and cause … this mode of community of idea is a mean between pure equivocation and simple univocation" (ibid.). The doctrine of analogy steers a course between what Aquinas takes to be two extremes: the meaninglessness of equivocation and the anthropomorphism of univocity. God, as cause of creatures, is both like and unlike the creatures he creates. Exactly how this theory is supposed to work will be seen in Section 8.2.2, where we examine Aquinas' use of it to explain God's presence.

A third alternative is one mentioned by Aquinas in the above passage, namely, the doctrine of univocity. According to this, a term means the same thing when applied to God as it does when it applies to creatures. As will become evident in what follows, this understanding of the divine names has a number of adherents in the

[5] As Copleston observes, "If, then, we take a term, the primary meaning of which is determined by the content of our experience, and apply it in an entirely different sense to a being which transcends our experience, its meaning is evacuated, without any other meaning being substituted" (134).

early modern period, including, in some cases, Leibniz. Amos Funkenstein has gone so far as to claim that a "drive for unequivocation" characterizes the essence of early-modern science, becoming something of a prevailing orthodoxy in the period. It is to this doctrine that we now turn.

8.1.2 Analogy, Univocity, and Omnipresence

Different theories about the divine names provide different ways of understanding God's relation to space and time. It is to these competing conceptions that we now turn. Of particular importance is the distinction between an analogical and a univocal understanding of "immensity" and "presence." As we will see below, Leibniz's account of God's presence in the world is largely taken from Aquinas, so it will repay our efforts to examine the latter's views with some care. In adopting this standpoint, Leibniz is dissociating himself from a position increasingly prominent throughout the seventeenth century, one that, rather than drawing on Aquinas, draws more on the theory of univocity. After discussing Aquinas' views, I turn to these alternative approaches, starting with the medieval context and then examining the theories of Hobbes, More, and the Newtonians. With this historical background in hand, we will turn to Leibniz's own account of God's omnipresence.

In explaining the sense in which God is present throughout creation – how God both "is in all things" and "is everywhere" – Aquinas makes heavy use of his theory of analogical predication. On the one hand, God is infinite, incorporeal, and transcendent. So conceived, it is not readily apparent how God can be said to be in a place, much less in all places. It is intuitively plausible that for something to have a position in the world, to be present here or there, it must either have a body or, barring that, be immanent rather than transcendent. Aquinas takes note of these objections in his discussion of divine omnipresence, conceding that it seems "that God is not in all things" since he is above all things (ST 1.8.1) and "that God is not everywhere" since an incorporeal being cannot be anywhere (ST 1.8.2). The task is thus to explain how God can be in all things and present in all places without compromising divine transcendence and incorporeality. For Aquinas, the solution to this conundrum lies in his doctrine of analogy, i.e., in saying that God is in things and present to them in only an analogical sense. To be exact, God is everywhere by power, presence, and substance:

> God exists in everything by power inasmuch as everything is subject to his power, by presence inasmuch as everything is naked and open to his gaze, and by substance inasmuch as he exists in everything causing their existence (ibid.).[6]

[6] Succinctly condensing this solution, Wierenga writes that "the predicate 'is present' as applied to God is *analogical* with its application to ordinary physical objects. The term is neither univocal (used with the same meaning as it is in ordinary contexts), nor equivocal (used with a completely unrelated meaning) … God is present at a place (in a special sense) just in case there is a physical object that is present at that place (in the ordinary sense) and God is able to control that object, God knows what is going on in that object, and God is the cause of the existence of that object" (287). The requirement that there actually be a physical object at a place is arguably too restrictive, as that would imply that God is not present in empty space.

In this explication, the attribute of omnipresence is explained by other divine attributes. God is omnipresent in that he is omnipotent and is able to act without the use of an intermediary on all creatures. God is also omnipresent in that he is omniscient and knows immediately what happens to all creatures. Finally, God is omnipresent in virtue of being the cause of the being and essence of creatures.[7] By reducing God's ubiquity to other attributes and operations, Aquinas is able to reconcile the presence of God in the world – in the attenuated sense just explained – with the transcendence of God above the world. What is important to emphasize is that God's presence to things is of a different kind than those things' presence to each other.

Funkenstein and Marion have proposed that the seventeenth century witnesses a breakdown in the Thomistic position and a concomitant rise in theory of univocity, both in general and with particular respect to divine ubiquity.[8] Whether or not this is an accurate generalization, it is no difficult task to identify myriad thinkers of the period for whom the presence of God is closely linked to his extension and, in some cases, corporeality. God is omnipresent in that he is literally present, extended in a three-dimensional spatial manifold. Henry More's theory of God's presence is exemplary of the shift towards univocity. In his exchange with Descartes, More asserts that "God does indeed seem to be an extended thing." More fully,

> God is extended in His manner just because He is omnipresent and occupies intimately the whole machine of the world as well as its singular particles. How indeed could He communicate motion to matter, which He did once … if He did not touch the matter of the universe in practically the closest manner, or at least had not touched it at a certain time? Which certainly He would never be able to do if He were not present everywhere and did not occupy all the spaces. God, therefore, extends and expands in this manner, and is, therefore, an extended thing (quoted in Koyré 1957, 111).

Contra Descartes, More holds that spirit, and indeed all substance, is extended, spirit being a penetrable extended substance and matter being an impenetrable extended substance. God is both immaterial and extended. Were God not extended, his presence and ability to interact with and in the material world would be inexplicable. A more persuasive line of reasoning is to be found in More's *Enchiridium Metaphysicum*. More starts with a substance/accident ontology, one in which everything that exists must be either an ultimate subject of predication, or a quality inhering in such a subject. Given this, a "real attribute of any subject can never be found anywhere but where some real subject supports it" (quoted in Koyré, 145). Extension is a real attribute, and a real attribute that can exist without a supporting material body.

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[7] Writes Rocca: "Since God originates and continues to uphold the being of things, and since a thing's being is at its innermost and deepest core, God is most intimately present and acting in reality" (267).

[8] Funkenstein (25) and Marion (288). It should be observed that in advocating the spatialization of God, the thinkers discussed below were not mapping uncharted territory. In addition the to Stoics, who tended to favor a spatially dimensional God, Philo of Alexandria stipulated that "He is Himself the space which holds Him; for He is that which He Himself has occupied," a remark echoed by Saint Cyprian (God is "one and diffused everywhere") and Arnobius of Sicca ("Thou art the first cause, the place and space of things created"). For these and other references, see Grant, 113. Grant (Chapter 6) provides an excellent discussion of numerous Medieval precursors to the views of More et al.

Moreover, it is an infinitely extended attribute, and as an infinitely extended attribute it must inhere in an infinitely extended substance. This substance cannot be material, since extension can (and does) exist without matter. This leads More to the conclusion that the substance in which infinitely extended space inheres is God.[9] Though More's endorsement of a spatially dimensional god is far more explicit than that of many of his successors,[10] he is far from alone in taking up this view.

Leibniz's more immediate adversaries, Newton and Clarke, likewise defend a conception of God that is at variance with any robust understanding of spatial transcendence, though they are careful to avoid the official Hobbesian theory of God being corporeal. Newton starts from the assumption that "time and place are common affections of all things without which nothing whatsoever can exist" so that what is "never and nowhere is not in the order of things" (Newton 1978, 117). Against those who would exempt God from these conditions of existence, Newton responds that existing in time and space "does not argue imperfection, since that is the common nature of all things" (ibid.). It is true that existing at a particular time and place would be a theologically unacceptable restriction on God's perfection, but God exists in all times and places, a mode of existence that is not incompatible with divine perfection. We will examine further Newton's understanding of God's relation to time in Section 8.2.2, but for now I wish to emphasize Newton's view that God's existence in space is not to be understood in only an equivocal or analogical sense. When Newton writes, as he does in the "General Scholium," that "the maker and lord of all things will not be *never* or *nowhere*," he intends this to be understood in a quite literal sense. God is not nowhere simply in virtue of his omniscience or omnipotence. Rather, he "is omnipresent not only *virtually* but *substantially*" (Newton 1996, 341). The substantial presence of God to creatures is fundamentally the same as that of creatures to each other, though, as Newton explains, "bodies feel no resistance from God's omnipresence" (ibid.).[11] In line with More, "presence" is taken literally in a way not allowed by the doctrine of analogy or equivocity.

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[9] See Grant, 227.

[10] One important exception that I will mention only in passing is Joseph Raphson, who is at least as direct in his argument for a spatial god as More. In his *De spatio reali seu ente infinito* of 1702, Raphson asserts that "How [the First Cause's] essential and intimate presence can be explained in the hypothesis of the non-extension of the First Cause without a manifest contradiction has not yet been made clear; and it will never be possible to make clear. Indeed, to be present by essence in places diverse and distant from each other … and also in the intermediate space, what else is it but, precisely to extend oneself?" (quoted in Koyré, 197–198). It is not clear if Leibniz was familiar with Raphson's work. Another notable exception, with whose work Leibniz was intimately familiar, is Baruch Spinoza.

[11] As McGuire (1990, 96) notes, "In Newton's mind there is a close conceptual link between divine omnipresence and the conception of spiritual immensity. God is actually everywhere by virtue of his existence in infinite space, and in every place he wills everything that he thinks fit to choose. The immensity of God's omnipresence is manifested through his real presence in this created world … God dwells *in* space." Grant (254) similarly concludes that for Newton "God is omnipresent because He is actually a three-dimensional, extended being … Newton had even made God's literal omnipresence the foundation of his physics … Only by the assumption of God's literal omnipresence in an infinite space did Newton feel he could account for numerous phenomena that could not otherwise be explained by mechanical means."

It would be going too far to characterize this trend towards univocity as a universal dispensation. Even so, Marion and Funkenstein are surely correct in their assertion that a multitude of seventeenth-century thinkers disclaim the Thomistic doctrine of analogy. As Funkenstein has written, "a renewed commitment to an unequivocal language science – every science, including theology – was the mark of the fourteenth century as it was again that of the seventeenth" (26).

8.1.3 Leibniz Against God's Spatiality

As previously noted, Leibniz goes to great lengths to separate his own views from those of many of his contemporaries, especially those who claim that God is either material or spatial. This he does by utilizing the resources of Aquinas' theory of omnipresence. Yet in adopting this approach, he is also adopting an understanding of God's omnipresence that it is not easily harmonized with his more general theological commitments. Like many of his contemporaries, Leibniz contends that various terms designating certain attributes can be predicated of God and creatures univocally. There is, for instance, a "great difference between the way in which men are just and in which God is just: but this difference is only one of degree" (PW 48). Similarly, "God has an understanding which is in a way like ours. For God understands things as we do, but with this difference: he understands them at the same time in infinitely many other ways" (AK 6.3.400).[12] With respect to many divine attributes – justice, knowledge, power, will – Leibniz's views are in line with those of his Newtonian opponents: God has the attributes in the same way, albeit to a much greater degree, than do creatures. Not so in the case of omnipresence and ubiquity, terms that cannot, on Leibniz's view, be literally predicated of God. Does this make Leibniz's understanding of divine omnipresence ad hoc and incoherent? Is there a non-arbitrary way of distinguishing between those predicates that can and that cannot be predicated of God univocally? Or is it the case instead that Leibniz has arbitrarily exempted God's presence from his broader theory of divine names?

The appearance of arbitrariness notwithstanding, Leibniz has sound theological reasons for allowing some terms to be predicated of God univocally without thereby extending this analysis to all terms. Specifically, God's justice and knowledge being of the same kind as that of creatures is not incompatible with other divine attributes in the way that God's presence being of the same kind as that of creatures might be. As Leibniz argues at length, if God is spatial in the manner suggested by Newton and his proxies, then a strong prima facie case can be made that God is not simple and without parts. A univocal understanding of God's presence – one that sees God as being spatially dimensional – improperly compromises God's

[12] The most elaborate statement of Leibniz's adoption of the theory of univocity can be found at Mon. 47–48. See also *Theodicy* Introduction Section 4. The views advanced in this paragraph and below follow Vailati (1997, 51).

simplicity. Leibniz's defense of this claim is most forcefully set forth in the Clarke correspondence, where he accuses his adversary of being committed to a God who is composite in virtue of being spatial:

> I objected that space cannot be in God because it has parts. Hereupon the author seeks another subterfuge by departing from the received sense of the words, maintaining that space has no parts because its parts are not separable and cannot be removed from one another by discerption. But 'tis sufficient that space has parts, whether those parts be separable or not (LC 5.51).

Against this, Clarke had responded in an earlier letter that space being a property of an "infinite and eternal being" raises no difficulties since space is "one, absolutely and essentially indivisible, and to suppose it parted is a contradiction in terms, because there must be space in the partition itself, which is to suppose it parted and not parted at the same time" (LC 3.3). This harkens back to a still earlier response in which Clarke had insisted that space is "absolutely indivisible" even in thought, for to move the parts of space would be to move them out of themselves (LC 2.4). Space cannot have moveable and separable parts since that would require the parts of space to be, as it were, in space. As Grant has noted, Leibniz and Clarke are mostly talking past each other on this point. The issue for Leibniz is not whether space has parts that are separable and movable from one another, but rather whether space has parts that are *discernible* from one another. It is the discernibility of parts of space, not their divisibility and mobility, that suffices to make space composite in a way that precludes God from in any way being spatial. The divisibility of space is a red herring, for immovable parts are still parts, and this objection is one that Clarke makes little attempt to defuse.[13]

Leibniz also has less satisfying reasons for denying that God's immensity is to be understood univocally. In his fourth letter to Leibniz, Clarke had claimed (in apparent opposition to Newton) that space and time are properties of a necessary being, God. For that reason, space and time are ontologically prior to those beings – material bodies – whose existence depends upon the existence of space and time. Against Leibniz's claim that this makes space and time coeval with, and thus independent of, God, Clarke responded that "it does not follow from this that anything is eternal *hors de Dieu*. For space and duration are not *hors de Dieu*, but are caused by and are immediate and necessary consequences of his existence" (LC 4.10). What is especially important for our purposes, though, is Clarke's additional assertion that divine ubiquity and eternity depend upon space and time being properties of God (ibid.), and that God would be ubiquitous even were creatures not to exist,

[13] Vailati, Chapter 1, and Grant, 247–255, provide fine assessments of the merits of Leibniz's response. Grant is especially sympathetic to Leibniz's position: "The traditional interpretation of God as an absolutely indivisible entity clashed with the conception of an absolute, infinite, extended, void space that was assumed indivisible and yet possessed of distinguishable, albeit inseparable and immobile, parts. Because this was indeed the opinion of More, Raphson, Clarke, and Newton, there was no satisfactory response to Leibniz's criticism and Clarke formulated none" (251–252).

precisely because space is an affection of God (LC 4.41). For Leibniz, this is tantamount to making God, or at least one of his properties, immensity, dependent upon the existence of space. It is to make God *qua* omnipresent dependent upon an independent absolute reality: "If the reality of space and time is necessary to the immensity and eternity of God, if God must be in space, if being in space is a property of God, he will in some measure depend on time and space and stand in need of them" (LC 5.50). According to Leibniz, a univocal conception of God's immensity is not compatible with God's self-sufficiency. Is Leibniz's criticism of Clarke on the mark? It is true that the property of being in space can be possessed by something only if space exists. So stated, this makes it sound as though God's immensity is dependent upon the existence of something outside of God, a theologically untenable position. Clarke's main contention, however, was not that "being in space is a property of God," but that space itself is a property of God. God's ubiquity results from one of his own affections, not, as Clarke was surely correct to point out, from something *hors de Dieu*. Leibniz's remonstrations to contrary notwithstanding, it is not obvious that a univocal understanding of "immensity" runs counter to God's self-sufficiency.

In any case, it is not my aim to show that Leibniz resoundingly defeats Clarke in these disputes, but only to diminish the appearance of arbitrariness in Leibniz's account of omnipresence. Whether or not Leibniz's rejoinders to Clarke are conclusive, they do show that he has at least some reason to maintain that omnipresence should be understood only analogically, even if other names are understood univocally. It is one thing for Leibniz's reasons for denying that God can be literally present to be unconvincing (though I think that it is not obviously unconvincing, if unconvincing at all, in the case of God's simplicity), it is something else altogether different for him to have no such reasons.

8.1.4 Leibniz on Divine Immensity and Omnipresence

Another issue that must be addressed before turning to Leibniz's considered views on divine omnipresence is his early understanding of the relation between God's immensity and space. Robert Adams has pointed to a passage from 1676 that seems to place Leibniz's theory about divine immensity close to those of More, Newton, and Clarke:

> But there is something in space which remains amidst the changes, and which is eternal, and is nothing other than the immensity itself of God, that is, a single attribute at once indivisible and immense. Of this, space is only a consequence, as a property is of an Essence (A 6.3.391).

Compare this, for instance, with Newton's own contention that "space is an emanative effect of the first-existing being" (quoted in Stein, 268), or Clarke's claim that "space and duration … are caused by, and are immediate and necessary consequences of his existence" (LC 4.10). Even worse, Leibniz claims that the divine

immensity is "in space." As Adams notes, this raises the specter of Spinozism in that it evokes a pantheistic understanding of God (Adams 1994, 124). Leibniz's statement that God is "in space" is highly reminiscent of More's declaration that God "occupies intimately the whole machine of the world" and "all the spaces." By extension, it appears to imply that God is dimensional in the way that More insists. Leibniz, however, is careful to clarify this statement in a study dated only a month later. Here Leibniz explains that "the immeasurable itself is God, insofar as he is thought to be everywhere, or insofar as he contains that perfection … which is ascribed to things when they are said to be somewhere," and adds that God is "absolutely ubiquitous, or omnipresent" (AK 6.3.519). God is immeasurable to the extent that God is understood under the name of omnipresence, or God's omnipresence just is his immeasurability. Further, God's immeasurability is the perfection, or the "absolute affirmative form," which corresponds to the spatial locality of created things. In that God's absolute immeasurability is only the divine correlate of dimensional presence, it itself need not involve literal spatial presence: "immeasurability does not indicate extension or parts" (AK 6.3.484). As we have seen in Chapter 7, the "inesse" relation is not primarily a spatial one: one thing "is in" another if it is its ontological or logical precondition. The concept of the genus "is in" the concept of the species and monads "are in" matter. Though creating ample opportunities for confusion when transposed into the context of God's omnipresence, we should not allow this to obscure the fact that God's immeasurability "is in" space as an ontological requisite, a perfection that founds the spatiality of creatures. Consequently, it is not "in" space literally.

The connection between God's immensity and the spatiality of creatures becomes something of a theme in Leibniz's later philosophy. In 1695, Leibniz reiterates that space and time are not real per se but "only insofar as they involve the divine attributes of immensity [and] eternity" (GM 6.247/L 445).[14] Space "involves" divine immensity in that the latter is an ontological presupposition of the former. Ten years later in the *New Essays*, Leibniz again reaffirms the connection between God's immensity and space in the following terms: "The idea of the absolute, with reference to space, is just the idea of the immensity of God and thus of other things" (NE 158). Unfortunately, the precise nature of this grounding relation remains unclear throughout all of these texts. The passage from the *New Essays* occurs within the context of Leibniz's denial that space is an infinite whole not made up of parts. At most, space can be mathematically infinite, not metaphysically infinite.

The obscurity of the precise relation between the reality of God's immensity and the reality of space aside, one point that does clearly emerge is that God's immensity does not require his literal spatial extendedness. Sharply contrasting his views

[14] See also "On Time and Place, Duration and Space" from approximately 1686: "Time and place, or duration and space, are real relations, i.e. orders of existing. Their foundation in reality is divine magnitude, to wit, eternity and immensity" (A 6.4.1641).

with those of Clarke, Leibniz argues that God's immensity neither presupposes nor implies the existence of any sort of spatial dimension:

> It is true that the immensity and eternity of God would subsist though there were no creatures, but those attributes would have no dependence either on times or places. If there were no creatures, there would be neither time nor place, and consequently no actual space. The immensity of God is independent of space … These attributes signify only that God would be present and coexistent with all things that should exist. And therefore I do not admit what is here advanced, that if God existed alone, there would be time and space as there is now, whereas then, in my opinion, they would be only in the ideas of God as mere possibilities … Those divine attributes do not imply the supposition of things extrinsic to God, such as actual places and times (LC 5.106).

This passage is notable on a number of counts. First, Leibniz starts by agreeing with Clarke that God's immensity does not depend upon the existence of creatures that are spatially located. Were this not the case, God would be what he is only in virtue of some fact external to him. While both Leibniz and Clarke deny that God's nature is dependent upon the existence and nature of creatures, they have importantly different grounds for doing so. As we have seen above, Clarke defends this on the basis of the fact that space is an affection of God. Though God's immensity is not dependent upon the existence of things in space, it implicates and is implicated in the existence of space itself as an affection of God. It is here that Leibniz parts company with Clarke. In stating his opposition to Clarke, Leibniz emphasizes the central thesis of his relationalism: the existence of creatures is a necessary condition for the existence of an "actual" space,[15] and so the existence of God is not sufficient for the existence of space. Nor is the existence of space necessary for the existence of an immense God: "the immensity of God is independent of space." Taken together, these two points establish that God's immensity cannot be analyzed as his literal spatial presence. Even in the absence of a spatio-temporal world, God is immense and omnipresent. In this passage, Leibniz is content to spell out God's immensity in modal terms: God is immense in that, necessarily, if something exists, God is present to it. God's immensity is not conditioned upon the existence of space, but is explained through the conditional asserting God's presence, however that is to be understood, to whatever might exist.[16]

In no uncertain terms, Leibniz holds that God's presence is qualitatively different from that of creatures and denies that it can be understood univocally. This, in spite of the fact that the general tenor of his philosophical theology favors a doctrine of univocity. If Leibniz's repudiation of the views of More, Clarke, and Newton are clear, less obvious is how he goes about providing a positive explanation

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[15] As opposed to space considered as an *ens rationis*.

[16] Additional reasons for holding God to be spatially transcendent can be found in Leibniz's statements that "God alone is above all matter, since he is its author" (L 590) and "mind is either separate from our united to a body: separate, as is God; united to a body, as is our soul" (A 6.4.1507). As we saw in Chapter 7, a necessary condition for an existent literally having a place in the order of coexistence is that it be connected to an organic machine. This, however, is precisely what God lacks.

of God's presence. Indeed, the Leibniz corpus is almost entirely bereft of any kind of constructive analysis of divine omnipresence. Two passages from the *New Essays* provide, albeit in very broad strokes, a rough outline:

> [God] is the source of possibilities and of existents alike, the one by his essence and the other by his will. So that space like time derives its reality only from him, and he can fill up the void whenever he pleases. It is in this way that he is omnipresent (NE 155).

> The third kind of ubiety is the repletive. God is said to have it, because he fills the entire universe in a more perfect way than minds fill bodies, for he operates immediately on all created things, continually producing them, whereas finite minds cannot immediately influence or operate on them. I am not convinced that this scholastic doctrine deserves the mockery which you seem to bring down on it (AK 6.6.222).

In the first text, Leibniz identifies God's omnipresence with his ability to create creatures at any place. God is omnipresent if and only if for any given (possible) place, he can produce a thing at that place. In the second passage Leibniz adds that God's omnipresence is to be understood in part by his continual production of things in places. Thus, omnipresence is linked with divine conservation.

The most important feature of these passages is that they explicate omnipresence through God's immediate operation on things, a kind of operation that is unique to God and denied to creatures. This explanation recurs in the Clarke correspondence, where Leibniz writes that God's "presence is manifested by his immediate operation" (LC 3.12) and that "the presence of God is perfect and manifested by his operation" (LC 4.35). What does it mean to say that God acts immediately on things? No answer is forthcoming from Leibniz here, but one fully consistent with his philosophical and theological commitments can be found in Swinburne:

> God is supposed to be able to move any part of the universe directly; he does not need to use one part of the universe to make another part move. He can make any part move as a basic action … The claim that God has no body is … the denial that God controls and knows about the material universe by controlling and getting information from one part directly, and controlling and getting information from other parts only by their being in causal interaction with the former part (1977, 103–104).

An action is "basic" if it is performed by an agent without the agent having to perform another action in order to perform it. Raising one's arm is a basic action, hitting a ball with a stick is not. Basic actions are those that do not require the mediation of some other action or some kind of instrument. Typically, an embodied creature can interact with another body only by acting directly upon its own body, and through its action on its body effecting some change on the body on which it is acting. Actions such as these are non-basic because they require an intermediary action, the action of the creature on its own body. It is obvious that Leibniz must reject any such account of God's actions since God is without a body (A 6.4.1507); God cannot perform non-basic actions through the use of a body that is properly his. Even so, God could still perform non-basic actions by effecting a change in one body by immediately acting on another body, even if the latter is not his own. However, God can act immediately upon any body in that he can act upon it without acting upon another body, and this, according to Leibniz, is just what it

means for God to be omnipresent. As one commentator observes, Leibniz reduces God's omnipresence to immediate operation, and immediate operation to omnipotence.[17]

Before taking up Leibniz's views on eternity, it is worth underscoring the extent to which this account of omnipresence is indebted to the Thomistic tradition. God "fills every place" by the fact that he "gives being to the things that fill every place" and he is "in all things" in that all things are "subject to his power." Those quotations are taken from Aquinas' *Summa*, but they could easily have been mistaken for Leibniz's own pronouncements. Distancing himself from his own commitment to a doctrine of univocity, Leibniz draws on the conceptual resources provided by Aquinas' theory of omnipresence. This theory steers a middle course between a univocal understanding of "presence," where God is spatially present in the same way that bodies are, and an equivocal understanding of "presence," where there is nothing in the properties of creatures that serves as a basis for understanding God's presence. In returning to Aquinas, Leibniz's analogical conception of divine omnipresence is squarely set against the views of many of his contemporaries in a way that preserves the transcendence of God.

8.2 Divine Eternity

Brian Leftow has aptly remarked that there is widespread consensus among Western theists that God is eternal, but that there is less accord about what precisely this means. In this sense, eternity is very much like omnipresence: everyone concurs that God is both even though there are pointed disagreements about how these claims are to be understood. The case of God's eternity might seem less problematic, for it is natural to assume that something is eternal if and only if it transcends time. Even if we grant this, however, we are still confronted with the question of how something transcends time. As we will see below, at least two different answers are available, leading to two importantly different accounts of eternity. But not all have granted this, as some have insisted that the very idea of a timeless God is involved in irresolvable conceptual incoherencies. On this view, God's eternity is not to be understood as timelessness, but as some sort of temporal duration. This leaves us with no fewer than three different theories about God's eternity, at least two of which have played an important role in the history of Western theology and philosophy. Before turning to Leibniz's reflections on the nature of divine eternity, I will first survey each of these three kinds of eternity. In Section 8.2.2, I look briefly at the role that these differing accounts have played in Western philosophy and theology. Finally, in Section 8.2.3 I expound Leibniz's own views on the nature of divine eternity.

[17] Adams (1994, 124).

8.2.1 Eternities

As just noted, eternity is not always identified with timelessness. For those rejecting eternity as timelessness but still retaining the idea of eternity, eternity is defined as infinite duration, i.e., infinite temporal duration or everlasting time. On this view, God is eternal not in that the sense that he is timeless, but in that he has existed for all times and will continue to exist for all times. Eternity so understood is often referred to as "sempiternity," and in what follows I will use this terminological convention. A sempiternal God is one who has existed in the past, who exists in the present, and who will exist in the future. God's existence and actions are temporally related to events in the world in the same way that those events are related to each other. If God intercedes in the ordinary course of nature, then that intercession – not just its effect but God's action in bringing about the effect – is simultaneous with some set of events, and is also before or after others. What is more, the whole of God's existence is not simultaneous with each moment in the world, for God as sempiternal exists throughout time, at each moment of time, just as created entities do. Finally, a sempiternal God changes at least in the sense that some of his states move from being in the future, to the present, and then into the past. I leave it to the reader to decide whether this is trivial or non-trivial change.

Two important proponents of this view are William Kneale and Richard Swinburne. The first argues that the notion of an eternal life, when eternity is understood as timelessness, is incoherent and contradictory. More specifically, talk about life with neither a before nor after is meaningless blather that cannot be made intelligible. This is not to say that timelessness in general is incoherent, for Kneale is ready to defend it in some contexts, both philosophical and non-philosophical. The problem arises when eternity (as timelessness) is taken out of one context in which it is coherent and is transposed into another (theological context) in which it is not coherent. According to Kneale, we talk about things timelessly in one context where it is perfectly acceptable to do so, but then use the same language in another context where it generates insuperable difficulties. In what context is this kind of discourse acceptable? Most obviously when we use the timeless present to formulate necessary truths such as the truths of mathematics or of logic. We say that 7 added to 7 *equals* 14, or A *is* A, and these statements are to be understood without reference to any date. This is because these truths are not intended to refer to the time of speaking. Why think that they are eternal (timelessly true) rather than sempiternal (true at all times)? Can we not dispense with the notion of timelessness altogether by arguing that necessary truths are sempiternally true? If so, we do not need the timeless present, but can say 7 + 7 was 14 and is now 14 and will be 14. According to Kneale, the very formulation of necessary truths in this language reveals why they cannot be merely sempiternally true. When working within the framework of sempiternity, we use tensed language, and we use tensed language because sempiternal things are things with a past, present, and future. Similarly, a truth is sempiternal if it was, is now, or will be true. The use of tensed language in the formulation of necessary truths, though, is absurd (according to Kneale), as it

implies that somehow it could have not been the case that 7 + 7 = 14. That is, the use of tensed language is inextricably bound to the formulation of contingent truths: contingent truths, and only contingent truths, are expressed using tensed language, using the past and future tense, "was" and "will be." When we come to necessary truths, truths that hold in all possible worlds, or that cannot conceivably be other than they are, we no longer use tensed phraseology. The timelessness of mathematical truths is simply the non-sensicalness, the meaninglessness, of saying things like "7 + 7 was 14" or "A triangle was a three sided object." This is non-sensical because it implies that it could have been otherwise: to say that X was the case has the connotation that X might not have been the case. But if the ascription of this sort of timelessness to necessary truths is justified on the above grounds, it leads to a profound incoherency when applied to a living god. Action, thought, and indeed the very notion of living cannot be made sense of in an atemporal context. On account of this incoherency, God's life cannot be timeless but only sempiternal. As we will see in what follows, this understanding of eternity plays an important role in seventeenth-century philosophy, though it is one to which Leibniz is steadfastly opposed.

Rejecting eternity as sempiternity, others have opted to equate it with timelessness. God is timeless in that, to use the characterization of Leftow,

> God does not change: what changes first has, then lacks, some property, and so must exist at least two times. Thus a timeless God never learns or changes His attitudes or plans … God's life lasts forever in the sense that at every time, it is true to say that, timelessly, God exists. Yet in itself, God's life is neither long nor short. We may say that a timeless God is forever unchanging. But from His own perspective, He knows and does what He does in the flash of a single now. A timeless God lives His whole life in a single present of unimaginable intensity (1999, 257).

For a timeless God there is no past or future, no later or earlier, no beginning or end. A timeless God does not and cannot alter, not even in the limited sense of having part of its life change from being future to past. God's life is wholly present in a single now, though one must bear in mind that terms like "present" and "now" have no temporal signification. Timelessness is evidently unlike sempiternity: God's actions are neither before nor after any event within the world (though the effects of God's actions may be), and no state of God is temporally related to any of his other states.

The distinction between eternity as sempiternity and eternity as timelessness is of primary importance, yet there are further distinctions within eternity as timelessness that can be made. I have in mind the contrast between two different kinds of timelessness discussed by Norman Kretzmann and Eleonore Stump in their now seminal "Eternity." On the first, eternity is a "pointlike and unextended" existence. The difference between eternity and time is like that between a point and a line. What is eternal lacks a beginning and end, is in complete, simultaneous possession of its life at once, and is not temporally distended in virtue of having a pointlike existence. What is temporal is strung out, or distended, in time in a way similar to a line being extended in space.

The second understanding of eternity as timelessness is atemporal duration. The coherence of this notion has been defended by Kretzmann and Stump, who argue

that the key to understanding what eternity really is to be found in a correct understanding of the classical tradition, and in particular a correct understanding of Boethius. The Boethian definition with which they start is this: Eternity is the complete possession all at once of illimitable life. There are four key facets of this definition on which Kretzmann and Stump focus. The first is that anything eternal has to have life. With this part of the definition, one can rule out many kinds of things from being eternal: Platonic Forms, numbers, universals, mathematical truths, or scientific laws of nature. The second facet is the one that is most central to their argument, and the one that has been gotten wrong by the commentary tradition. Eternity is not only a life, but is also an *illimitable* life. What does this mean? That it is without limit, obviously. But what does this entail? That the magnitude have neither a beginning nor an end, neither a first member nor a last member, and that for any given element in the series, there is both a prior and posterior element. More simply, it requires, according to Kretzmann and Stump, the series to be extended infinitely in each direction. One might maintain that life is illimitable in virtue of having no extent or duration whatsoever, and that the life of an eternal thing is that of an instant or a point. Instants and points have no extension at all, and what has no extension can have neither a beginning nor an end. Kretzmann and Stump hold that this is not right, and that it "is natural" to assume that illimitable life means a life of infinite duration, or a life that is unlimited in either direction. Suffice it to note at the moment that we have two distinct concepts of the illimitability of life: one as an instantaneous moment, the other as infinite duration. To this point, atemporal duration – infinite duration, duration with neither beginning nor end – looks strikingly like sempiternity. So how does atemporal duration differ from sempiternity? Boethius thinks of eternity as being atemporal, and atemporality ultimately comes down to "*the complete possession all at once*." It is this that makes the duration of eternity a properly eternal duration, and not a temporal duration. In temporal duration, the events constituting that duration occur sequentially, and nothing can be said to possess such a duration *all at once*. In eternal duration, duration is atemporal in that there is no future or past, no change, no becoming, no earlier or later. These kinds of temporal relations, and the concomitant concepts of change and mutability, have no applicability to what endures atemporally.[18]

For the sake of terminological convenience, I will refer to eternity as point-like timelessness simply as "eternity," and to eternity as atemporal duration as "atemporal duration."

To recap, God's relation to time can be understood in three distinct ways. In two of these ways – eternity and atemporal duration – God is timeless. On both of these views, God acts in such a way that the effect of the action can be located in time, even though the action itself cannot be located in time. Given God's timelessness, it is consistent to maintain that God brought it about that a temporal object came

[18] Kretzmann and Stump summarize this notion of eternity as follows: "If anything exists eternally, it exists. But the existing of an eternal entity is a duration without succession, and, because eternity excludes succession, no eternal entity has existed or will exist: it *only* exists. It is in this sense that an eternal entity is said to have present existence" (434).

into existence yesterday, even though God did not yesterday bring it about that a temporal object came into existence. What is more, the action whereby God brings about the existence of something is neither earlier nor later than the thing's existence. If God is sempiternal, on the other hand, different moments of God's life are extended over a successive series of moments, each of which is simultaneous with a different moment of the world.

8.2.2 The History of God's Eternity

Among Leibniz's medieval predecessors, the most common argument for asserting God's eternity rests upon a purported connection among being, immutability, and eternity. Specifically, it is claimed that since God is perfect being lacking in nothing, God must be immutable, and for God to be immutable, God must be eternal. God's eternity follows from God's nature as being, or, to use Leftow's phrase, God's nature as "truest existence." The clearest formulation of this line of reasoning is to be found in the works of Augustine and Aquinas. It is a central tenet of Augustine's thought that "God … truly exists because he is unchangeable" (O 8.780). To say of something that it "truly exists" is semantically equivalent to saying of it that it is "unchangeable," an equivalence for which Augustine argues in the following manner[19]:

> That which is changed does not retain its own being, and that which can be changed, even if it is not actually changed, is able not to be that which it had been. For this reason, only that which not only is not changed, but also is even unable to be changed in any way, is most truly said to be (*Oeuvres*, 15.428).

> Being is a name for immutability. For all things that are changed cease to be what they are, and begin to be what they were not. Nothing has true being, pure being, real being, except what does not change … What does "I am who am" mean but "I am eternal. … I cannot be changed"? (*Oeuvres*, 38.65).

Immutable things exist more fully than mutable things because the latter are lacking in part of their being: what changes is no longer what it once was and is not yet what it will be. The connection between being and immutability is hardly novel with Augustine, being traceable back at least to Parmenides, and recurring again in the thought of Plato and later Platonists. But within the Christian theological tradition, Augustine is perhaps the first to systematize it in a way that is designed to establish God's eternity.[20] As the second passage makes clear, God's nature as truest existence entails not only his immutability, but also his eternity. More exactly, it entails his eternity because it entails his immutability: God's timelessness is a

[19] Many of the below translations are taken from Leftow (1991), Chapter 5.

[20] Swinburne (1977, 217) contends that the "doctrine of divine timelessness is very little in evidence before Augustine. The Old Testament certainly shows no signs of it … The same applies in general for New Testament writers."

consequence of his necessary changelessness. It is important to note that Augustine is not arguing that God is eternal because he *does* not change, but because he *cannot* change: " 'I am eternal … I cannot be changed'." Perhaps Augustine thinks that since anything that is temporal does change (at least in the sense of having a past and a future), it must be able to change, and to not be able to change means that it is not temporal.

This defense of God's eternity is restated by Aquinas in the *Summa Theologica*: "being eternal follows from immutability … Hence since God is maximally immutable, it supremely belongs to Him to be eternal" (ST I.10.2). As with Augustine, the principle reason why God must be eternal is because he is immutable. God, in turn, is immutable because he is pure act "without any admixture of potentiality," is, as simple and not compounded, completely unmoved, and is lacking in nothing:

> anything in change acquires something through its change, attaining something not previously attained. But since God is infinite, comprehending in Himself all the plenitude of perfection of all being, He cannot acquire anything new, nor extend Himself to anything whereto He was not extended previously (ST I.9.1).

For Aquinas, immutability entails eternity since to be in time is to be mutable. This is so because time just is the measure of motion, or of things that can change.[21]

One other possible reason, on Augustinian grounds, for holding God to be eternal starts from the fact that only present things exist: "How, then, do these two times exist, the past and the future, when the past does not exist now and the future does not yet exist?" In asserting that timeless existence is more genuine than temporal existence, Augustine is in part asserting that timeless beings are more genuinely present (in eternity) than temporal ones are (in time). To elaborate, if something is present and also has part of its existence in the past and future, it is temporal. If it is present and has none of its existence in the past and future, it is eternal. But if this is so, timeless beings are more genuinely present than temporal beings, for they are present without anything lacking by being in the past or future. That is, an unchanging being is fully present in that its entire existence is manifest in its present existence. A changing thing was or will be different than it is now, and so is less fully present at any given moment.

Whatever the merits of these arguments are, they proved less than entirely convincing to many of Leibniz's contemporaries, as those who opted for a univocal understanding of "presence" also eschewed the very notion of timelessness. In his *Immortality of the Soul*, More declared strongly in favor of sempiternity, writing that by "By *Eternal*, I understand nothing here but Duration without end

[21] More recently, Paul Helm has followed Augustine and Aquinas in maintaining that an immutable God is *ipso facto* an eternal God: "A God who acts but is immutable … must be timelessly eternal, since any action in time (as opposed to ac action the effect of which is in time) presupposes a time before the act, and a time when the act is complete, and thus presupposes real change" (Helm, 90). For criticisms of these kinds of arguments, see Swinburne (1977, 210), who argues that the coherence of theism requires that God be eternal in only the sempiternal sense.

or beginning" (21). Similar statements are to be found in the works of Newton and various Newtonians. In a manuscript from the early 1690s, Newton starts with the assumption that "Time and Place are common affections of all things without which nothing whatsoever can exist," adding that everything is "in time as regards duration of existence … what is never and nowhere is not in the *rerum natura*" (1978, 117). From the context of the passage, it is clear that Newton in no way intends to exclude God from this generalization; God can no more exist outside of time than can the ordinary physical objects of Newtonian mechanics. Newton acknowledges that timelessness has a kind of pre-theoretical appeal, given the fact that the "human race is prone to mystery, and holds nothing quite so holy and perfect as what cannot be understood" (1978, 121). Yet God's timelessness is neither philosophically coherent nor Biblically supported. Pressing these two points at once, Newton asks his reader to "consider whether it is more agreeable to reason that God's eternity should be all at once (*totum simul*) or that his duration is more correctly designated by the names Jehova and "He that was and is and is to come" (ibid.). Mindful of the supposed connection among divine perfection, immutability, and eternity, Newton attempts to defuse any objections to God being temporal by arguing that perfection does not entail timelessness. This, in turn, is done by maintaining that God is immutable even though he is temporal:

> To exist in time and place does not argue imperfection, since this is the common nature of all things. For the Duration of a thing is not its flow, or any change, but permanence and immutability in flowing time. All things endure insofar as they remain the same at any time. The duration of each thing flows, but its enduring substance does not flow, and is not changed with respect to before and after, but always remains the same (1978, 117).

Newton's point seems to be that to the extent that something endures, it does not change. That is, the endurance of a thing through time presupposes that the thing does not undergo *substantial* change – "its enduring substance does not flow" – for if it did, it would not endure, but would pass out of existence. Hence, if God endures through time, then he remains substantially unaltered. Since being in time does itself imply substantial change, there is no reason, *pace* Augustine, why an immutable entity cannot be temporal. As for accidental change, Newton allows that God's actions "are changed, but that these are changed, and are successively manifested according to the will of that which endures, argues perfection" (ibid.). Newton's God is thus a sempiternal God, one who is permanent in virtue of being substantially unchanged across time, but one who is still very much in time.

Unsurprisingly, Newton's proclamations are echoed in the works of Clarke. Barely able to conceal his scornful contempt for the traditional approach to God and time, Clarke derides those Scholastics who have conceived the eternity of God as

> not a *Real* Perpetual *Duration*, but *One Point* or *Instant* comprehending Eternity, and wherein all things are really co-existent at once. But unintelligible Ways of Speaking have (I think) never done any Service to Religion. The true Notion of the Divine Eternity, does not consist in making past things still present, and all things future to be already come (quoted in Vailati, 20).

It is only in this way that God can be an agent who providentially intercedes in the ordinary course of nature. For Clarke, to make God timeless is not only incoherent, but is also to make it impossible for him to act in time, and so to act in the world. Almost anticipating the arguments of Kneale and Swinburne, Clarke holds that a timeless god "cannot vary his Will, nor diversify his Works, nor act successively, nor govern the World, nor indeed have any Power to will or do anything at all" (quoted in Vailati, 21). A providential God cannot also be a timeless God.

8.2.3 Leibniz on Divine Eternity

In approaching Leibniz's views on eternity, we would do well to recall his account of God's immensity. We saw in Section 8.1.3 that, his general adherence to a theory of univocity notwithstanding, Leibniz denies that God is present in space in the same way that creatures are. God's omnipresence is explained through his ability to act immediately upon all bodies in all places, and this in turn is explained by God's omnipotence. From God not being spatial in the way that creatures are it is natural to infer that neither is he temporal. In what follows, I will argue that this is in fact Leibniz's final position. There are, however, several texts where he appears to favor a sempiternal God. Moreover, even assuming that Leibniz attributes timelessness to God, we are still faced with the question of what kind of timelessness: pointlike or atemporal duration?

A series of writings from the *De Summa Rerum* sounds a decidedly ambiguous note about the nature of eternity, appearing to waver between eternity as sempiterny and eternity as timelessness. In one piece, Leibniz writes

> *Eternity*, if it is conceived as something which is homogenous with time, will be unlimited time; but if it is conceived as the attribute of something eternal, it will be duration through an unlimited time. But the true origin and the inmost nature of eternity is the very necessity of existing, which does not of itself indicate any succession, even if it should happen that what is eternal co-exists with everything … eternity *per se* does not indicate succession (AK 6.3.484).

Leibniz provides us with no fewer than four ways of understanding eternity. First, eternity can be unlimited time itself. Second, it can be the duration of something that lasts for an unlimited amount of time. In both cases, nothing can be eternal without being temporal. The "inmost nature" of eternity, however, involves the necessity of existing rather than unlimited time.[22] But Leibniz's wording here is cautious: if eternity does not "of itself" imply succession, it is not incompatible with it either. Hence Leibniz claims (our third possibility) that what is eternal might happen to co-exist with other things, making it a necessary existent that is temporally distended. As a necessary existent, it would exist at all times, again linking, albeit only accidentally, eternity with sempiternity. Finally, in that eternity does not

[22] It should be noted that around this time, Leibniz endorses Spinoza's definition of "eternity" as "existence itself insofar as it is conceived to follow from the essence of the thing" (L 197).

"of itself" imply succession, something can be both a necessary existent and non-temporal. What I wish to emphasize is that Leibniz holds that even on the strict interpretation of eternity – one that focuses on its inmost essence – something eternal is not *ipso facto* non-temporal, just as it is not *ipso facto* temporal.

Notes from March 1676, only weeks after the above piece was composed, provide little clarification. On the one hand, Leibniz argues that "there is something in space [the immeasurability of God] that remains throughout changes, and this is eternal … there is in matter, as there is in space, something eternal and indivisible" (AK 6.3.391–392). In contending that what is eternal in space is what remains throughout changes, Leibniz has surely committed himself to identifying eternity with sempiternity, for to remain throughout change is a kind of temporal permanence. What is more, it is hard to see how anything in matter or space could be timeless. Yet Leibniz immediately reiterates that the "necessity of existing" does not "express succession, duration, or divisibility" (ibid.).[23]

Whatever ambiguities can be found in these early views, Leibniz decides firmly in favor of eternity as timelessness in his later writings. It is true that within various polemical contexts, Leibniz occasionally concedes that eternity can be understood as either sempiternity or timelessness. In his fifth letter to Clarke, for example, Leibniz writes that "it cannot be said that a certain duration is eternal but it can be said that the things which continue always are eternal, always gaining a new duration" (LC 5.49). Duration itself cannot be eternal since, being successive, it perishes continually, and something cannot exist if no part of it exists. But Leibniz is, by his own understanding, speaking imprecisely in this passage, for as we will see in what follows, the admission that what always endures is eternal is plainly inconsistent with other views propounded in the very same letter.

These other views are set forth most explicitly in a passage already examined in Section 8.1.3, but that is worth revisiting:

> It is true that the immensity and eternity of God would subsist though there were no creatures, but those attributes would have no dependence either on times or places. If there were no creatures, there would be neither time nor place, and consequently no actual space. The immensity of God is independent of space, as his eternity is independent of time. These attributes signify only that God would be present and coexistent with all things that should exist. And therefore I do not admit what is here advanced, that if God existed alone, there would be time and space as there is now, whereas then, in my opinion, they would be only in the ideas of God as mere possibilities. The immensity and eternity of God are things more transcendent than the duration and extension of creatures, not only with respect to greatness, but also to the nature of the things. Those divine attributes do not imply the supposition of things extrinsic to God, such as actual places and times (LC 5.106).

Most relevant for our purposes are Leibniz's statements that eternity is independent of time, and that a necessary condition for the existence of time is the existence of creatures. If God is eternal but can exist without time, then God's eternity cannot be understood in temporal terms. Put differently, the possibility of an eternal God existing without time implies that eternity is not sempiternity. As in the case of

[23] See also his statement at AK 6.3.396 that "absolute existence is eternity or [*sive*] necessity."

space, Leibniz is content to explicate eternity in largely modal terms: If something exists, then it coexists with God. How a timeless God can coexist with creatures is an issue I take up below, so I will not try to unravel this difficulty at the moment. Staying with this passage, Leibniz also asserts that eternity is "more transcendent" than duration with respect to the "nature of things" and not only its magnitude. Though not at all pellucid, this passage is likely best read as positing a qualitative, in kind difference between duration and eternity.

Further evidence for Leibniz's commitment to the timelessness of God is to be found in his portrayals of the nature of God's thought. In contrast to the discursive reasoning of creatures where one thought is given after another thought, the "divine understanding has no need of time for the seeing the connection of things":

> All trains of reasoning are in God in a transcendent form, and they preserve an order amongst them in his understanding as well as in ours: but with him it is only an order and a priori*ty of nature*, whereas with us there is a priori*ty of time* (Theodicy, 192).

Or again, later in the *Theodicy*:

> One says that the decrees of God have an order among themselves. When one ascribes to God (and rightly so) understanding of the arguments and conclusions of creatures, in such sort that all their demonstrations and syllogisms are known to him, and are found in him in a transcendent way, one sees that there is in the propositions or truths a 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).

God's thoughts are asymmetrically ordered according to the relations of natural priority and natural posteriority. As this is so, some of God's thoughts are logically posterior to others, such that they cannot be understood absent reference to those thoughts that are naturally prior. The natural ordering of God's thoughts does not involve a temporal ordering: a belief that is prior by nature is not prior by time, and a belief that is posterior by nature is not posterior by time. The order of nature, as we have seen in previous chapters, is a merely logical or ontological ordering. While it is an ingredient of temporal relations, it is not itself a kind of temporal order. In contrast to the purely natural ordering of God's thoughts, our thoughts have both a natural and a temporal order. Strictly speaking, nothing Leibniz has said is inconsistent with God being temporal. Why not? Because the foregoing account allows for the possibility that God's thoughts all co-exist at each moment of a temporal existence. At each moment of a temporal existence, God thinks all thoughts, where these thoughts are naturally ordered. There would be no interesting sense in which any one of God's thoughts would be temporally prior or posterior to another, since each would be temporally, if not naturally, simultaneous with all the others. It is possible, therefore, to read these passages in a way that allows for God to be sempiternal. But such a reading is strained at best. Surely the intention of Leibniz's explication of divine thought is to deny to God any kind of temporal successiveness.[24]

[24] On this score, see Leibniz's comment in the *New Essays* that in "the case of eternity, it lies in the necessity of God's existence: there is no dependence on parts, nor is the notion of it formed by adding times" (AK 6.6159).

Leibniz's God is thus a timeless God. But is the timelessness of God to be conceived as a point-like existence, or as a kind of atemporal duration? In a late piece from 1712, Leibniz draws a contrast between space and time, on the one hand, and extension and duration, on the other hand. Space and time considered in themselves are ideal orders of coexistence and successive existence, whereas "duration and extension are attributes of things," and more exactly attributes of things that are temporally and spatially ordered (G 6.584/A 261). Any duration is measurable by time, just as any extension is measurable by space (ibid.). This is reiterated in the Clarke correspondence, where Leibniz writes that things keep their own duration though not their own time: "Things keep their own extension, but they do not keep always keep their space. Everything has its own extension, its own duration, but it does not have its own time and does not keep its own space" (LC 5.46). Though duration and time are distinct, Leibniz is clearly of the view that all and only those things that are temporal can have the attribute of duration. There is nothing in Leibniz's texts to suggest that he countenanced the possibility of an atemporal duration, and much to indicate that he would have found such a notion incoherent.

These conclusions find further support in a series of writings where Leibniz posits a conceptual connection between change and duration. Change, as we have observed in earlier chapters, is simply an aggregate of contradictory states, or an aggregate of two contradictory states, where on state immediately follows the other. Leibniz contends that duration "pertains" to change, a terminological convention that he often employs when explicating what kinds of relations fall under a certain metaphysical category (AK 6.4.399). It is enough for present purposes to note that because duration pertains to change, duration either results from, and is thus dependent upon, or accompanies change: no change, no duration. Given this understanding of duration, God's immutability implies that he cannot endure.

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