Leibniz's Philosophical Methodology and His Philosophy

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1. INTRODUCTION

Throughout his mature career, Leibniz seems to have advanced at least two theories about reality, namely the theory of corporeal substances and the theory of monads. One of the main endeavors in recent Leibniz scholarship has been to understand whether the mature Leibniz seriously entertained more than one theory of reality, and if so, what the theoretical motivations for these theories could be.[1]

In this paper I will show how paying close attention to Leibniz's philosophical methodology can defuse worries about Leibniz's theory pluralism and clarify the nature of

[1] The thesis that there is a theory of corporeal substances that is distinct from the theory of monads in Leibniz's mature philosophy has been defended in Daniel Garber, 'Leibniz and the Foundations of Physics: The Middle Years', in Kathleen Okruhlik and J. B. Brown (eds.), *The Natural Philosophy of Leibniz* (Dordrecht: D. Reidel, 1985), 27–130; *Leibniz: Body, Substance, and Monad* [*Leibniz*], (Oxford: Oxford University Press, 2009). Since the publication of Garber's paper in 1985, commentators have advanced different interpretations of Leibniz's mature philosophy. Some commentators accept a unified approach according to which the official position of the mature Leibniz remains more or less the same, whether it is the theory of monads, the theory of corporeal substances, or something else, e.g., Robert Adams, *Leibniz: Determinist, Theist, Idealist* [*Leibniz*], (Oxford: Oxford University Press, 1994), Part III; Donald Rutherford, *Leibniz and the Rational Order of Nature* [*Order*], (Cambridge: Cambridge University Press, 1995); Pauline Phemister, *Leibniz and the Natural World* [*Leibniz*] (Dordrecht: Springer, 2005); Richard Arthur, *Monads, Composition, and Force* [*Monads*] (Oxford: Oxford University Press, 2018). Some commentators adopt a developmental approach that acknowledges the evolution of thought in the mature Leibniz, such as Garber, *Leibniz*; Samuel Levey, 'On Unity, Borrowed Reality, and Multitude in Leibniz', *The Leibniz Review*, 22 (2012), 97–134. In addition, Glenn Hartz has advanced a pluralist interpretation in his *Leibniz's Final System* (London: Routledge, 2007), according to which Leibniz is a theory pluralist who simultaneously entertains both the theory of monads and the theory of corporeal substances. The current paper lends support to the developmental interpretation and the pluralist interpretation insofar as Leibniz's mature methodology allows him to hold different hypotheses as possible explanations of the phenomena.

Leibniz's shifts between his theories.[2] Specifically, I will argue that, from his early years, Leibniz practiced a method that aims to explain phenomena through hypotheses, and the theories obtained in this way are at best highly probable (i.e., 'morally certain'). The presence of such a method means that, first of all, Leibniz's commitment to a particular theory during a certain period or in certain texts does not necessarily amount to his being completely certain about the theory's truth; second, his shifts between different theories can be motivated by defeasible reasons pertaining to the theories' probability, thus he could well switch back to an older theory when he saw reasons for preferring it.

This paper proceeds as follows. In sections 2 and 3 I discuss Leibniz's evolving views about philosophical methodology, and in section 4 I focus on Leibniz's applications of his methodology in his mature philosophy. Section 2 is about the methodology of the young Leibniz. There I argue that the young Leibniz learned from Hobbes a bipartite methodological framework which contains an abstract, '*a priori*' part that demonstrates necessary truths from primary definitions or causes on the one hand, and a concrete, '*a posteriori*' part that explains contingent phenomena from probable hypotheses as their possible causes on the other.[3] I call this

[2] Leibniz's philosophical methodology used to be understood as one of logical deduction based on primitive truths. According to the classical interpretations of Bertrand Russell, *A Critical Exposition of the Philosophy of Leibniz* (Cambridge, 1900), and Louis Couturat, *La logique de Leibniz* (Paris: Felix Alcan, 1901), Leibniz's theory of reality is derived from his logic. Notable critiques of this interpretation include Stuart Brown, *Leibniz* (Bringhton: Harvester Press, 1984); François Duchesneau, *Leibniz et la méthode de la science* (Paris: PUF, 1993); Christia Mercer, *Leibniz's Metaphysics: Its Origins and Development* [*Metaphysics*] (Cambridge: Cambridge University Press, 2001). Brown and Duchesneau take Leibniz's philosophical method to be a 'hypothetico-deductive' one, which is similar to the *a posteriori* method in the bipartite model in my account of Leibniz's methodology. However, their interpretations either ignore the *a priori* method in Leibniz's methodology (Brown) or identify it with the hypothetico-deductive method (Duchesneau), which is not right.

[3] Throughout this paper the terms '*a priori*' and '*a posteriori*' are used in the sense of 'from cause' and 'from effect'. This is the sense in which these terms are used by most early moderns, and as we shall see, by Hobbes and

methodological framework the 'bipartite model', and I show its profound influence on the young Leibniz. In section 3 I first briefly describe the fundamental change in Leibniz's philosophy that took place during the end of the 1670s: for various reasons, Leibniz became convinced that contingent truths about the actual world are grounded in the 'architectonic principles' that inform God's optimal design, and these architectonic principles are epistemically accessible to us through the contemplation of divine nature. In this way all general truths, including contingent ones, are in principle demonstrable from necessary truths grounded in the principle of contradiction in conjunction with the architectonic principles grounded in the principles of sufficient reason and perfection.[4] Then I show how the emergence of the architectonic principles that ground contingent truths affects Leibniz's methodology. The most important change is that the mature Leibniz came to think that all general truths could be in principle be demonstrated *a priori* from the contemplation of God. Based on this new *a priori* way of knowing contingent truths, Leibniz introduced a new method, the '*a priori* certain' method, into his methodology;

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very often by Leibniz himself. The Kantian understanding of these terms as 'by reason' and 'by experience' is also witnessed in the writings of the mature Leibniz. (Robert Adams thinks that Leibniz might have been crucial in the transformation of the meaning of these terms, see *Leibniz*, 109–10.) To some extent these two understandings of the terms coincide for Leibniz, since for him it is only through reason that we know the primary cause of things, i.e., God, and it is only through experience that we know the observable effects of God. The reason why Kant uses *a priori* exclusively in the sense of 'from reason' but not 'from cause' might be that for Kant the two notions are not the same, based on his distinction between analytic and synthetic judgements. For Kant's justification of the analytic-synthetic distinction, see Desmond Hogan, 'Metaphysical Motives of Kant's Analytic-Synthetic Distinction', *Journal of the History of Philosophy*, 51:2 (2013), 267–307.

[4] In this paper I restrict my discussion of truths (both necessary and contingent) to general truths such as the laws of motion that apply to all created things, because the derivation of particular contingent truths (such as 'Caesar crossed the Rubicon in 49 BCE') from the principles of sufficient reason and perfection would involve infinite steps and be beyond human reach. So the *a priori* certain method insofar as it is practiced by human beings can only be used to derive general contingent truths. This restriction does not affect the main point of the paper because the theory of reality belongs to general contingent truths. Thanks to Donald Rutherford for pointing out the issue.

however, he nonetheless preserved the bipartite model due to the difficulty of following through the *a priori* certain method. Thus, the methodology of the mature Leibniz is a hybrid one which combines the new *a priori* certain method with the bipartite model.

In section 4 I show how the hybrid methodology of the mature Leibniz is relevant for understanding his philosophy. In Leibniz's natural philosophy, he attempts to demonstrate some of the fundamental laws of nature using the *a priori* certain method in his *Dynamica*, but he also preserves a place for explanatory hypotheses such as the theory of planetary motion. The same situation can be found in Leibniz's metaphysics, which I illustrate with two examples, pre-established harmony and the theory of monads. I suggest that pre-established harmony has the same status as the laws of nature demonstrated in *Dynamica*, while the theory of monads is a hypothesis that cannot be demonstrated using the *a priori* certain method. Hence the theory pluralism of the mature Leibniz is supported by his philosophical methodology where multiple incompatible hypotheses can be entertained at the same time as possible explanations of phenomena if none of them is yet *a priori* demonstrable.

2. THE EARLY LEIBNIZ AND THE BIPARTITE MODEL

Like many philosophers of his age, Leibniz was concerned with finding a correct method for doing philosophy, that is, for organizing and extending human knowledge. Thanks to the fertile intellectual environment of the German-speaking world, Leibniz received a variety of methodological influences from his earliest days: for example, the Lullism, likely mediated by Johann Heinrich Alsted, of the *Dissertation on Combinatorial Art*; the Ramist influence that one can discern in the *New Method for Teaching and Learning Jurisprudence*, which Leibniz might have received through authors like Alsted and Bartholomäus Keckermann; the idea that philosophy should be done following the geometrical method based on the model of Euclid, from

philosophers like Erhard Weigel, among others; and the methodological eclecticism that was common among German philosophers at the time.[5] It is thus very hard to talk about the methodology of the early Leibniz without being partial to one particular line of influence. However, I think that when we consider Leibniz's early career (that is, before his stay in Paris) as a whole, there was one philosophical methodology, learned by Leibniz at a very early stage, that became prominent in his first attempts at system-building in the late-1660s and the early-1670s. This methodology is that of Thomas Hobbes. In what follows I will first briefly describe Hobbes's methodology, which I call the 'bipartite model'; then, I will present evidence showing its decisive and formative influence on the early Leibniz.

Hobbes's conception of philosophical methodology is summarized in the following definition of philosophy:

> For the understanding of method, it will be necessary for me to repeat the definition of philosophy, delivered above (Chap. 1, art. 2) in this manner, *Philosophy is the knowledge we acquire, by true ratiocination, of phenomena or apparent effects* [*phaenomenωn sive*

[5] For the Lullist influence on Leibniz, see Catherine Wilson, *Leibniz's Metaphysics* (Princeton: Princeton University Press, 1989), 15–29; also see Marine Picon, *Normes et objets du savoir dans les premiers essais leibniziens* [*Normes*] (Paris: Classiques Garnier, 2021), 107–9, 135–37 for a more critical assessment. With regard to the relationship between Leibniz and Ramism, he was positively influenced, for example, by the idea of a 'natural method' that could both facilitate teaching and follows the order of nature (compare Leibniz, *Nova Methodus* II.7, A VI.1, 296–96 with Keckermann, *Systema Logicum Maius*, Book III, Tract II, Chapter 1, in *Systema Systematum* Vol.1 [Hanover, 1613], 309–10), at the same time, he was critical of certain Ramist ideas, for instance the use of dichotomies (A II.1, 88). For assessments of the relationship between Leibniz and Ramism, see Maria Rosa Antognazza, *Leibniz: An Intellectual Biography* (Oxford: Oxford University Press, 2009), 39–46; Picon, *Normes*, 57–67. For the influence of Weigel on Leibniz, see Konrad Moll, *Der junge Leibniz* Vol. 1 (Stuttgart: Friedrich Frommann, 1978). For Leibniz and the eclecticism of his German teachers and contemporaries, see Mercer, *Metaphysics*, 23–59.

> *effectuum apparentium*]*, from the knowledge we have of its conceived production or some possible generation, and of such production, as has been or could have been, from the knowledge we have of its effects*. Method, therefore, in the study of philosophy, *is the shortest way of finding out effects by their known causes, or of causes from their known effects*. (*DC* VI.1, OL I, 58, translation modified from EW I, 65–66)

According to Hobbes, method helps us acquire both the knowledge of effects—which Hobbes calls *phenomena* because they are the effects that appear to our senses—from known causes and the knowledge of causes from known phenomena. Hobbes also calls the knowledge of effects from causes *a priori*, and the knowledge of causes from effects *a posteriori*.[6] An important distinction between these two kinds of knowledge for Hobbes is that only *a priori* knowledge can be completely certain, i.e., when we are ourselves the cause that generates the phenomena in question. By contrast, *a posteriori* knowledge lacks such certainty, since we are not the producer of the phenomena in question—God is. Thus, geometrical knowledge is completely certain for Hobbes since 'the generations of the figures depend on our will' insofar as we set down the definitions of geometrical figures and construct them accordingly from points and lines, but with respect to natural phenomena we are only able to demonstrate that 'such and such could have been their causes' because 'the causes of natural things are not in our power, but in the divine will' (*De Homine*, X.5, OL 2, 93). As a result, *De Corpore* is divided into two parts: Parts II-III demonstrate all the geometrical laws of motion by deriving necessary effects from causes (i.e., bodies in motion), while Part IV titled *Physica sive Naturae Phenomena* explains the main

[6] See *De Homine*, X.4–5, OL 2, 92–93; OL 4, 39. Hobbes also connects the *a priori*/*a posteriori* distinction with the analytical/synthetical distinction in *DC* XX, OL 1, 251–58.

'phenomena of nature' from their possible causes or 'hypotheses'.[7] For this reason I shall call this methodological framework the 'bipartite model'.

The bipartite model differs both from the rationalist method of logical deduction and from the hypothetico-deductive method because it combines elements of both. On the one hand, it acknowledges that we have epistemic access to primitive principles and definitions and could logically demonstrate derivative principles from them. However, while these universal principles regulate the whole of natural philosophy and cannot be violated, we cannot straightforwardly deduce from them a complete description of the world, which is why Hobbes thinks that the phenomena themselves are the starting point when we try to explain them with explanatory hypotheses.[8] On the other hand, hypotheses are not constrained by their explanatory success alone, but are also constrained by the universal principles. In a passage from De Homine Hobbes goes as far as claiming that we cannot find out the possible causes of phenomena without already knowing, via demonstration, what effects the causes necessarily produce (X.5, OL II, 93). Hobbes's actual practice falls short of this stringent requirement, but it is clear that all his natural

[7] See *Epistle Dedicatory* and XXX.15, OL 1, 430–431. Also see OL 4, 39. It should be noted that Hobbes conflates geometry with the science of bodies in motion, hence geometry itself is treated causally by considering the interactions between bodies, and the necessary laws of motion are themselves part of geometry (on this point see Douglas Jesseph, Squaring the Circle [Chicago: Chicago University Press, 1999]).

[8] OL 1, 316. This point is emphasized in recent interpretations of Hobbes's method from the perspective of Aristotelian 'mixed sciences'. According to these interpretations, Hobbes does not think we can logically demonstrate everything from *a priori* geometry, but rather we need to supply universal geometrical principles with extra conditions when we apply them to concrete subjects. See Zvi Biener, 'Hobbes on the Order of Sciences', *Southern Journal of Philosophy*, 54 (2016), 312–332; Marcus Adams, 'Hobbes on Natural Philosophy as "True Physics" and Mixed Mathematics', *Studies in History and Philosophy of Science*, 65 (2016), 43–51. Leibniz himself also seems to be influenced by the idea of mixed sciences when he says that what result from the application of universal metaphysical principles to phenomena are the *scientiae mixtae* (A VI.4, 544; also see A VI.4, 524–525, 584).

philosophical hypotheses are constrained by some universal principles—for example, all phenomena are produced only by bodies in motion—that he takes to be demonstrable.[9]

While Hobbes's bipartite model might seem similar to many of the philosophical methodologies current at the time, it has some distinctive features. Zabarella's method, for instance, contains two similar inferential procedures, one from effect to cause and another from cause to effect, but there is no place for the explanation of phenomena through hypotheses or possible causes in this framework.[10] One finds a similar emphasis on the role of hypothesis in Parts III and IV of Descartes' *Principia Philosophiae*, where he proposes certain hypotheses to explain the main celestial and terrestrial phenomena, but Descartes is much less explicit—and perhaps consistent—about his overall methodology than Hobbes, and he seems to discount reasoning from effect to cause in favor of reasoning from cause to effect.[11]

Furthermore, I think it can be established as a historical fact that the young Leibniz was

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[9] For a demonstration of this principle, see *DC* IX.9, OL 1, 111–112.

[10] Zabarella defends the position that there are two kinds of order and method, the compositive, or from cause to effect, and the resolutive, or from effect to cause (*On Methods*, Book II, Chapter VI, John P. McCaskey ed. and trans., *On Methods* Vol.1 [Cambridge: Harvard University Press, 2013], 152–53; Book III, Chapter IV, *On Methods* Vol.2, 24–25). For a comparison between Zabarella's method and Hobbes's method, see Helen Hattab, 'Hobbes's and Zabarella's Method: A Missing Link', *Journal of the History of Philosophy*, 52 (2014), 461–85. One reason to think that Zabarella's methodology might not have directly influenced Leibniz is that, while Zabarella makes great effort to distinguish between order (*ordo*) and method (*methodus*), that distinction, as well as the notion of *ordo* itself, is nowhere to be found in Leibniz's early writings (for a discussion of this point, see Picon, *Normes*, 54–55).

[11] *Principia Philosophiae*, III.4, AT VIII, 81–82. The use of hypotheses seems to be in conflict with the more pronounced aspects of the Cartesian methodology, namely the use of the clear and the distinct ideas. Furthermore, the way in which Descartes uses certain methodological notions, such as *analysis* and *synthesis*, is different from how Hobbes and Leibniz use the notions (AT VII, 155–56). Hobbes and Leibniz associate analysis with resolution and synthesis with composition. On a historical note, Leibniz only came to study Descartes seriously in the mid-1670s, so there is only a slim chance that the young Leibniz was influenced by Descartes's methodology, however it is understood.

reading Hobbes's works and consciously putting into practice Hobbes's bipartite model. To begin with, we find Leibniz commenting on the bipartite division of Hobbes's philosophical system as early as 1663:

> Metaphysics, i.e. first philosophy, is the System of Theorems; a Theorem is a true proposition even if nothing exists, that is, it is only a hypothetical proposition, or resolvable into hypothetical propositions. First philosophy is defined in this manner by Honoratus Fabri […] and Hobbes, who divided his work on body into two parts, first philosophy which is abstracted from existence, and physics, i.e., causes of things existing in the world. Metaphysics is the work of pure reason, and it flows from definitions, while sense provides the bases of physics. (A VI.1, 22, note 212)[12]

Here Leibniz accurately notes the bipartite structure of Hobbes's philosophical system, with one part starting from primitive causes or definitions, and another from sensible effects. In 1666, in a letter to Thomasius Leibniz tries to explain Anaxagoras's alleged claim that snow is black with several materialistic 'hypotheses' that explain color in terms of the impression of moving particles on our sensory organs. Besides the fact that Leibniz's explanation depends on hypotheses, the specific contents of these hypotheses also indicate significant Hobbesian influence.[13]

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[12] Translations in this paper are mind unless otherwise noted.

[13] A II.1, 7–8. Hobbes is explicitly cited in Hypothesis 1, which reduces color to subjective phantasma generated from the impression of moving bodies. This is Hobbes's theory of perception in *DC* XXV (e.g., OL 1, 318). Also, the conception of blackness as the 'privation of color' in Hypothesis 3 can be found in *DC* XXVII.16, OL 1, 378–379.

While Leibniz was clearly aware of the Hobbesian bipartite model in the first few years of his career, a major development comes with the first publication in 1668 of Hobbes's collected works in Latin, the *Opera Philosophica* [*OP*].[14] As Leibniz fervently claims in his July 1670 letter to Hobbes, he believes that he has read all of Hobbes's works, 'in part separately and in part in the collected edition' (A II.1, 91/L104). So there is no doubt that Leibniz read the *OP* soon after its publication. The *OP* contains the major works that Leibniz most likely read before, namely the philosophical trilogy, and some works that Leibniz might not have read 'separately'. For example, the Latin *Leviathan* was published for the first time in the *OP*, and Leibniz might not have read the English *Leviathan* due to his limited knowledge of the language; furthermore, there are four minor polemical works, three of them written as dialogues between fictional characters *A* and *B*, which form was later imitated by Leibniz in his anti-Hobbesian *Dialogue* (1677), and Leibniz might not have had access to them before 1668. I think there is evidence that it is through reading the *OP* that Leibniz came to fully understand the bipartite model, especially the importance and nature of hypotheses; and it is under the influence of this reading that Leibniz began to construct systems of his own using the bipartite model.

In 1668 one of Leibniz's main projects was the *Demonstrationes Catholicae*, an ambitious encyclopedia that reconciles all religious sects using rational arguments. One of the main endeavors of the *Demonstrationes* is the defense of the possibility of Christian mysteries, such as the Eucharist, Trinity, and Incarnation. In a note to his first outline of the *Demonstrationes Catholicae*, Leibniz explains the strategy of his defense of the Christian mysteries:

> All these things are of pure Hypothesis. Hypothesis is nothing but the rendering of a

[14] *Thomae Hobbes Opera Philosophica Quae Latinè Scripsit Omnia* (Amsterdam: Joan Blaeu, 1668).

> possible cause [causae possibilis redditio], or the explication of a possible way. (A VI.1, 495, note on lines 8–12, written between 1668–69)

So Leibniz's defense of the possibility of the Christian mysteries consists in finding a 'hypothesis' through which the mysteries *could* be produced. This sounds very similar to how natural phenomena are explained in the Hobbesian bipartite model. Moreover, the definition of hypothesis as 'the rendering of a possible cause' can be traced to Hobbes's works. In *Dialogus Physicus*, Hobbes attempts to defend his own physical hypotheses against other hypotheses by showing that certain experiments, most prominently Boyle's air-pump experiment, can best be explained using Hobbes's hypotheses and that his own hypotheses are most conceivable.[15] In a passage where Hobbes replies to the charge that his own hypotheses seem much too extraordinary (*mirabiles*), Hobbes says:

> It is not foreign to reason that the causes of the extraordinary works of nature are also extraordinary […] and it is impossible to render the causes [*causas reddere*] of extraordinary effects of nature without extraordinary hypotheses. (*OP*, *Dialogus*, 16; OL IV, 254)

The context of this passage is in some sense similar to Leibniz's defense of the Christian mysteries: both are concerned with 'extraordinary', or more literally 'miraculous' phenomena or effects. Of course, Hobbes is still dealing with natural phenomena, while Christian mysteries are

[15] 'Two things make a hypothesis legitimate: first, it might be conceivable [*conceptibilis*], that is, not absurd; second, from the assumed hypothesis the necessity of the phenomena can be inferred' (OP, *Dialogus*, 16; OL IV, 254).

admittedly not natural, but it does not seem far-fetched that Leibniz would see an analogy between natural phenomena and Christian mysteries and the ways in which they are explained. Furthermore, in this passage Hobbes connects the notion of hypothesis with an expression that looms large in the fourth part of *De Corpore*, 'rendering the possible cause'. There, whenever Hobbes finishes explaining a particular phenomenon, he concludes the account with the sentence 'we have rendered the possible cause [*reddidimus causam possibilem*]' (*passim*). So, I think it is likely that Leibniz wrote the note on hypothesis while studying the *Opera Philosophica*, which was fresh from the press at the time.

In a text that seems to be composed roughly at the same time, Leibniz makes explicit his methodological framework for defending the Christian mysteries:

> 1) Phenomena, which must be saved, or passages from the Bible, Councils, and Fathers.
> 2) Definitions of the words, and thereby the collected interpretations of passages […]
> 3) Philosophical Theorems demonstrated from definitions.
> 4) Postulates or Hypotheses assumed possible, and from these are solved the Problems of divine art, or the demonstration of possibility. (A VI.1, 514, written in 1668)

The theoretical framework is unmistakably that of Hobbes's bipartite conception of philosophy: first, there is an *a priori* part consisting of definitions and theorems, which are universal and necessary; then, there is an *a posteriori* part beginning from hypotheses, and from which, together with the *a priori* theorems, the phenomena are derived. Yet there is a subtle twist, as in physics the phenomena themselves are not in question, while in theology we are demonstrating the very possibility of phenomena (which we do not experience ourselves but learn from

testimony); in other words, in physics we are investigating possible causes, while in theology, possible effects. But the framework is still roughly the same for both kinds of inquiry, since what we need to do in both cases is show the possibility of hypotheses and derive the phenomena from them.

The *Demonstrationes Catholicae* is modelled on this framework: first, there are a series of Prolegomena containing 'elements of philosophy', and the first two Parts containing the 'demonstration of the existence of God' and 'demonstration of the immortality of the soul, and its incorporeality' (A VI.1, 494–95). This is the *a priori* part demonstrating theorems from definitions. Then, there is the long Part III where the possibility of Christian mysteries is demonstrated based on hypotheses that conform to the philosophical and theological theorems on the one hand and could produce the mysteries on the other (A VI.1, 495–99). Leibniz gives a specimen of the system in his treatment of transubstantiation, where he first demonstrates a series of propositions based on two definitions and a theorem demonstrated elsewhere and then offers a hypothesis (the hypothesis of concurrent mind) through which transubstantiation could be produced (A VI.1, 508–11/L 115–17). Leibniz explains in a later passage what he tries to accomplish in dealing with the mystery of the Eucharist:

> To demonstrate the possibility of something is the same as to explicate some Hypothesis or possible way (possible, that is clearly and distinctly intelligible), from which it follows that the thing would be produced; or in other words, to show in what way a given problem can be constructed, at least by God. […] Therefore, although we cannot solve the problems by the deed itself [*opere ipso*], yet we can solve them by contemplation, that is, we can demonstrate a possible way clearly and distinctly, which is what we propose to accomplish

in the Mysteries of the Eucharist. (A VI.1, 515)

This passage again echoes several Hobbesian themes: the characterization of hypothesis as possible cause, the requirement that the hypothesis be intelligible, and the thought that only God knows the true causes of phenomena.

Leibniz's application of the bipartite model was not limited to his envisioned theological system and the attempt to defend the possibility of Christian mysteries. At almost the same time as the composition of *Demonstrationes Catholicae*, Leibniz began to compose a bipartite legal system consisting of the *Elementa Juris Naturalis* (1669–71) and *Elementa Juris Civilis* (1670–72). As Leibniz summarizes in his 1670 letter to Jean Chaplain, this bipartite legal system is modelled upon a 'more solid' system of natural philosophy, which, based on the way in which he characterizes the system, seems to be Hobbes's system, and in that letter he goes as far as comparing civil law with hypotheses.[16] It is also worth noting that Leibniz's plan for a reformed legal system is the earliest among his system-building efforts, and the division of law into natural law and civil law can already be seen in earlier texts such as the *New Method for Teaching and Learning Jurisprudence* (A VI.1, 341–45; published in 1667). So while Leibniz's study of the

[16] According to Leibniz's description, this more solid system of natural philosophy consists of '*arithmetic, geometric, and phoronomic* demonstrations *about magnitude or number of parts, figure, and motion* which depend on definitions alone' on the one hand, and 'sense, fact and history' on the other (A II.1, 83). This matches up with Hobbes's natural philosophical system where the abstract, *a priori* part demonstrates the physico-mathematical laws of motion, and the concrete, *a posteriori* part starts with phenomena. The goal of the system is to come up with all the laws, natural or civil, so that in the completed legal system 'there would no longer appear to be any paragraph which is not organized and which is not demonstrated from *the hypotheses of positive [law] and the axioms of natural law*' (A II.1, 89). I have dealt with the relationship between Leibniz's legal system and his physical system in greater detail elsewhere (Hao Dong, 'Law and Physics in Leibniz', *Journal of the History of Philosophy*, 62:1 [2024], 49–73).

Opera Philosophica in 1668–69 may have motivated him to apply the bipartite model in a more wide-ranging and consistent way, he was not a stranger to the model before 1668 and already began applying it to his plan of legal reform.

It is no surprise to see, given the thoroughgoing influence of the bipartite model on Leibniz, that his first physical system is again informed by it. This system is divided into the *Theory of Abstract Motion* (*TMA*, published in 1671) where 'some elements concerning the true reasons of motion [*de veris motus rationibus*]' are 'demonstrated by the geometrical method from the definitions of terms alone',[17] and the *New Physical Hypothesis* (*HPN*, published in 1671), which relies on a general hypothesis about ether whose motion explains some of the major natural phenomena.[18] Not only is the overall structure of this early physical system a faithful imitation of *De Corpore*—with the abstract laws of motion being demonstrated geometrically and the hypotheses constrained by these laws explaining how the phenomena of nature could have been produced—its specific contents are also heavily influenced by the Hobbesian doctrines. The basic idea of *TMA* is that all bodily action reduces to local motion, thus the abstract laws of motion are derived from the geometrical composition of the speeds of motion without considering the magnitude of the moving bodies. The same idea also underlies Hobbes's geometrical demonstrations of the laws of motion. The *HPN*, on the other hand, is concerned with explaining how ordinary phenomena that seem to be in tension with the abstract laws of motion can be produced if we assume an ether which pervades everything, constantly moves, and has an intricate discrete structure on the microscopic level. Although Hobbes did not explicitly

[17] Leibniz to Oldenburg, 23 July 1670; A II.1, 95. Also see *De Rationibus Motus*, A VI.2, 160.

[18] See Leibniz's description of his hypothesis in a series of letters to Oldenburg, A II.1, 104–105, 144–45, 167–68. For a summary of how some of the main phenomena such as gravity, elasticity, and magneticism are explained by the motion of ether, see Philip Beeley, *Kontinuität und Mechanismus* (Stuttgart: Franz Steiner, 1996), 157–62.

deal with this issue, many features of the Leibnizian ether can be traced back to Hobbes.[19]

Looking back at the intellectual journey of the young Leibniz, we can discern a clear trajectory: while Leibniz's early writings (mostly pre-1668) are teeming with methodological influences, it was Hobbes's bipartite model that formed the backbone of Leibniz's attempts at building systems of his own—theological, legal, and physical—in the late 1660s and early 1670s. In the rest of this paper I will show that the mature Leibniz was still under the influence of the bipartite model, although the methodology of the mature Leibniz was a more complicated, hybrid one.

3. NEW SYSTEM, OLD SYSTEM: THE HYBRID METHODOLOGY OF THE MATURE LEIBNIZ

Like Hobbes, the young Leibniz held that while there are truths that we could demonstrate from primitive definitions which hold by necessity 'even if nothing exists', truths about the contingent conditions of the actual world cannot be known with certainty; the most we can regarding the actual world are hypotheses or possible causes inferred *a posteriori* from phenomena.[20] Although

[19] For the idea that bodily action reduces to motion, compare *DC* VI.6 and A VI.2, 168–69; for the geometrical composition of speeds, see *DC* Chapters XVI–XXIV and A VI.2, 265 (Predemonstrable Foundations 13–14), 338–39; for the hypothesis of ether and its structure, see A VI.2, 164, 271 (Special Problem 11), and 228–32, for relevant passages from Hobbes, see *DC* XV.8, XXVI.5. A concise and persuasive treatment of these issues can be found in Garber, *Leibniz*, 13–40, esp. 20–21. Also see Arthur Hannequin, 'La première philosophie de Leibnitz', In *Études d'histoire des sciences et d'histoire de la philosophie* Vol. 2 (Paris: Félix Alcan, 1908), 59–148, esp. 78–81.

[20] Here I pass over the thorny issue of whether concrete truths about the actual world are contingent for the young Leibniz. On the one hand, there are texts where Leibniz seems to imply that these truths are contingent (A II.1, 95, lines 21–29); on the other hand, there is some evidence suggesting that during most of the 1670s Leibniz is a necessitarian (see Adams, *Leibniz*, 10–12; Mogens Lærke, 'Quod Non Omnia ad Existentiam Perveniant: Leibniz's Ontology of Possibility, 1668–1678', *Leibniz Review* 17 [2007], 1–30). Even if we accept the picture of a necessitarian Leibniz during most of the 1670s, some propositions can be regarded as epistemically contingent, namely those that cannot be demonstrated from primitive definitions. In this way the distinction between the

Leibniz did not elaborate on the reason why this is so, it is plausible that he thought, like Hobbes, that only the producer of natural phenomena, i.e., God, has epistemic access to the overarching design of the world, and human beings can only guess at it through its observable effects.

Things change in the late 1670s. In a text written between 1677 and 1678, Leibniz first affirms that there are many alternative ways in which the world could have been created, some of which are more perfect than others; then, based on the 'great axiom' that 'nothing is without reason', Leibniz derives the consequence that God chose to create the world in the best of all the possible ways (A VI.4, 1359–63). Here the principle of sufficient reason is explicitly introduced to ground the principle of perfection, which forms the basis of God's contingent design of the actual world (A VI.4, 1360). There are a host of texts written in the same period where the divine design of the actual world is grounded in the principles of sufficient reason and perfection.[21] This thought is not entirely new to Leibniz, but at this time he seems to think that one can directly infer important information about the actual world from these principles. For example, the principle of the equality between the entire cause and full effect which forms the basis of mechanics follows from the principle of sufficient reason (A VI.4, 1963), and the principle that 'nature acts by the shortest paths' which is fundamental to Leibniz's optics follows from the principle of perfection (A VI.4, 1367). In short, the principles of sufficient reason and perfection ground the 'architectonic' principles that inform the divine design of the actual world, and we, as rational beings created in the image of God, have epistemic access to the architectonic principles through contemplating the divine nature and its most perfect way of operation.

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necessary and the contingent in Leibniz's early physical system can be preserved as an epistemic distinction even within a metaphysically necessitarian picture of the world

[21] E.g., *Conversation with Steno*, A VI.4, 1377, 1379–83; *Definitiones Cogitationesque Metaphysicae*, A VI.4, 1394–95; *De Libertate et Necessitate*, A VI.4, 1444–45; *De Necessitate et Contingentia*, A VI.4, 1449.

Put in another way, in the late 1670s the gap between divine knowledge and human knowledge was bridged to a certain extent as Leibniz started to think that human beings could come to know the actual world in the way that God does, i.e., as the producer and architect, and not only an observer, of the final product. This important change opens up the possibility of knowing all general truths, including contingent ones about the actual world, entirely *a priori* or from their cause, since God is the primitive cause of all contingent truths. As a consequence, the original bipartite model requires modification since it cannot accommodate this *a priori* way of knowing contingent truths.

In fact, Leibniz began to formulate a new methodology immediately following the change described above. In a text that is the preface for an envisioned 'Booklet on the Elements of Physics [*Libellus de Elementorum Physicae*]' (A VI.4, N.366; see also *Conspectus Libelli*, A VI.4, N.365), Leibniz gives a detailed description of the methodological framework of physics, or natural philosophy. This framework consists of four different methods, and we shall look at them one by one.

The first method is called '*a priori* certain', and it is a new method, not found in Leibniz's early system, which is made possible by the recently discovered architectonic principles:

> *The most perfect method is to discover the interior constitution of bodies a priori, from the contemplation of God, the author of things. But this method is a difficult one and not to be undertaken by anyone whatever*.

> Just as there is a twofold way of reasoning from experiments, one leading to the application, the other to the cause, so there is also a twofold way of discovering causes, the

> one *a priori*, the other *a posteriori*, and each of these may be either certain or conjectural. The *a priori* method is certain if we can demonstrate from the known nature of God that structure of the world which is in agreement with the divine reasons and from this structure, can finally arrive at the principles of sensible things. (A VI.4, 1998–99; translation modified from L 283)

This method is *a priori* because it proceeds from the primitive cause, or 'author', of things. It contains two steps. First, by contemplating the divine nature we could come to know the general 'structure' of the world; then, from the general structure of the world we can 'finally arrive at the principles of sensible things' and 'discover the interior constitution of bodies' which are the 'causes' discovered *a priori*. The general structure of the world is informed by 'divine reasons' which correspond to the architectonic principles informing the divine design of the actual world. The old *a priori* method is not entirely absent here, since necessary truths are also part of the 'known nature of God' insofar as they are grounded in the divine intellect. The new *a priori* certain method thus incorporates the old *a priori* method and extends it by adding the contingent architectonic principles; therefore it constitutes a comprehensive method that makes use of both necessary truths and architectonic principles to demonstrate contingent truths about the actual world.[22] Below we shall see instances of the application of the *a priori* certain method.

It is useful to clarify the nature of certainty that is involved in the *a priori* certain method. Since the 'divine reasons' that form one of the starting points of the *a priori* certain method are

[22] The old *a priori* method by itself is the method that deals specifically with the demonstration of necessary truths, which is in effect Leibniz's logical calculus of terms. Leibniz does not mention it as a separate method in *Elements of Physics* since it is a treatise about the actual world. Similarly, in the rest of this paper I will not discuss this method separately since my focus is on general contingent truths about the actual world.

architectonic principles grounded in the principles of sufficient reason and perfection, the 'structure of the world' and the 'principles of sensible things' that follow from these divine reasons would hold by *moral necessity*, according to Leibniz's famous distinction between 'logical, metaphysical or geometrical' necessity based on the law of non-contradiction, and moral necessity based on God's free choice for the most perfect world.[23] Although moral necessity falls short of strict necessity across all possible worlds, it nevertheless allows for full-blown certainty about the general structure of the actual world, because while the negation of a morally necessary proposition is not impossible, it involves imperfection which is incompatible with the most perfect order of the current world. Therefore, if we can demonstrate a proposition from architectonic principles, we can be completely certain of its truth in the actual world. This seems to be the reason why Leibniz thinks the *a priori* certain method is the most perfect method.

The second method is called the '*a priori* conjectural' method. Here we see the familiar language of hypotheses:

> *Some hypotheses can satisfy so many phenomena, and so easily, that they can be taken for certain. Among other hypotheses, those are to be chosen which are the simpler; these are to be presented, in the interim, in place of the true causes*.

> The conjectural *a priori* method proceeds by hypotheses, assuming certain causes, perhaps, without proof, and showing that the things which now happen would follow from these posited causes. A hypothesis of this kind is like the key to a cryptograph, and the simpler it

[23] See, e.g., *Theodicy*, *Preliminary Dissertation* §2 (GP VI, 50/H 74), §349 (GP VI, 321/H 334).

> is, and the greater the number of events that can be explained by it, the more probable it is. But just as it is possible to write a letter intentionally so that it can be understood by means of several different keys, of which only one is the true one, so the same effect can have several causes. Hence no firm demonstration can be made from the success of hypotheses. Yet I shall not deny that the number of phenomena which are happily explained by a given hypothesis may be so great that it must be taken as morally certain. Indeed, hypotheses of these kind are sufficient for everyday use. Yet it is also useful to apply less perfect hypotheses as substitutes for truth until a better one occurs, that is, one which explains the same phenomena more happily or more phenomena with equal felicity. There is no danger in this if we carefully distinguish the certain from the probable. (A VI.4, 1999–2000/L 283)

The conjectural *a priori* method is *a priori* because it also proceeds from causes. But unlike the first method, the causes here are not known with certainty, but only assumed 'without proof' as possible causes. The possible causes are shown to be probable because they could successfully produce phenomena or effects. Some considerations, for example the simplicity of the hypotheses, the number of the phenomena explained, and how smoothly the phenomena are explained, could increase the level of probability of the hypotheses, even to the point where they could be taken as 'morally certain', which means that they are 'sufficient for everyday use'. But it should be clear from the context that the *moral certainty* that could be attained by the *a priori* conjectural method is different in kind from the certainty of the *a priori* certain method: the latter is full-blown certainty about morally necessary truths grounded in divine providence, while the former stems from the high probability of propositions that are not yet demonstrated *a priori*. Thus, one should be careful in distinguishing moral certainty from moral necessity: the former is

an epistemic notion describing the credence of probable propositions, while the latter refers to the modal status of contingent propositions that hold in the best of all possible worlds. Although all contingent truths are morally necessary, 'proofs' that only aim at moral certainty cannot demonstrate them to be such, and therefore they fall short of full-blown certainty. As Leibniz says in a letter to Duke Johann Frederich, 'all proofs that only carry a moral certainty [*certitude morale*] can be overturned by stronger contrary proofs' (A II.1, 752).

While the *a priori* certain method is not to be found in Leibniz's early system, the *a priori* conjectural method had been an integral part of the old bipartite model. It is the stage of the *a posteriori* method of the bipartite model where one justifies a hypothesis by seeing whether the phenomena could be successful produced from the posited possible causes and thereby finishes the *a posteriori* inference of hypothesis from phenomena. And Leibniz similarly claims in his early writings that considerations such as theoretical simplicity and explanatory power can increase the level of probability of the hypothesis.[24] So it seems that the old bipartite model does not disappear from Leibniz's methodology. In section 4 I will argue that the bipartite model is still among the main ways in which Leibniz obtains and justifies his theories. But before that, let us see what the *a posteriori* methods are.

Like the *a priori* methods, the *a posteriori* methods are divided into the certain and the conjectural. These methods are *a posteriori* because they proceed from effects or phenomena to their possible causes. Leibniz first describes the *a posteriori* conjectural method in the following way:

Analogies are useful in guessing at causes and in making predictions.

[24] E.g., A II.1, 102; A VI.2, 246, 275.

> The conjectural *a posteriori* method, which proceeds from experiments, rests for the most part upon analogies. For instance, seeing that many terrestrial phenomena agree with magnetic phenomena, some men teach that the earth is a great magnet, that the structure of the earth corresponds to this, and that heavy bodies are drawn to earth as a magnet draws iron. (A VI.4, 2000/L 284)

The *a posteriori* conjectural method cannot reliably reveal the true causes of things, which is why it is called conjectural, and its main idea is to analogize the phenomena to be explained with phenomena about which we have a firmer grasp, and to hypothesize that the causes of the former are similar or even the same as those of the latter. As Leibniz admits, although analogies of this kind are very useful, they are only of heuristic value. Hence the *a posteriori* conjectural method only leads us to probable causes of the phenomena, whose viability as possible hypotheses is to be confirmed by the *a priori* conjectural method.

By contrast, the *a posteriori* certain method supposedly leads us from phenomena to their true causes. But one might be a bit perplexed about how this could be. Here is Leibniz's description of it:

> *The method of reasoning from experiments resolves the phenomenon into its attributes and seeks the causes and effects of each attribute*.

> There remains the certain method of reasoning from experiments to causes, which I hold needs to be cultivated more widely and with greater care than heretofore. Many men are

> content with analogies because they stimulate the imagination, even though they do not satisfy the mind. But the true method of reasoning from experiments is this—we must resolve every phenomenon into all its circumstances by considering separately color, odor, taste, heat, and cold, and other tactile qualities, and finally, the common attributes of magnitude, figure, and motion. Now if we have discovered the cause of each of these attributes in itself we will certainly have the cause of the whole phenomenon. (A VI.4, 2001/L 284)

The *a posteriori* certain method roughly involves three steps: first, the phenomenon (or its concept) is resolved into all its component attributes; then, the causes of each of these attributes are discovered; finally, the causes of each attribute are composed into the cause of the entire phenomenon. The distinctive feature that makes this method certain seems to be the first step, the resolution of the phenomenon into its component attributes. But even if one concedes that this step of resolution can be achieved with certainty, it only pushes the question one step back—how could one discover the causes of the component attributes? One possible response is that the process of resolution could be carried on until one reaches primitive attributes whose causes are self-evident, but Leibniz does not think that this is humanly possible due to the infinite complexity of attributes involved in any phenomenon.[25] Another possible answer is that one

[25] The texts where Leibniz talks about this point are numerous. Most importantly, see, *Meditations on Knowledge, Truth, and Ideas* (1684–85), where Leibniz expresses pessimism about the prospect of achieving adequate knowledge (A VI.4, 587/L 292). In a text written during the same period, *On Universal Synthesis and Analysis* (1683–85), which expresses roughly the same idea as the current text, Leibniz seems to be more optimistic (A VI.4, 543/L 231). But it seems that at least with respect to concrete things, Leibniz does not think we could carry the conceptual resolution to the end. In a text written in 1688, Leibniz claims that 'all our concepts about complete things are imperfect' (A VI.4, 974).

could demonstrate from architectonic principles that some attribute has such-and-such causes. However, by doing so we would be essentially following the *a priori* certain method, since the causes are not discovered *a posteriori* or from the effect, but rather *a priori* or from the cause. Now the only option left seems to be that the causes are posited as hypotheses or possible causes, whose probability is to be justified by the *a priori* conjectural method.

So, it seems an exaggeration to name this method 'certain' since it only facilitates the discovery of the causes of phenomenon by dividing the phenomenon into several less complex component attributes. But if we do not yet know how to derive the attributes following the *a priori* certain method, then we could only posit hypotheses about the possible causes of these component attributes and check their viability by the *a priori* conjectural method. The situation is strikingly similar to that of Hobbes's methodology as described in Chapter 6 of *De Corpore*. There Hobbes claims that by resolving the idea of any singular thing (e.g., gold) we could obtain 'universals' that compose it (e.g., color and weight), and by knowing the causes of the universals, and composing again these causes, we could obtain the cause of the singular thing that we wanted to explain (*DC* VI.4–5, OL 1, 61–62). But the causes of the universals could only be known hypothetically based on the bipartite model, so conceptual analysis by itself does not reveal the true cause of the thing to be explained.

Therefore, it seems that the *a posteriori* methods described here—both the conjectural and the certain—are methods of discovery that help us find the possible causes of phenomena. There is nothing in them that is incompatible with the bipartite model of Hobbes and the young Leibniz. Indeed, it seems that the *a posteriori* methods form a whole with the *a priori* conjectural method: the former are methods for discovering the hypotheses, while the latter is the method for justifying the probability of the hypotheses. Together they constitute the complete process

through which one infers possible causes from phenomena. It is only the extra *a priori* certain method that distinguishes this new fourfold methodology from the old bipartite model. With the *a priori* certain method one could in principle directly discover the contingent makeup of the current world through contemplating the divine nature. And it seems that the *a posteriori* method can truly become certain and reveal the moral necessity of contingent truths only insofar as it is somehow converted to the *a priori* certain method. In other words, the hypothesis or possible cause discovered from phenomena can be known to be their true cause only when we have found a way to derive it from the contemplation of God using the *a priori* certain method. Without the *a priori* certain method, the rest of the methods are but a more elaborate version of the *a posteriori* side of the bipartite model which could at best attain moral certainty.

Leibniz preserves the bipartite model in his new methodological framework mainly because, as he admits, it is very difficult to know any contingent truths using the *a priori* certain method, so we must have a way to form probable hypotheses and to adjudicate between them in the interim. This point is consistently incorporated in the programmatic texts that outline the structure of Leibniz's mature system. Here are two such texts[26] where Leibniz summarizes the different kinds of principles that he makes use of:

> *Intellectual First Principles of the Essence of Things*
>
> Every judgement is either true or false. […]
>
> *Intellectual Principle of the Existence of Things*

[26] The first text is from *Definitiones Cogitationesque Metaphysicae* (dated around 1679 by the Akademie editors, A VI. 4, 1393) where Leibniz gives an outline of his system and discusses his conception of body in detail. The second text is a set of marginal notes to *Introductio ad Encyclopediam Arcanam* (1683–85, A VI.4, N. 126) where Leibniz discusses his conception of the *scientia generalis*.

Of several incompatible possible, the more perfect exists. […]

First Principles of Sensation or First Perceptions

I. I, who perceive, exist.

II. The things I perceive are various. […]

Principles of Opinions

That which is easier is more probable.

By the easier I mean that which has fewer requisites, i.e. that for whose sake fewer suppositions must be made.

There is no presumption that change will occur. […]

Principles of Physical Certainty

Phenomena which agree with the rest are held to be true, whereby Body, Space, Time, World, Individual are also adumbrated. (A VI.4, 1394–96/LC 237–41)

First a priori Principles

Principles of Metaphysical Certainty

Nothing can be and not be at the same time, or anything either is or is not; Nothing is without reason.

First Principles of a posteriori Knowledge, or of Logical Certainty

All perception of my present thought is true.

Principles of Topical Knowledge

Everything is presumed to stay in the state in which it is.

That which has fewer requisites is more probable, or that which is easier [is more probable].

Principle of Moral Certainty

Everything that is confirmed by many indications, which can hardly concur unless in what is true, is morally certain, or incomparably more probable than its opposite.

Principle of Physical Certainty

Everything that human beings have always experiences in many ways will still happen, for example that iron be merged into water. (A VI.4, 530)

While the nomenclature is not consistent across these two texts, the various kinds of principles introduced are more or less the same, and they stem from the hybrid methodology that I have just discussed. The *a priori* principles or 'intellectual' principles are the starting points of the *a priori* certain method. These principles include the principle of contradiction in which necessary truths about possibles are grounded, and the principles of sufficient reason and perfection in which contingent truths are grounded. From these two principles every truth could in principle be derived *a priori*. But since this is very difficult to achieve, Leibniz preserves the *a posteriori* route of finding causes from given effects or phenomena, and in the *a posteriori* route the starting points are my current perceptions. Since the causes discovered in this way, when they are not derived *a priori* from the divine design of the current world, are only possible causes, the 'principles of opinions' or 'principles of topical knowledge' serve to help us judge about their probability: the simpler a hypothesis (or the fewer requisites it has), and the fewer changes it posits, the more probable it is. And when a hypothesis becomes so probable that we could think of no better alternative, it could be said to attain moral certainty. Therefore, the various kinds of principles given in these two texts elaborate the hybrid methodology discussed above, where the

new *a priori* way of knowing contingent truths coexists along with the bipartite model.[27]

One might imagine that because the principle that 'a hypothesis involving fewer prerequisites while explaining more phenomena is more probable' is also grounded in divine wisdom, which produces the most phenomena with the least 'decrees or hypotheses',[28] such a principle would suffice for demonstrating the truth or falsity of a proposition or a theory with certainty. But Leibniz is consistent throughout these texts in saying that considerations such as theoretical simplicity and explanatory success are only signs of the probability of a hypothesis and do not suffice to demonstrate it with certainty. This is understandable since these are imprecise notions, and the possibility of finding a simpler and explanatorily more powerful hypothesis cannot be easily ruled out. Thus, while these considerations have some connection with divine wisdom, Leibniz only uses them to show the high probability of a hypothesis.[29]

Based on the foregoing discussion, it seems that although the mature Leibniz thought it was in principle possible to know contingent truths with certainty directly from the contemplation of divine nature, the bipartite model persisted into his mature philosophy due to the difficulty of knowing all contingent truths purely *a priori*. Of course, the bipartite model did not remain entirely the same as the one in Leibniz's early system. In Leibniz's early system the

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[27] Some other relevant texts include A VI.4, 124–25, 136 (where Leibniz talks about probable propositions and moral certainty), 341 (where hypotheses are included as one of the principles).

[28] See, e.g., *Discours de metaphysique* §5, A VI.4, 1536–37/AG 38–9. It is important to distinguish between 'hypothesis' used in the sense of a divine decree (similarly, hypothetical necessity, *ex hypothesi*, etc.) and 'hypothesis' used in the sense of a probable theory that is assumed while not demonstrated. The young Leibniz seems to use 'hypothesis' mostly in the second sense, while 'hypothesis' begins to be widely used in the first sense somewhat later (see A VI.4, 1445, 1449, 1454; the notion of hypothetical necessity is already contained in earlier texts such as *Confessio Philosophi*, A VI.3, 128). As the methodological writings discussed above and texts such as *New System* make clear, the mature Leibniz still frequently uses 'hypothesis' in the sense of a probable theory. It is not hard to tell the two senses of 'hypothesis' apart.

[29] See Leibniz's defense of the Copernican hypothesis in C 590–93/AG 90–94.

hypotheses are only constrained by necessary truths, e.g., the abstract laws of motion, while now they are also constrained by the contingent architectonic principles. Relatedly, while in the early system hypotheses could never be so strongly constrained by necessary truths as to be directly implied by the latter, in the mature system they could be constrained by necessary truths plus contingent architectonic principles to the point where they are directly implied by them. But as pointed out above, if the hypotheses turn out to be directly implied by necessary truths plus architectonic principles, then we would be following the *a priori* certain method, rather than the bipartite model. Therefore, despite certain changes, for the early and the mature Leibniz the main idea of the bipartite model remains roughly the same, that is, hypotheses are inferred via something like inference to the best explanation from phenomena: we first start from phenomena and posit several hypotheses that could potentially explain the phenomena, then we choose the most viable one either by eliminating some hypotheses based on their violation of *a priori* principles or based on considerations such as simplicity and explanatory power.

4. LEIBNIZ'S MATURE PHILOSOPHY AND THE HYBRID METHODOLOGY

The hybrid methodology of the mature Leibniz is an extension of the bipartite model of the young Leibniz insofar as it incorporates contingent architectonic principles. The old bipartite model involves two modes of reasoning: the *a priori* demonstrations of necessary truths from definitions and the *a posteriori* inferences of hypotheses from phenomena based on considerations such as explanatory power. The hybrid methodology of the mature Leibniz preserves these two modes of reasoning and adds a third mode of reasoning, *a priori* demonstrations of contingent truths from architectonic principles. These three modes of reasoning do not exist independently of each other, since, for example, in demonstrating contingent truths from architectonic principles one would need to make use of necessary truths,

and in inferring possible causes from phenomena one could invoke necessary truths and architectonic principles to eliminate alternative hypotheses. Nonetheless, it seems that there are still two distinct methods to justify a theory, namely the *a priori* method that could potentially establish the full-blown certainty of the theory, where the theory would be demonstrated as morally necessary truths, and the *a posteriori* method of inferring a hypothesis from phenomena that could at best establish the moral certainty of the theory, where the theory would remain hypothetical.

In this section I will first show that this hybrid methodology informs Leibniz's mature philosophy and then argue that it helps us better understand the nature of Leibniz's theories of fundamental reality, such as the theory of monads. If my interpretation is on the right track, then the mature Leibniz lacks the intellectual resources to demonstrate the theory of monads *a priori* since the *a priori* principles available to him cannot rule out the existence of *per se* unities other than simple, mind-like substances. In other words, the theory of monads is in the end only a highly probable hypothesis.

According to the hybrid methodology, Leibniz's mature philosophy consists of four components: (1) necessary truths grounded in the principle of contradiction, which hold in every possible world;[30] (2) contingent architectonic principles grounded in divine perfection, which only hold in the actual world; (3) truths that can be demonstrated from (1) and (2) using the *a priori* certain method, which are fully certain; (4) hypotheses that cannot be *a priori* demonstrated but only *a posteriori* inferred from phenomena. All four components, as I argue, can be identified in Leibniz's mature philosophy.

[30] Apparently among necessary truths there is a demonstrative hierarchy as some are demonstrated from others logically. But for the sake of simplicity, I assimilate all necessary truths.

These four components and their interrelations are most fully exposed in Leibniz's mature natural philosophy. Leibniz's systematic treatise of his science of dynamics, *Dynamica*, is organized almost entirely according to the *a priori* certain method. *Dynamica* is divided into two parts, containing 'simple Dynamics, or that which abstracts from things [*a rebus abstracta*]' and 'concrete Dynamics concerning the things that happen in the system of things' respectively (GM VI, 285). Such a division into the abstract and the concrete is reminiscent of Leibniz's early physical system comprising the *Theory of Abstract Motion* and the *New Physical Hypothesis*. However, such a comparison is only half correct. While Part I of *Dynamica* is like the *Theory of Abstract Motion* in that it only deals with the properties of matter and motion that are geometrically demonstrable—so that its contents would fall under (1)—Part II of *Dynamica* is not hypothetical like the *New Physical Hypothesis*. At the beginning of Part II of *Dynamica* Leibniz proposes an important 'axiom', namely that 'an entire cause is equivalent to its full effect' (GM VI, 437). As is well established, this axiom is closely related to the optimality of the actual world, thus it is a contingent architectonic principle that is grounded in divine perfection.[31] This axiom is pivotal in Part II of *Dynamica* since its main results are demonstrated from the geometrical truths demonstrated in Part I of *Dynamica* plus this architectonic principle. For instance, the conservation of power in a closed system follows directly from the axiom;[32] and in conjunction with the measure of motive power (mv^2) established in Part I,[33] the axiom entails the conservation of the motive power of bodies during collision.[34] Thus, it seems that the contents of

[31] See Garber, *Leibniz*, 237–50; Jeffrey McDonough, *A Miracle Creed*, (Oxford: Oxford University Press, 2022), 100–32.

[32] Part II, Section 1, Proposition 7; GM VI, 440.

[33] Section 3, Chapter 2, Proposition 5; GM VI, 365.

[34] Part II, Section 1, Proposition 40; GM VI, 460.

Part II of *Dynamica* fall under (2) and (3), but not (4).[35]

What is also interesting about *Dynamica* is that it demonstrates what was previously assumed as a hypothesis—Galileo's law of free fall[36]—using the *a priori* certain method. In Leibniz's earlier presentation of his dynamics in *Brevis Demonstratio*, he assumes the truth of the Galilean law and uses it to argue against Descartes that what is conserved during collision is not the quantity of motion, $m|v|$, but mv^2.[37] But Galileo's law itself is not demonstrated *a priori*. Based on Leibniz's list of principles that we saw at the end of section 3, at this stage it seems that Galileo's law is justified by the principles of experimental confirmation and induction, which can only establish the high probability of Galileo's law. In *Dynamica*, by contrast, Galileo's law is demonstrated *a priori* in the same way as the conservation of motive power.[38] This change shows that what is temporarily assumed as a hypothesis can be demonstrated *a priori* and thereby become a truth with full certainty as long as one is equipped with all the relevant *a priori* principles and knows how to derive the hypothesis from them.

Leibniz's mature natural philosophy is nonetheless not devoid of hypotheses. *Dynamica*, after all, only establishes the general laws of nature. Most notably, Leibniz's theory of planetary motion by which he explains Kepler's laws of planetary motion mechanically seems to be a hypothesis, as Leibniz refers to it as 'physical hypothesis' and 'my hypothesis'.[39] Indeed, the

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[35] The axiom about the equivalence of entire cause and full effect is not the only architectonic principle introduced in Part II of *Dynamica*. For instance, it also introduces the principle of continuity (GM VI, 491).

[36] 'The perpendicular heights of heavy bodies are proportional to the squares of the speeds which they can acquire by falling from those heights, or to the squares of the speeds by virtue of which they can raise themselves to those very heights' (GM VI, 288/AG 107).

[37] GM VI, 117–19. For a new translation of the *Brevis Demonstratio*, see Richard T. W. Arthur (ed.), *Leibniz: Journal Articles on Natural Philosophy* [*Journal Articles*] (Oxford: Oxford University Press), 56–60.

[38] Part II, Section 1, Proposition 32; GM VI, 452–55.

[39] Arthur (ed.), *Journal Articles*, 194.

theory is devised as a possible explanation of phenomena, which are Kepler's laws in this case, and it is difficult to see how the theory, as well as Kepler's laws themselves, can be demonstrated from necessary truths plus considerations of divine perfection. Thus, despite Leibniz's attempt to organize his natural philosophy following the *a priori* certain method, the *a posteriori* method and explanatory hypotheses still make up a significant portion of it.

While the relevance of the hybrid methodology for Leibniz's natural philosophy is easy to establish, one might dispute whether the same holds for Leibniz's metaphysics, understood as the science of real being which includes his theories of reality, and more specifically, whether Leibniz's metaphysics only employs the *a priori* certain method such that its main theories are fully certain. Leibniz persistently seeks to set out his metaphysics demonstratively, which, on the current interpretation, means to demonstrate the certain tenets of his metaphysics following the *a priori* certain method.[40] But it is another question whether he actually succeeds in applying it or whether he has the intellectual resources to do so. As we have seen in the case of natural philosophy, Leibniz has no problem with hypotheses in cases where there is no *a priori* demonstration. Thus, given the presence of the hybrid methodology in his mature system, there is little reason to think that Leibniz would exclude propositions that are not *a priori* demonstrable from his metaphysics. In the rest of this section, I will discuss two cases, those of pre-established harmony and the theory of monads, and show how the hybrid methodology is relevant for understanding their statuses within Leibniz's system.

While Leibniz often calls his pre-established harmony a 'hypothesis', it seems that he actually has the intellectual resources to demonstrate it following the *a priori* certain method. Pre-established harmony consists of two main claims: first, all substances are causally

[40] Rutherford, *Order*, 71–98.

spontaneous, second, the spontaneously produced states of all substances correspond to each other.[41] The first claim follows from Leibniz's containment theory of truth, which is presumably necessary,[42] and the second claim follows from Leibniz's view on divine perfection according to which God maximizes both the magnitude of reality and order in creating the actual world,[43] thus in the actual world the spontaneous states of substances correspond to each other following the greatest possible order. Pre-established harmony therefore has the same kind of certainty as the natural philosophical results demonstrated in Part II of *Dynamica* that follow from necessary truths plus architectonic principles.

Indeed, despite appearances to the contrary, Leibniz's official argument for pre-established harmony can be interpreted as following the *a priori* method.[44] The argument goes roughly as follows. First, there are three hypotheses that could explain the phenomena of apparent mind-body interactions: the hypothesis of real influx, the hypothesis of occasionalism, and the hypothesis of pre-established harmony. Second, the hypothesis of real influx is ruled out because it is 'inconceivable', and the hypothesis of occasionalism is ruled out because it requires constant miracles on the part of God, which diminishes divine perfection. Therefore, the hypothesis of pre-established harmony should be upheld. The second step only uses *a priori* principles, either necessary or architectonic.[45] The first step can be interpreted as exhausting all the logical

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[41] One may add a third implicit component, namely that there exist some substances in the world. This component can be justified via divine perfection since God seeks to maximize perfection in creating the world and perfection is related to the magnitude of positive reality.

[42] See, e.g., A VI.4, 1647/AG 33.

[43] See Rutherford, *Leibniz*, 22–45; Jeffrey McDonough, 'Leibniz and the Puzzle of Incompossibility: The Packing Strategy', *The Philosophical Review*, 119 (2020), 135–63.

[44] Here I mainly follow Leibniz's presentation of the argument in the *New System* (GP IV, 483–84/AG 143–44).

[45] It is clear that the hypothesis of occasionalism is ruled out based on the principle of perfection, which is architectonic. It is not so clear, however, what the nature of the 'inconceivability' of real influx is. At first glance it

possibilities for how different created things operate in tandem.[46] Thus, while Leibniz's explicit argument of pre-established harmony seems to involve an *a posteriori* inference of hypotheses from phenomena, his underlying reasoning can be reconstructed in a way that conforms to the *a priori* method.

By contrast, it is difficult to see how the theory of monads can be demonstrated *a priori* analogously to pre-established harmony. The main *a priori* support for the theory of monads seems to be Leibniz's view on the convertibility of being and unity, which according to Leibniz is a necessary truth:

> I hold as axiomatic the identical proposition which varies only in emphasis: that what is not truly one entity is not truly one entity either. It has always been thought that 'one' and 'entity' are reciprocal things [*sont des choses reciproques*]. (To Arnauld, April 1687, A II.2, 186/LA 121)

> With you, I hold that being and one are convertible [*Ens et Unum converti*]. (To Des Bosses, February 1706, LDB 20/21)

While the convertibility axiom dictates the existence of *per se* unities if there exists anything at all, it does not specify what kind of *per se* unity constitutes the bottom level of reality. It could

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might seem that the inconceivability of the hypothesis of real influx consists in its violation of the principle of contradiction, however, in a later letter to Damaris Masham (June 1704), Leibniz says that the hypothesis of real influx is rejected because it (like the hypothesis of occasionalism) requires constant miracles, which violates the principle of perfection (GP III, 354). In any case, both hypotheses are ruled out on *a priori* grounds.

[46] In the same letter to Lady Masham Leibniz argues that the three hypotheses exhaust all the logical possibilities (GP III, 355).

be that all *per se* unities are simple substances, in which case the theory of monads would be true; or it could be that all *per se* unities are hylomorphic composites, in which case the middle-year Aristotelian theory of corporeal substances would be true;[47] or it could be that some *per se* unities are monads, while some are composite substances. In addition, there are different ways in which composite substances are characterized in Leibniz's system.[48]

It is also difficult to see which additional principles, either necessary or architectonic, can help to demonstrate the theory of monads *a priori*. A possible line of *a priori* demonstration that can establish the existence of monads is through the so-called 'mill argument'. According to one construal of the key premise of the mill argument, perceptions can only exist in simple substances 'and not in the composite or in the machine', which could be a necessary truth;[49] but the maximization of perfection requires the existence of things that can perceive; therefore, simple substances exist in the best of all possible worlds. However, it is unclear exactly what the key premise of the mill argument is, and whether it relies on simplicity rather than just unity, or some other features of Leibnizian substances such as their active nature.[50] Furthermore, even if this *a priori* demonstration is acceptable to Leibniz, it does not establish that simple substances

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[47] Garber, *Leibniz*; Phemister, *Leibniz*; Arthur, *Monads*.

[48] Look and Rutherford have identified at least three different views on the nature of composite substances: the 'Unity View' where a composite substance is directly made up of substantial form and primary matter (LDB xlii), the 'Composite View' where a composite substance is made up of substantial form and secondary matter (LDB xliii), and the 'M-Composite View' where a composite substance is made up of monads (LDB li). Admittedly these views are not equally tenable for Leibniz, but the important point is that the constraint placed by the convertibility axiom on the nature of *per se* unities is quite loose.

[49] *Monadology* §17 (GP VI, 609/AG 215).

[50] For instance, Marleen Rozemond, 'Mills Can't Think: Leibniz's Approach to the Mind-Body Problem', *Res Philosophica*, 91:1 (2014), 1–28, argues that the mill argument relies on the active nature of substances. Paul Lodge and Marc Bobro, 'Stepping Back Inside Leibniz's Mill', *The Monist*, 81:4 (1998), 553–72, emphasize indivisible unity—which does not amount to simplicity for Leibniz—as the key premise.

are all there is in the actual world. Indeed, it seems that the maximization of perfection calls for the existence of as many kinds of substances as possible.

Moreover, an episode from Leibniz's correspondence with Des Bosses concerning the substantial bond shows directly that Leibniz does not think the theory of monads is *a priori* demonstrable. As is well established, Leibniz's conception of the substantial bond undergoes several shifts throughout the course of his correspondence with Des Bosses, and although the substantial bond is often discussed in connection with the problem of transubstantiation in the earlier portion of the correspondence, towards the end of the correspondence it is taken seriously as part of a metaphysical theory that preserves the reality of corporeal phenomena.[51] In this theory the substantial bond is itself a composite substance and it is not aggregated from the monads that coexist with it. What is most revealing about this theory is that the substantial bond is part of the *natural* order, since the states of substantial bonds correspond to those of the monads by physical necessity:

> A substantial bond superadded to monads is, in my opinion, something absolute, which although it accurately corresponds in the course of nature to the affections of monads, namely their perceptions and appetitions, so that in a monad it can be read in which body its body is, nevertheless, supernaturally, the substantial bond can be independent of the monads and can be changed and accommodated to other monads, with the previous

[51] See Look and Rutherford (LDB lx–lxxii); Look, *Leibniz and the 'Vinculum Substantiale'*, Stuttgart: Franz Steiner Verlag, 1999; Jean-Pascal Anfrey, 'The Unity of Composite Substance: The Scholastic Background to the *Vinculum Substantiale* in Leibniz's Correspondence with Des Bosses', *Vivarium* 58:3 (2020), 219–52.

monads remaining. (To Des Bosses, 24 January 1713, LDB 296/297)[52]

The correspondence between substantial bonds and monads is of the same kind with that between monads (i.e., pre-established harmony), since the latter is also part of the natural order informed by God's general optimal design of the world which nevertheless can be violated by miracles. Thus, in this theory the substantial bonds are as integral to the natural order as the monads themselves. And if so, then it would be impossible to rule out the existence of substantial bonds by *a priori* principles. Of course, Leibniz is not asserting the existence of substantial bonds within the natural order but rather experimenting with it as a hypothesis; however, the fact that Leibniz is willing to incorporate substantial bonds within the natural order already shows that he does not think the theory of monads itself is *a priori* demonstrable.[53] Hence the theory of monads is a genuine hypothesis for Leibniz.

Indeed, throughout the Des Bosses correspondence Leibniz explicitly refers to the theory of monads as a hypothesis.[54] And the strongest reasons adduced by Leibniz to support the theory of monads are related to its theoretical simplicity:

I regard the explanation of all phenomena solely through the perceptions of monads agreeing among themselves, with corporeal substance excluded, to be useful for a

[52] Similar statements about the natural correspondence between the states of the monads and those of the substantial bonds abound in the later stage of the Leibniz-Des Bosses correspondence, see LDB 300/301, 302/303, 319–321, 336/337, 350/351, 366/367, 372/373.

[53] I think my point made here agrees with that of Jeffrey McDonough, 'Leibniz's Conciliatory Account of Substance', *Philosophers' Imprint*, 13:6 (2013). What McDonough calls 'philosophical reasons' in his interpretation correspond to the *a priori* principles, necessary or architectonic, in my interpretation.

[54] See, e.g., LDB 256/257, 275/276, 293/294.

> fundamental inspection of things. In this way of explaining things, space becomes the order of coexisting phenomena, as time is the order of successive phenomena, and there is no absolute or spatial nearness or distance between monads. […] Next, we must consider what would have to be superadded, if we were to add a substantial union, that is, suppose that there is corporeal substance, and thus matter; and whether it is then necessary to revert to a mathematical body. (LDB 254/255)

> Indeed, I suppose nothing everywhere and throughout all things except that which we all admit in our own souls on many occasions, namely, internal spontaneous changes. And in this way, I exhaust the totality of things with one act of the mind. (LDV 320/321)

In the first passage Leibniz attributes the advantage of the theory of monads to its elimination of any real foundations of space and time, which drastically decreases the number of items posited by the theory.[55] The second passage, taken from the De Volder correspondence, expresses roughly the same idea that the theory of monads is preferable because it is extremely economical and easy to grasp. Based on the methodological texts that we have examined in section 3, Leibniz believes that theoretical simplicity pertains to the 'principles of opinions' and the 'principles of topical knowledge' that can only increase the probability of a hypothesis *a posteriori* inferred from phenomena,[56] perhaps up to the point of moral certainty, but it can never

[55] Note that space and time's having real foundations does not necessarily lead to the Newtonian absolute space and time, which would violate the principle of sufficient reason. See Vincenzo de Risi, 'The Genesis of Relationism: Leibniz's Early Theory of Space and Newton's Scholium', *Oxford Studies in Early Modern Philosophy*, 12 (2025).

[56] For an interpretation that similarly emphasizes the importance of the *a posteriori* mode of reasoning in Leibniz's mature metaphysics, see Paul Lodge, 'The Empirical Grounds for Leibniz's "Real Metaphysics"', *The Leibniz Review*, 20 (2010), 13–36. However, Lodge seems to think that empirical grounds and *a posteriori* reasoning based

establish the full-blown certainty of the hypothesis. Hence, despite the fundamentality of the theory of monads in Leibniz's metaphysics, it is only a highly probable hypothesis that serves as a possible explanation of the phenomena.

Therefore, like his natural philosophy, Leibniz's mature metaphysics also consists of four components that spring from the hybrid methodology, i.e., necessary truths, architectonic principles, *a priori* demonstrable truths, and hypotheses. The apparent theory pluralism in Leibniz's later writings that has troubled commentators for a long time presents no real difficulty because such pluralism is countenanced by the hybrid methodology where multiple incompatible hypotheses can be entertained at the same time as possible explanations of phenomena. Of course, although I have argued that the theory of monads is only a hypothesis and Leibniz seems to be aware of its hypothetical status, Leibniz's actual theoretical commitment in his late years is a separate question. It could be the case that, despite the indemonstrability of the theory of monads within Leibniz's system, he was nonetheless exclusively committed to it in his late years or at least during certain periods of his late years.[57] To give a persuasive answer to this further question requires a careful examination of all the relevant texts in his late years, which cannot be done here. Nonetheless, the current interpretation shows that, if there are indeed periods when Leibniz was exclusively committed to the theory of monads, such a commitment is not warranted by his own philosophical methodology, which, given the relevance of Leibniz's methodology to his philosophy, is a strong reason to think that Leibniz was perhaps never committed to the

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thereon are with the only way to justify contingent truths about the actual world. As we have seen, Leibniz thinks that the *a priori* certain method can be used to demonstrate contingent truths independently of empirical grounds.

[57] For instance, John Whipple, 'Leibniz on Fundamental Ontology: Idealism and Pedagogical Exoteric Writing', *Ergo*, 4 (2017), argues that in the texts where Leibniz seems to be committed to the existence of composite substance he is writing exoterically, while in his esoteric writings he is only committed to the theory of monads.

theory of monads as exclusively and consistently as many commentators take him to be. A more plausible position is that in his late years Leibniz generally thought that the theory of monads was the most probable hypothesis among a host of probable hypotheses.[58]

5. CONCLUDING REMARKS

Throughout his career Leibniz's philosophy was informed by his philosophical methodology: in his early years, Leibniz subscribed to the bipartite model, and his early philosophical systems were accordingly divided into a part about necessary truths and a part about hypotheses explaining contingent phenomena. In his mature career, Leibniz was convinced of our ability to know contingent truths *a priori* from the contemplation of divine nature, and his methodology became a hybrid one where the *a priori* certain method that demonstrates general contingent truths with full-blown certainty coexists with the bipartite model. In many cases he attempted to derive his theories *a priori*, but he was also content with the less ambitious goal of moral certainty established through the bipartite model when *a priori* demonstrations were not available, as was the case with the theory of monads.

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[58] Garber argues that towards the end of the Des Bosses correspondence Leibniz seems to envisage a theory that is only populated by substantial bonds, thus the substantial bond 'originally introduced to bind the monads together into a composite substance, has largely taken over' (*Leibniz*, 380). Garber's view is based on Leibniz's claim that substantial bonds only depend on monads naturally but not essentially, so it is a metaphysical possibility that substantial bonds exist independently of monads. For Leibniz, as we have seen, such a metaphysical possibility can only be actualized by miracles, so monads are still as much an integral part of the natural order as substantial bonds and not shoved aside. But Garber's general point might still hold, if the existence of monads cannot be established by *a priori* demonstrations. In that case the three main competing hypotheses of reality for the late Leibniz would be (1) the hypothesis that only posits monads, (2) the hypothesis that posits both monads and substantial bonds/corporeal substances, and (3) the hypothesis that only posits substantial bonds/corporeal substances. Leibniz might still regard (1) as the most probable among the three, but it would have a weaker (if at all) theoretical advantage over (3) than over (2), because (3) only posits one kind of being as well.

Having Leibniz's methodology in mind is crucial when we try to understand Leibniz's philosophical theories and his justifications for them, since based on the current interpretation there are two distinct kinds of reason that could justify a theory: one kind of reason is derived either from necessary truths or the principles of sufficient reason and perfection and warrants the complete certainty of a theory, while another kind of reason is defeasible and only increases a theory's probability. If Leibniz only had the second kind of reason for a theory, then it should not come as a surprise that he might experiment with alternative theories.[59]

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