10 Leibniz on Infinite Beings and Non-Beings

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Abstract Ohad Nachtomy's paper considers a fundamental metaphysical problem in Leibniz: the relation between infinity and being. Nachtomy argues that, for Leibniz, both a nonactive law prescribing an infinite program of action, and also a source of action or primitive force, are required in order to account for an actual being.

10.1 Introduction

The notion of being has played a central role in philosophy ever since its early days. Against Plato's notion of being, Aristotle has used the notion of substance to account for changes and variations of one and the same thing. The notion of substance as referring to being is especially central for thinkers from the rationalist school, such as Descartes, Spinoza, and Leibniz. Likewise, the rationalists' notion of substance suffered severe attacks from empiricist thinkers, such as Locke, Berkeley and Hume. Famously, Locke mocked the rationalists' notion of Substance as a mere pompous word for "I know not what," resembling children's use of words without having an idea what they mean by it. Hume famously denied a continuous and subsistent notion of substance beyond sequences of distinct perceptions, arguing that any relations between these perceptions much derive from our own mind. And Berkeley went as far as arguing that the notion of material substance is utterly contradictory.

While all this is very familiar to readers in modern philosophy, it seems to me that there is a neglected aspect in the rationalist's notion of substance that calls for

some close attention. What I have in mind is the strong, if under-investigated, connection between substantiality and infinity. For all rationalists, God is an infinite and most perfect substance. According to Descartes, God creates two types of *finite* substance—thinking and extended. According to Spinoza, there is nothing but a unique and infinite Substance, God or Nature, which has infinitely many attributes, each of which has both finite and infinite modes. According to Leibniz, God creates a world (among infinitely many possible worlds) and each world consists of infinitely many substances, and each substance itself consists of infinitely many other substances.

It can be seen from these few remarks that a number of intriguing questions arise when one examines the relation between substantiality and infinity in the context of these rationalist thinkers. Indeed, this is a field of research to which I aim to dedicate a book length project. The present article is something of a chapter within this broader project and its scope is likewise much narrower. It focuses on Leibniz's distinctions between beings and non beings and their inherent relation to infinity.

I will examine various contexts in which Leibniz distinguishes beings from non-beings and various ways in which he articulates this distinction. More specifically, I focus on one of Leibniz's defining features of true beings, namely that they are infinite. I examine a number of contexts in which the notion of infinity plays a significant role. This examination reveals that, according to Leibniz, infinity is a necessary (but not sufficient) condition for being.

The first context I examine is Leibniz's early distinction between infinite number and infinite being, articulated in 1675-76. This early context is formative of Leibniz's usage of these notions as paradigms of being and non-being. The second context is Leibniz's distinction between infinite numbers, which he regards as impossible, and infinite series, which he regards as possible. This leads to the distinction between individuals and their complete concepts, which is the most important case of Leibniz's more general distinction between possible things and actual ones. Thus, I briefly examine the distinction between beings and non-beings in terms of possible things and actual ones. I then examine Leibniz's formulation of the distinction in terms of the difference between beings and beings of reason (*entia and entia rationis*), which will lead us to examine Leibniz's notion of aggregates as an intermediary level between beings and non-beings. After considering Leibniz's distinction between aggregates and substances (formulated and defended during the correspondence with Arnauld in 1686-7), I finally examine his later distinction between natural machines and artificial machines (first formulated in the *Nouveau system* in 1695).

The first case is a particularly interesting case within Leibniz's broader distinction between *entia* and *entia rationis*. The final case is a particularly interesting case within Leibniz's broader distinction between aggregates and individual substances. Since these distinctions and formulations are drawn from successive stages in Leibniz's career—early, middle, and late—they illustrate a general distinction between beings and non-beings that runs in Leibniz's texts and thus expose a general strand in the way he conceptualizes the distinction between beings and

non-beings. Leibniz's distinctions between possible individuals and actual ones and his related distinction between complete concepts and created agents can only be briefly treated here.

However brief, the examination of the contexts mentioned above yields some interesting results. First it shows that infinity, for Leibniz, is a mark of existence, that is, it is a necessary but not sufficient condition. Second, it shows that Leibniz's notion of being requires both logical and metaphysical models of substance. Recent interpretations of Leibniz's notion of substance and more generally his notion of being emphasize different aspects of his complex view. For example, in rehabilitating the tradition of the Russell/Couturaut/Gurwitsch panlogistic conception of substance, Cover and O'Leary-Hawthorne have recently argued that a Leibnizian substance is to be identified with the law of the series that underlies its complete concept (Cover and O'Leary-Hawthorne 1999, 227).[1] By contrast, Fichant (1997), Mercer (2001), and Phemister (2005) have argued that the essential aspect of Leibniz's notion of substance is its inherent capacity to act. While the logical model of substance stresses the texts in which Leibniz defines a substance through its complete concept and law of the series, the metaphysical model stresses texts in which the notions of force and activity are prominent as the defining features of substance.

My survey suggests that neither the logical nor the metaphysical model is sufficient to account for what Leibniz would consider as a being or as a complete entity. Rather, my examination suggests that each model constitutes a necessary but

[1] I use the following abbreviation: Arthur = (Leibniz 2001).

not sufficient condition to characterize the Leibnizian notion of being. I will suggest that both aspects are required for Leibniz's conception of a being, and that Leibniz was employing both models—logical and metaphysical—to account for the notion of being.

10.2 Infinite Number and Infinite Being

In notes and letters from 1675-76 Leibniz compares the notion of an infinite number and that of an infinite being. He notes that "the number of all numbers is a contradiction" (e.g., A 6.3 463; PDSR 7)—i.e. an impossible notion (A 6.3 477; Arthur 53).[2] Leibniz's reasoning on this point derives from Galileo's paradox, namely that the series of natural numbers cannot be equal to the series of their squares. If so, the whole (the series of natural numbers) would not be greater than their part (the series of their squares) and the fundamental axiom of the quantitative sciences would have to be given up.[3] For this reason, Leibniz concludes that the notion of an infinite number is impossible. At the same time, Leibniz famously argues that, in order to prove that the greatest or the most perfect being exists, one has to show that its notion is possible, i.e., that it does not imply a contradiction.

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[2] In a letter to Conring (1677) Leibniz writes: "At qui subtiliores sunt adversarii ajunt Ens perfectissumum tam implicare contraditionem quam numerum maximum" (A 325).

[3] "There comes to mind a similar line of reasoning conspicuous in Galileo's writings. The number of all squares is less than the number of all numbers, since there are some numbers which are non square. On the other hand, the number of all squares is equal to the number of all numbers, which I show as follows: there is no number which does not have its own corresponding square, therefore the number of all numbers is not greater than the number of all squares; on the other hand, every square number has a number as its side: therefore, the number of squares is not greater than the number of all numbers. Therefore, the number of all numbers (square and non-square) will be neither greater than nor less than, but equal to the number of all squares: the

I have argued elsewhere (Nachtomy 2005) that Leibniz's concerns regarding the possibility of the infinite being are motivated by his concerns about the contradiction involved in the notion of infinite number. In this context, it is clear that Leibniz is investigating these notions by comparing and contrasting them, seeking to show that maximum perfection is consistent while maximum in number is not. The contrast between them is as significant as their similarity. While both concepts ('all units', 'all perfections') seem to imply infinite quantity, the concept of the infinite being serves Leibniz as a paradigm of being while the notion of the greatest number serves him as a paradigm of an impossible one.

In a Letter to Oldenburg of December 1675, Leibniz writes:

> Assuming that …a being [whose essence is to exist] is possible or that there is some idea corresponding to these words, it certainly follows that such a being exists. But we believe that we are thinking of many things (though confusedly) which nevertheless imply a contradiction; for example, the number of all numbers. We ought strongly to suspect the concepts of infinity, of maximum and minimum, of the most perfect, and of allness (*omnitnias*) itself. Nor ought we believe in such concepts until they have been tested by that criterion which must, I believe, be credited to me, and which renders truth stable, visible and irresistible…" (Loemker, 257)

The criterion Leibniz refers to here is his demand to provide a real definition or to give a possibility proof to such problematic notions. The case we are considering, the contrast between infinite number and infinite beings, is Leibniz's formative case for the applicability and usefulness of this criterion. Indeed, Leibniz is often using the notion of infinite number as a paradigm for an impossible notion which he *contrasts* with the possibility of the most perfect or infinite being (A 6.3 572;

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whole will be equal to the part, which is absurd" (A 550-51; Arthur, 177). See also A 6.3. 11; Arthur 5.

PDSR 91; A 6.3 325).[4] It need not be surprising that Leibniz is intrigued by this comparison. These concepts have a similar syntactic structure and both seem to imply an infinity or totality of simple elements: attributes or simple forms in God; simple units in number.

Moreover, Leibniz's analysis of the notion of the greatest being is carried out in terms that suggest maximal totality and number, such as "the subject of all perfections" (A 580; Pk 103), "one which contains all essence, or which has all qualities, or all affirmative attributes." In a set of definitions from 1676, (A 6.3 482-84) and in reference to Euclid's definition of number, Leibniz writes: "Number, if it is understood simply as integral and rational, is a whole consisting of units" (A 6.3; Pk 37-38). In the same group of texts he also draws an explicit analogy between God's essence and whole numbers.[5] In this analogy, numbers consist of units and God's essence consists of simple forms or perfections. If, as we have seen, Leibniz defines whole number as consisting of units, then the greatest number would be seen as consisting of all units. Since he defines God as consisting of all essence or all perfections or all positive attributes, the greatest being is seen as consisting of all perfections. Thus, just as there are infinitely many units in the notion of an in-

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4 In a letter to Conring (1677) Leibniz writes: "*At qui subtiliores sunt adversarii ajunt Ens perfectissumum tam implicare contraditionem quam numerum maximum*" (A 325). Leibniz's possibility proof is given in the following passage: "Demonstrationem reperisse videor, quod Ens perfectissimum, seu quod omnem Essentiam contineat, seu quod omnes habeat Qualitates, seu omnia attributa affirmativa, sit possibile, seu non implicet contradictionem. Hoc patebit si ostendero omnia attributa (positiva) esse inter se compatibilia. Sunt autem attributa aut resolubilia, aut irresolubilia, si resolubilia sunt erunt aggregatum eorum in quae resolvuntur; suffecerit ergo ostendisse compatibilitatem omnium primorum, sive irresolubilium attributorum, sive quae per se concipiuntur, ita enim si singula compatibilia erunt, etiam plura erunt, adeoque et composita. Tantum ergo suffecerit ostendere Ens intelligi posse, quod omnia attributa prima contineat, seu duo quaelibet attributa prima esse inter se compatibilia" (A.6.3 572; PDSR, p. 91-93).

finite number, so there would be infinitely many perfections or attributes in the notion of God.

However, if this were the case, Leibniz would have to consider these notions to be equally problematic (or equally unproblematic). Yet, he clearly doesn't. Rather, he considers the notion of an infinite being to be possible, and uses it as a paradigm of a Being, and he considers the notion of an infinite number to be impossible, and uses it as a paradigm of a non-being (not only it does not exist but it cannot exist).[6]

If the notions of all perfections and all simple units are analogous, Leibniz's position is very puzzling. Furthermore, the distinction between these notions plays an important role in other contexts in Leibniz's metaphysics. For example, we know that his later (1679-86) notion of individual substances as well as their complete concepts involve infinity. While the complete concept of an individual involves infinitely many predicates, Leibniz's notion of individual substance involves infinitely many properties as well as relations to infinitely many other individuals. Since he considers individual beings to be possible (as some of them are actual), surely he considers their infinite concepts to be non-contradictory. But, as just noted, he considers infinite number to be impossible. So, to put the question more generally, what is the difference Leibniz sees between the notion of an infinite being (or substance)—created or not—and that of an infinite number?

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[5] See Nachtomy (2007, chap. 1-2).

[6] In this period (as well as later ones, cf. 1984; DM; NE), it is clear that Leibniz is investigating these notions by comparing and contrasting them. It is arguable that Leibniz's concern regarding the possibility of the infinite being (and perhaps of possibility proofs in general) is driven by his

How can he justify his claim that the notion of infinite being is non-contradictory if that of infinite number is contradictory?

One might suggest that an important difference Leibniz sees between these notions derives from the semantic difference, namely that the one is a notion of a being and the other is a notion of a non-being. While numbers are universal, divisible, and may be composed by a conjunction of units; beings, for Leibniz, are individual (that is, unique), active and indivisible. While beings for Leibniz must be active agents, numbers are not active. Rather, numbers are understood as abstractions in the minds of agents.

Unlike the notion of a number, the notion of God (and, in fact, of any true being, of which God is the most perfect) is, according to Leibniz, a notion of something that is not produced by composition of parts, that is, it is not something that is made up (per impossible) by composing or conjoining an infinite number of units or perfections. God (and any created Leibnizian being) is not a sum of perfections. In fact, a being for Leibniz is not a sum at all; rather, it is an active agent and, in this sense, it is one and indivisible. The whole agent acts and his action is not a sum of the actions of its constituents. Such a unity cannot be fully defined in terms of its constituents and in this sense admits of no parts. If so, one clear difference between numbers and beings is that a being has unity and activity while a number does not. In other words, a number is not an entity because it is neither one nor active. And so, even if it is unclear whether Leibniz is entitled to this distinction (see Nachtomy 2005), it seems quite clear that, for him, not only infinity

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concerns about the contradiction he discerns in the notion of infinite number, most rapid motion,

but also activity and unity must characterize being. As we shall see, this conclusion is supported by the other contexts of our survey.

Another interesting question that arises from the comparison between the notion of infinite number and that of infinite being is whether the kind of infinity Leibniz ascribes to complete beings and true units is the same as that he ascribes to non-beings. My conjecture is that it is not. I will examine and reformulate this conjecture in the course of this paper through a number of examples and contexts I turn to consider.

10.3 Infinite Number and Infinite Series

Let me begin with a particularly illuminating example. While Leibniz rejects the notion of an infinite number as contradictory, he accepts the notion of infinite series of numbers. Indeed, the notion of a series plays a central role in his development of the infinitesimal calculus. This gives rise to the following question: What is the difference Leibniz sees between infinite series and infinite series of numbers, such that the one is consistent and acceptable while the other is contradictory?

One crucial difference can be clearly stated: the notion of an infinite series avoids the contradiction of an infinite number because it is not defined as a collection of units but rather according to its law of generation. A series is not defined as a sum of units but according to its rule of production—a kind of machine whose

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and its likes. See my (2005).

activity produces well-regulated results.[7] Leibniz employs here his notion of generative definition, which he is also using to provide real definitions, that is, in demonstrating that a given concept is consistent. In this sense, to define *x* is to construct a concept of *x*, which also demonstrates its self-consistency (just as we have seen that Leibniz demands in the context of proving the possibility of the '*Ens Perfectissimum*' and disproving that of an infinite number).

Let us examine the difference in Leibniz's approach to infinite numbers and infinite series in a bit more detail. For simplicity's sake, we can contrast two very intuitive notions, the notion of an infinite number and the series of natural numbers. It is crucial to observe that Leibniz does not see the series of natural numbers as a collection of units but rather gives it an operative definition. His definition is given through a procedure that *generates* the series, so that the successive number results from the addition of "one" (cf. e.g., NE 4.2.1). The reiterability of this procedure implies that it can be carried on without limitation. For Leibniz, this shows the intelligibility of the series of natural numbers. But it also reveals something essential to Leibniz's analysis of infinity in this context, namely that it is bound up with a notion of activity or, more precisely, with a possible activity of an agent, namely, the possibility of continuing to apply the procedure. Thus, while an infinite number is not seen as a sum of units, i.e., it is not a whole, one can speak of the law generating a series, seen as a definition *in act*, and thus as what gives the series its unity and intelligibility. Thanks to its formation law, one can speak of a series rather than of an aggregate of units.

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7 "A series is a multitude with a rule of order" (A 6.4 1426).

This point reveals a profound aspect about the way Leibniz conceives of numerical infinity and the extent (as well as the exact sense) of its intelligibility. It is instructive to recall Yvon Belaval's insightful remark on this point. Belaval has suggested that Leibniz's definition of 'number' is operative. According to Belaval, this definition implies that

> le nombre, tant que relation, n'a de réalité (et de possibilité) que pour autant qu'il est pensé. C'est donc du côté de l'esprit qu'il faut chercher la source de l'infinité numérique: d'une manière plus précise, c'est l'infinité actuelle de l'esprit qui rend compte de l'infinité virtuelle de toute suite numérique. (Belval 1960, 270)

Belaval's remark goes down to the heart of Leibniz's views on infinity and being. The way Belaval presents this point shows that numerical infinity can only be placed in the context of the actual thoughts of an active mind. In this sense, the reality of infinite (in the quantitative sense) notions presupposes the reality of the mind thinking them. This sort of conceptualism about abstract entities, such as number and relations, is a familiar theme in Leibniz.[8] Yet the far-reaching consequences—especially for our current purposes of distinguishing between infinite beings and infinite non-beings—are not sufficiently appreciated. In light of this definition, the series of natural numbers can be seen as infinite to the extent that it presupposes a mind that would go on to add units. In other words, the method of production presupposes a producing (thinking) agent.

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8 As Couturat nicely points out (1961, 471; my translation), "one can say that Leibniz remains a nominalist in an entirely negative sense, namely that he rejects realism and denies universals a real and substantial existence. But he does not thereby refuse to assign them objective value, like the nominalists who reduce them to names. Rather, he adapts and intermediate position, which one designate by the name *conceptualism*,…" As Mugnai notes (1992, 25), "there are no ideas without the intellectual activity of someone thinking (be it God or man or some other rational being)."

This conceptualist approach explains why Leibniz argues that infinity is to be regarded as merely potential in abstract and mathematical contexts. This potential type of infinity does not apply to the infinity of beings, which are active thinking agents, whose activity is non-discrete and whose infinity (and perfection) is not potential but actual. This difference corresponds to the qualitative feature of active agents as distinct from the quantitative feature of a number as a sum of units. Hence, in the realm of beings, infinity is regarded not *in potentia* but rather *in act*. By contrast, in the realm of non-beings, infinity is understood as potential.

This point gives rise to a neat division (which I will attempt to corroborate in the sequel): the type of infinity Leibniz ascribes to being is different from that he ascribes to non-beings. In particular, one type of infinity applies to thinking beings and another applies to thoughts. While the one is quantitative and discrete, the other is qualitative and indivisible. This difference is strongly related to their metaphysical difference. We can now better describe the origin of this division and its place in Leibniz's metaphysics, namely as rooted in the difference between actual thinkers and potential thoughts. As we shall see, this point reoccurs in a variety of context in Leibniz's metaphysics.

10.4 Complete Concepts of Individuals and Created Individuals

Like the generative definition of the natural numbers, Leibniz also uses the notion of the 'law of a series' at one of the most central points of his metaphysics. The notion of the law of a series is used to define not only series of numbers but also beings—that is, individual substances. As is well known, Leibniz holds that

every created being, that is, every individual substance, is defined through its own law of the series. This indicates at once that all Leibnizian beings other than God are also infinite and are defined and individuated through their unique law of generation.[9]

At the same time, we also know that, according to Leibniz, each individual has a concept so complete that it entails all its predicates. In other words, the complete concept of the individual includes anything true of it (*Discours métaphysique* 8 and 13). It goes without saying that such a concept is infinite. This gives us another sharp contrast between an infinite being (an individual) and an infinite non-being or its conceptual counterpart. In other words, this is yet another clear articulation in Leibniz's metaphysics of the contrast between a concept and an agent. It goes without saying that a concept of an individual must be consistent. This is obvious because, if an individual exists, as many surely do, then they must also be possible, that is, they must have consistent concepts or perfect representations in God's understanding. And, indeed, this is what Leibniz illustrates with his famous examples of the concepts of Alexander and Caesar in the *discours métaphysique* and the ensuing correspondence with Arnauld.

Leibniz, however, is somewhat less explicit about how such infinite concepts of individuals are to be defined. Since I have written about this topic at length elsewhere, let me just emphasize one point here. Leibniz is very explicit that the

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[9] "The law of order... constitutes the individuality of each particular substance" (GP IV, 518; L 493). "For me nothing is permanent in things except the law itself… The fact that a certain law persists, which involves the future states of what we conceive to be the same – this is the very fact, I say, that constitutes that same substance" (GP II 263- 64; L 534-35). See also *Theodicy* 291.

concept of an individual involves (or includes) infinitely many predicates, which all serve to define the whole career of an individual—past, present, and future. Thus, each predicate is an essential component of the definition of that individual. However, if such a concept would be seen as a mere conjunction of predicates or as a set of infinitely many predicates it would turn out to be contradictory, just as that of an infinite number of units. For this reason, it seems more likely that Leibniz thought about the infinite concept of an individual along the lines that he thought about an infinite series, i.e., as defined by its law of generation.[10]

In fact, I would suggest that this is why Leibniz has found the notion of the law of the series attractive in the first place. I shall argue later that the law of the series suffices to define the concept of an individual but that it is not sufficient to define an actual individual. An actual individual also involves inherent force as a source of the individual's activity. (More on this later.)

In fact, this comparison between the complete concept of an individual and an actual individual illustrates the most fundamental case in Leibniz's metaphysics, namely a case in which both beings and non-beings are infinite and both play an indispensable role in defining the things that exist in our world. One might say that this comparison brings us to the very heart of the positive aspect of Leibniz's metaphysics. At the same time, it shows the double face of Leibnizian beings: on the one hand, they have consistent individual concepts; on the other, they exist only as active agents.

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[10] See Nachtomy (2007, chapters 1-2).

10.5 Possible Things and Actual Things

This point is strengthened when we note that the contrast between individuals and their complete concepts expresses a more general distinction in Leibniz's metaphysics, namely that between possible things and actual ones. There is no need to stress here the centrality of these notions in Leibniz's metaphysics. Let me just remark that, after all, complete concepts are used as a different way to talk about and understand the notion of possible individuals, which, if actualized, become individual substances. As we know, for Leibniz such substances make up the ontology of the created world. Whatever else there is in the created world (including extension, space, and time) is parasitic on the existence of individual substances (and, for this very reason, extension, time, and space are not considered as true beings).

At the same time, it is worth noting that the space of possibilities, for Leibniz, is broader than that of concepts of individuals. For example, it includes concepts of individuals that are merely possible (i.e., which will never be actualized); possible worlds which will never be created; concepts, relations, and proportions, which are merely intelligible (that is, consistent) but, since they are not concepts of individuals, they are not even candidates for existence. Since the realm of the possible includes any idea or thought that is non-contradictory, it is obvious that the space of possible things is far more inclusive than that of actual ones. In particular, it obviously includes both infinite and finite notions. This illustrates that we find both infinite and finite items in the realm of non-beings or possibilities, which are merely conceived in the understanding—either human or divine. By

contrast, true beings, for Leibniz, are always infinite. This brings us to another fundamental way to articulate the distinction between being and non-beings in Leibniz's metaphysics.

10.6 Entia and entia rationis

The traditional distinction between *entia* (beings) and *entia rationis* (beings of reason) is very instructive for clarifying the way Leibniz articulates the distinction between beings and non-beings, and especially so in clarifying which kind of infinity is applicable to each one of them. While this distinction is a commonplace, it is very interesting to observe the role it plays in the context of Leibniz's metaphysics.

It is first important to observe that the realm of *entia rationis* for Leibniz is not only immense but also includes the objects of some of the most important sciences. Thus, possibilities, concepts, and relations are classified as *entia rationis*, but also the objects of mathematics (numbers, relations, proportions) and geometry.[11] It is clear that *Entia rationis*, for Leibniz, are not fictions or mere figments of the imagination. As we have seen, they are not impossible entities but rather consistent thoughts and concepts (either human or divine). Thus numbers, shapes, and, in effect, all universal concepts are for Leibniz incomplete beings. Such incomplete beings are either abstractions from concrete beings or constructions of simple beings.

[11] "Numbers, modes, and relations are not entities" (A 6.3 463; Pk 7).

Thus, it turns out that for Leibniz, some non beings, such as series, lines, relations, proportions are mental abstractions that may develop (or divide) to infinity. This is so because they are considered in the first place as products of some thinking beings, hence, as abstractions and thoughts rather than as concrete things. Thus a series such as ½, ¼, 1/8, 1/16… is infinite in the sense that someone could go on, according to a rule. But beings, such as God and created substances are infinite in a different sense, namely, they are infinite in act, not in *potentia* because they are concrete indivisible and perfect wholes, either in their kind (in the case of created substances) or absolutely perfect (in the case of God).

This nicely explains Leibniz's articulation of the distinction between ideal and real, abstract and concrete things, such that, while possible things admit of potential infinity, existing things admit of actual infinity. This distinction is usually drawn in the context of divisibility to infinity. But it seems to apply more generally, so that it cuts through infinite beings and non-beings. Abstract and ideal things are potentially infinite; concrete and real things are actually infinite. As I noted, however, they are not infinite in the same sense: while abstract and ideal things are infinite in a quantitative (and divisible or discrete) sense; concrete and real things are actually infinite in the qualitative (indivisible and non discrete) sense of activity and perfection.

Along these lines, it seems that we can distinguish between

1. Infinity of thoughts, which is abstract and potential, and which pertains to concepts, series, ideas, relations, possibilities, and other *entia rationis*.
2. Infinity of thinking (beings), which is concrete and actual, and which pertains to substances alone, either created or not.

3. An intermediate level: infinity of thoughts and thinking beings, which is semi mental and semi concrete. This level pertains to aggregates and relations, which are founded in a multiplicity of real things but whose unity derives from a mind perceiving them all together, which is why they are considered to be semi mental and semi real. The final two sections of my survey in this article are dedicated this intermediate category.[12]

10.7 Aggregates and Substances

As I noted, the unity of beings and their non-compositional nature play an essential role in Leibniz's distinction between created, individual substances, which are one and active, and aggregates, which are neither one nor act as one agent. According to Leibniz, aggregates, such as woodpiles and armies, are beings by aggregation and therefore are not truly one. While one may ascribe activity to their constituents, they do not act as a single agent but as an aggregate of many agents. In fact, it seems more precise to say that they do not act. By contrast, true beings are not composed and are truly one. For example, Leibniz writes that "...no entity that is truly one [*ens vere unum*] is composed of parts. Every substance is indivisible and whatever has parts is not an entity but only a phenomenon."[13]

Let us now attend to the difference between the way a number is said to result from a composition of units (which we have considered in the first section) and the way an aggregate results from a composition of parts. A major difference stems from the fact that what is being composed (or aggregated) in aggregates are real constituents whereas, in numbers (as well as other abstractions), what is being

[12] There are two other important distinctions that I can only mention here: (1) Leibniz's distinction between complete and incomplete beings, and (2) his distinction between the abstract and the concrete. See texts in Rauzi's collection.

composed are possible (but not actual) constituents or parts. This distinction becomes all the more significant in the context of infinity. Unlike a number (and an aggregate), a being, for Leibniz, is not defined quantitatively or compositionally; rather, it is defined through a basic capacity to act or what Leibniz calls its primitive force (or to which he sometimes refers to as its Entelechy).

Yet, as Levey notes, there are also close connections between Leibniz's approach to the question of infinite number and that of aggregates.

> Leibniz construes cardinal numbers (other than 1 and 0) as aggregates of 'unities' or 'ones' (e.g., 6 = 1 + 1 + 1 + 1 + 1 + 1) and he views them as applying to aggregates of things taken as a whole rather than to uncollected things taken as so many individuals. Where the number 1 or unity applies to an individual thing, the number 5 applies to an aggregate 'whole' with five 'parts' (what we would probably consider to be a *set* with five *members*). So in his view, the infinite cardinal number is bound up with the concept of an infinite aggregate or whole in two ways. First, an infinite number itself would count as an infinite whole; and second, such a number would apply to infinite aggregates or wholes. Consequently, the concept of an infinite number is also doubly bound up with Galileo paradox: both the number and what it *numbers* would violate the part-whole axiom, if either were to exist." (Levey 1998, 103)

Leibniz denies that any of these exists precisely because neither can be considered to be a whole. As he writes, "an infinity of things is not one whole, or […] there is no aggregate of them" (A.6.3 503), which is in contrast with a passage referring to God, namely, that, "an infinite whole is one" (A.6.3 474; Arthur 49), and in contrast with Leibniz's claim that an organic being consists of infinitely many others. While Leibniz does not deny that we can talk about infinitely many things (if only syncategoretmatically), he denies that an aggregate of such things is a being.[14] In this respect, the distinction between an infinite number and an infinite being seems

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[13] Quoted in Brown (2000, 41).

[14] In his mature philosophy, Leibniz defines the world as an aggregate of finite things (*aggregatum rerum finitarum*) (cf. GP VII, 302). Similarly, in his letter to Gabriel Wagner of March 3

to be analogous to the distinction between aggregates, which Leibniz does not regard as true beings, and individual substances, which he regards as true beings. This is the case because beings are not aggregated or composed but are indivisible active units. This is explained through the definition of individuals by their inherent laws of action which are one and indestructible. They are not composed or constructed of more basic constituents but are created as active infinite beings whose constituents can be considered by abstraction (but not by decomposition).[15]

The contrast between beings and non-beings gives rise to Leibniz's three-fold distinction between indivisible individuals, real or well-founded phenomena, and mere phenomena, which are incomplete *entia rationis.*

> A *suppositum* is either an *individual* substance, which is a complete entity, one in itself, such as God, a mind, the ego; or it is a real phenomenon, such as a body, the world, a rainbow, a woodpile. We conceive the latter on the model of a complete substance, but since body—unless it is animated, or contains within it a certain single substance, corresponding to the soul, which they call a substantial form or primary entelechy—is no more one substance than a woodpile; and since again there is no part of it which can be regarded as a unity in itself (since body is actually subdivided, or certainly subdivisible, into parts), it is a consequence that every body will only be a real phenomenon, like a rainbow. Similarly mathematical things, such as space, time, a sphere, an hour, are merely phenomena, which we conceive on the model of substances. And accordingly there is no real substance which is not indivisible one. And indeed, it may be that those things that are divisible and consist in magnitude, such as space, time, and bulk, are not complete beings, but must have something superadded to them, which involves all those things that can be attributed to this space, this time, this bulk. (A 6.3 132; Arthur 265-67)[16]

1698, Leibniz defines the world as an aggregate of changeable things or things that are susceptible of imperfection (cf. Grua, 396 ; Adams 1994, 15).

[15] I believe that this is the reason why what Levey has recently called 'the construction problem' rests on a misconstrued version of Leibniz's view of being and unity (Levey 2007, 64-66).

[16] "The aggregate of all bodies is called the *world*, which, if it is infinite, is not even one entity, any more than an infinite straight line or the greatest number are. So God cannot be understood as the *World Soul:* not the soul of a finite world because God himself is infinite, and not of an infinite world because an infinite body cannot be understood as one entity, but that which is not an entity in itself has no substantial form, and therefore no soul. So Martianus Capella is right to call God an extramundane intelligence" (A.6.4 1509; Arthur 2001, 287).

As we have seen above, Leibniz does not deny that infinity applies to complete beings. Rather, according to Leibniz, infinity is one of the defining features of beings—both created and not. For example, we know that he characterizes organic beings as nesting infinitely many such beings, and we know, furthermore, that his very distinction between artificial machines, which he does not consider as true beings, and natural machines, which he considers as true beings, turns on the fact that natural machines have a nested structure to infinity (see next section). But, as we have also seen, the sense in which infinity qualifies beings cannot apply to the quantitative aspects of magnitude and the number of their constituents (for otherwise they would be as contradictory as the greatest number). It is partly for this reason that, as we have seen, Leibniz does not define created beings as sums of their predicates or as combinations of their constituents but rather through their unique method of production or their law of formation.[17] Since Leibniz is fully aware of the impossibility of an infinite sum of predicates or perfections, he does not identify the principle of individuation with a unique sum of predicates but with its method of production. Leibniz's genetic definition of beings explains how a thing is produced through its formation law.[18] By defining a being through its formation law Leibniz can hold that a being is both one and infinite at the same time.

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[17] A corollary to this view is Leibniz's definition of infinite series. He does not define infinite series as a sum of numbers but as a product of its formation rule. In this connection, see Couturat's interesting discussion (1973, 476). Couturat cites this passage from the letter to des Bosses (of 11 March, 1706): "Neque enim negari potest, omnium numerorum possibilium naturas revera dari, saltem in divina mente, adeoque numerorum multidudinem esse infinitiam."

[18] See Gurwitsch (1974, 65-72), section II d., on Generative Definitions.

However, as we have seen, Leibniz applies genetic definitions to mathematical things such as infinite series as well as to concepts of individuals. As Couturat already pointed out, Leibniz defines infinite series according to their laws of production. By Leibniz's lights, an infinite series is, like a number, a mathematical abstraction, a being of reason, not a true being. Hence, a law of production is not sufficient to distinguish between infinite beings, such as Leibnizian individuals, and infinite non-beings or abstractions, such as mathematical series, possible individuals or concepts of individuals. This observation is supported by Leibniz's practice to define concepts of individuals (which are clearly distinguished from existing individuals) by their laws of production.[19] Since the law of production is applicable to concepts as well, it must be regarded as a necessary but not sufficient condition for characterizing Leibnizian beings. In addition, according to Leibniz, a being must also be active and entail its source of activity. Nonbeings, such as infinite series and possibilities, are not active but are rather conceived by a different mind—divine or human. Hence, they are regarded as *potentially* infinite. They *can* be divided or be composed to infinity. This is consistent with Leibniz's acceptance of infinite beings that are true substances and his conception of infinite numbers as impossible beings, numbers as *entia rationis*, and aggregates as semi-beings or well founded phenomena. Much more needs to be said about these distinctions than I have space here. But let me just note that the notion of syncategormatic in-

[19] I have argued for this point in my (2002, 31-58).

finite is available for Leibniz to characterize such concrete multiplicities as aggregates.[20]

Leibniz's acceptance of infinite beings (God and individual substances) and his rejection of an infinite number (and the above observations) seem to indicate that activity, unity and infinity are all necessary requisites for a Leibnizian being. In addition, his rejection of aggregates as true beings indicates that infinity is not the distinguishing feature between aggregates and substances since both involve an infinity of substances (if, as hinted above, the infinity ascribed to substances and aggregates is of different sense). Rather, what accounts for the distinction between aggregates and substances seems to be their source and type of unity. While the unity of aggregates is external, the unity of individual substances, which also consist of infinitely many constituents is intrinsic. This point is made even more explicit in the context of Leibniz's distinction between natural/organic machines and artificial ones to which I now turn.

10.8 Natural Machines and Artificial Machines

As Fichant notes, Leibniz introduces the concept of "natural machine" in the *Système Nouveau de la nature* (1695) as a mean to limit the claims of a mechanistic approach, which confuses the natural with the artificial. Particularly relevant is Descartes's program to describe animals as subtle machines that lack any internal

[20] For the origin and the meaning of this doctrine, see Leibniz (2001), Richard Arthur's introduction.

power.[21] By contrast, Leibniz's agenda may be seen as an attempt to revive the Aristotelian distinction between animate and inanimate things in "an intelligible way" and resist the reduction of natural machines to artificial ones.[22] It is with this aim in mind that Leibniz draws the distinction between artificial and natural machines in the System Nouveau. Fichant points out that, according to Leibniz, the difference between nature and art is marked by two traits: composition to infinity, which guarantees indestructibility, and true unity, which is the foundation of substantiality in natural machines (Fichant 2003, introduction). As Leibniz writes,

> Il faut donc savoir que les machines de la nature ont un nombre d'organes infini, et sont si bien munies et à l'épreuve de tous les accidents, qu'il n'est pas possible de les détruire. Une machine naturelle demeure encore machine dans ses moindres parties, et qui plus est, elle demeure toujours cette même machine qu'elle a été, n'étant que transformée par des différents plis qu'elle reçoit, et tantôt étendue, tantôt resserrée et comme concentrée lorsqu'on croit qu'elle est perdue.
>
> De plus, par le moyen de l'âme ou forme, il y a une véritable unité qui répond à ce qu'on appelle MOI en nous ; ce qui ne saurait avoir lieu ni dans les machines de l'art, ni dans la simple masse de la matière, quelque organisée qu'elle puisse être, qu'on ne peut considérer que comme une armée ou un troupeau, ou comme un étang plein de poissons, ou comme une montre composée de ressorts et de roues. (GP IV, 482)

I have suggested above that these two traits—infinity and unity—derive from a common source—viz., the formation law of the individual, which unifies its infinite constituents. As this text indicates, the distinction between natural and artifi-

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[21] In his *Principles of Philosophy* article 203, Descartes seems to assimilate the artificial and the natural. For him, artificial machines serve as models to explain the natural ones. Natural machines are like artificial ones, except much more complicated. He wants to establish that they are of the same kind. He uses the notion of divine created machines to show that the subtle parts of machines are extremely complex and invisible to us. While both Descartes and Leibniz argue that machines are extremely subtle, Descartes uses this point to argue for his view that, in the final analysis, animals are nothing but subtle machines. By contrast, Leibniz uses this point to argue that there is a categorical difference between them. See also *Les passions de l'ame,* first part, articles 5 and 6 where he writes e.g., that the body has in it "the corporeal source of movement" (art. 6).

[22] See for example, Leibniz's controversy with Stahl (Carvallo 2004, 80), where Leibniz criticizes the Moderns for pretending that "*nihil aliud sit natura corporum quam Mechanismus*" (there is nothing in the nature of bodies but mechanism).

cial machines is a particular case within the general distinction between aggregates and substances. But while Leibniz wishes to stress the difference between the mechanic and the organic, he is very explicit that the only difference between natural machines and artificial ones is the nested structure to infinity of the natural ones. This difference is also related to the intrinsic unity and substantiality of natural things (see GP III, 457). In accordance with Leibniz's commitment to an intrinsic connection between being and unity, the structured ensemble of natural machines must have substantial unity or else it would not differ from mere aggregates.[23] This implies that a natural machine (or an organism) must be united as *one* single substance, as Leibniz states in a letter to De Volder:

> Although I said that a substance, even though corporeal, contains an infinity of machines, at the same time, I think that we must add that a substance constitutes one machine composed of them, and furthermore, that it is activated by *one* entelechy, without which there would be no principle of true unity in it. (AG 175; my italics).[24]

While the particular distinction between artificial and natural machines seems to turn on a nuance, it is in effect highly consequential. One obvious consequence is that a machine of nature is identified with a corporeal substance in counter distinction from an aggregate.[25] Indeed, most of the differences between aggregates and individual substances apply to the distinction between artificial machines and natural ones, which indicates that Leibniz regards the two distinctive traits of natural machines—infinity and unity –as distinctive features of beings. But this is not

[23] "…since I am truly a single indivisible substance, unresolvable into any others, the permanent and constant subject of my actions and passions, it is necessary that there be a persisting individual substance over and above the organic body" (Comments on Fardella, AG 104).

[24] See also GP II 252; GP VII 502 and C 13-14.

[25] Je ne compte pour substances corporelles que les machines de la nature qui ont des âmes ou quelque chose d'analogique; autrement il n'y aura point de vraie unité (A Jaquelot, 22 mars 1703, GP III, 457).

the place to expand on this fascinating topic.[26] It is rather time to conclude this paper.

10.9 Conclusion

The distinctions and contrasts considered above support the following general conclusion: a being, according to Leibniz, requires both a law generating an infinite series and primitive force or power of action.[27] The first set of examples, contrasting an infinite number with an infinite being, shows that, while both notions are infinite, an infinite being does not have a compositional or additive unity but rather requires primitive unity. While this is to be expected in an example that contrasts real beings with ideal numbers, we see similar reasoning (and conclusion) in the context of the real and concrete things, that is, in the contrast Leibniz draws between aggregates and individual substances. The unity of individual substances is lawlike and internal, the unity of aggregates is external in requiring a mind to perceive the various relata (e.g., sheep) as one thing (e.g. flock). This point is confirmed by the fact that Leibniz's distinction between artificial and natural machines turns on the infinite nested structure of the natural, whose law of generation also functions as its source of unity. As the first contrast makes clear, as well as Leibniz's view of actualization and many texts confirm, a law is a necessary (but not sufficient) condition for a complete Leibnizian being—power of action or primitive force are required as well. In this sense, both models—logical

[26] See Fichant (2003) and Duchesneau (1998). I investigate the distinction between natural and artificial machines in detail in a forthcoming article.

and metaphysical—are required for Leibniz's conception of being. While the logical model may account for the notions of some infinite non-beings, such as infinite series and concepts of individuals, power and activity are indispensable aspects of a Leibnizian being as well.

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[27] I have reached similar conclusion in my (2007, chp. 5).