## Leibniz's Formal Theory of Contingency Extended

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### *1. Leibniz's Formal Theory of Contingency*

With his "infinite analysis" theory of contingency, or as we will call it, his "formal theory of contingency," Leibniz suggests that the distinction between necessary and contingent propositions can be drawn in purely formal terms. So, for example, in his *De Contingentia*, tentatively dated to 1689, Leibniz writes:

> "And here is uncovered the secret distinction between necessary and contingent truths, which no one will understand easily unless one has some tincture of mathematics. Namely that in necessary propositions one arrives, by an analysis continued to some point, at an identical equation (and this very thing is to demonstrate a truth in geometrical rigor); but in contingent propositions the analysis is continued to infinity by reasons of reasons, so that indeed a full demonstration is never obtained, although there is always, underneath, a reason for the truth, even if it is perfectly understood only by God, who alone runs through an infinite series with one act of the mind."[1]

In passages such as this, Leibniz seems to be suggesting that we can draw a formal distinction between necessary and contingent truths. In the case of necessary truths, logical analysis yields finite demonstrations and we may come to know necessary truths perfectly. In the case of contingent propositions, logical analysis does not yield finite demonstrations, and God alone can know contingent truths perfectly.

In fleshing out his views on infinite analysis, commentators have typically assumed that Leibniz is trying to draw a distinction between propositions

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[1] A VI, 4, 1650: "Et hic Arcanum detegitur discrimen inter Veritates Necessarias et Contingentes, quod non facile intelligent, nisi qui aliquam tincturam Matheseos habet. Nempe in propositionibus necesssariis analysi aliquousque continuata devenitur ad aequationem identicam; et hoc ipsum est in geometrico rigore demonstrare veritatem; in contingentibus vero progressus est analyseos in infinitum, per rationes rationum, ita ut nunquam quidem habeatur plena demonstratio, ratio tamen veritatis semper subsit, etsi a solo Deo perfecte intelligatur, qui unus seriem infinitam uno mentis ictu pervadit."

that have, and propositions that do not have, finite proofs.[2] On their readings, necessary truths can be finitely proven because there are finite proofs of necessary truths; contingent truths cannot be finitely proven because there are no finite proofs of contingent truths. The guiding interpretative thought here is that, for Leibniz, a proof of a contingent truth would have to be like an infinite series. It could have a beginning and consecutive terms, but it could not, by its very nature, have a last term. God, as an infinite being, might nonetheless grasp even such necessarily infinite proofs of contingent propositions. Perhaps he is able to run through all the steps of the proof by a kind of supertask, or perhaps he can take all the members in at once through an infinitely broad intuition. Or perhaps he is able to do both. As contingent beings, however, we can neither consecutively run through all the steps of an infinite proof nor intuit infinitely many steps at once, and so we are unable to prove contingent propositions ourselves.

The standard strategy of trying to understand Leibniz's formal theory of contingency in terms of propositions that have, and propositions that do not have, finite proofs is a reasonable one, and it has been skillfully pursued in a number of different directions. Nonetheless as a general strategy it has run up

[2] For recent discussions of Leibniz's formal theory of contingency, see especially Jan Cover/John Hawthorne: "Infinite Analysis and The Problem of the Lucky Proof," in: *Studia Leibnitiana* 32 (2000), pp. 151–165; Gonzalo Rodriguez-Pereyra/Paul Lodge: "Infinite Analysis, Lucky Proof, and Guaranteed Proof in Leibniz," in: *Archiv für Geschichte der Philosophie*, 93 (2011), pp. 222–236; Giovanni Merlo: "Complexity, Existence and Infinite Analysis," in: *Leibniz Review* 22 (2012), pp. 9–36; Stephen Steward: "Solving the Lucky and Guaranteed Proof Problems," in: *Leibniz Review*, 24 (2014), pp. 29–46. For classic discussions see also Robert Adams: *Leibniz: Determinist, Theist, Idealist*, Oxford 1994; David Blumenfeld: "Leibniz on Contingency and Infinite Analysis," in: *Philosophy and Phenomenological Research* 45 (1985), pp. 483–514; E. M. Curly: "The Root of Contingency," in: Harry Frankfurt (ed.): *Leibniz: A Collection of Critical Essays*, Garden City, NY 1972; John Carriero: "Leibniz on Infinite Resolution and Intra-mundane Contingency. Part One: Infinite Resolution," in: *Studia Leibnitiana* 25/1 (1993), pp. 1–26: "Leibniz on Infinite Resolution and Intra-mundane Contingency. Part Two: Necessity, Contingency, and Divine Faculties," in: *Studia Leibnitiana* 27/1 (1995), pp. 1–30; Ian Hacking: "Leibniz and Descartes: Proof and Eternal Truths," in: *Proceedings of the British Academy* 59 (1973), pp. 175–88: "Infinite Analysis," in *Studia Leibnitiana* 6 (1974), pp. 126–30: "A Leibnizian Theory of Truth," in: Michael Hooker (ed.): *Leibniz: Critical and Interpretive Essays*, Baltimore 1978, p. 185–195: Hidé Ishiguro: *Leibniz's Philosophy of Logic and Language*. London 1972. pp. 171–203; Patrick Maher: "Leibniz on Contingency," in: *Studia Leibnitiana* 12 (1980), pp. 236–242; Benson Mates: *The Philosophy of Leibniz: Metaphysics and Language*, New York 1986, pp. 105–117.

against a stubborn, deep-seated difficulty. For given Leibniz's views on the nature and structure of true propositions as well as his advanced understanding of formal demonstration, it is very hard to see how he could possibly deny that contingent propositions have finite proofs. Leibniz allows that in the case of any true proposition the relevant predicate is contained in the subject, and his rules of valid substitution and inference imply that any true predicative proposition should be reducible to an explicit identity statement in a finite, in fact quite small, number of steps. Although we won't look at the details here, it is this core difficulty that lies behind the much-discussed problems of the Lucky Proof and the Guaranteed Proof.[3]

Fortunately, Leibniz's lifelong interest in ideal languages suggests a different strategy for making sense of his remarks concerning infinite analysis. Taking inspiration from the work of figures such as Johann Heinrich Alsted, Johann Heinrich Bisterfeld, Jan Amos Comenius, Athanasius Kircher, and ultimately Raymond Lull, Leibniz conceived of an ideal language that would consist of primitive simple concepts, complex concepts composed from those simple concepts, and valid rules of inference and substitution.[4] Users of such a language, Leibniz maintained, could carry out inferences blindly and resolve arguments with the certainty of mathematics. Indeed, in an important analogy, Leibniz suggests that primitive concepts could be designated by prime numbers, complex concepts by compound numbers, and inferential rules modeled on algebraic rules. Two people fluent in such a language, and capable of carrying out basic arithmetical operations, could then resolve their disputes like two accountants. Rather than talking past each other with mismatched concepts, or winding through labyrinths of Aristotelian syllogisms, they could simply sit down and declare, in Leibniz's often quoted remark, "let us calculate!"[5]

What is most important about Leibniz's fascinating work on ideal languages for our present purposes is that it shows him to have a keen interest

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[3] The problem of the Lucky Proof was introduced by Adams: *Leibniz: Determinist*, p. 34. The problem of the Guaranteed Proof was introduced by Maher: "*Leibniz on Contingency*" and is influentially developed in Rodriguez-Pereyra/Lodge: "Infinite Analysis, Lucky Proof," p. 223. Representative responses to these problems can be found in Jonathan Bennett: *Learning from Six Philosophers: Descartes, Spinoza, Leibniz*, Oxford 2001, p. 327–329, Cover/Hawthorne: "Infinite Analysis", Maher: "Leibniz on Contingency," p. 238–239, Merlo: "Complexity, Existence," Rodriguez-Pereyra/Lodge: "Infinite Analysis, Lucky Proof," and Stewart: "Solving the Lucky," pp. 37–38.

[4] For background and a guide to the relevant texts, see Maria Rosa Antognazza: *Leibniz: An Intellectual Biography*, Cambridge 2009, p. 62, and Richard T. Arthur: *Leibniz*, Polity 2014, pp. 29–32.

[5] A VI, 4, 964; see also ibid., 913.

not only in logic and demonstrations per se—for example, in rules of valid substitution and inference—but also in what may be described as meta-logical concerns, concerns about the reach and limitations of formal systems. Although already present in his thinking about the scope of ideal languages, Leibniz's meta-logical concerns are perhaps most easily illustrated by his closely related thinking about calculating machines. Having developed a formal conception of logic, and having seen the intimate connection between logical and algebraic rules, it was but a short—if brilliant—step to recognize that even advanced mathematical operations might be carried out in a blind, mechanistic manner. In the late 1670's, Leibniz famously took that step, drawing up plans for his Step Reckoner—the first machine capable of performing all four algebraic operations of addition, subtraction, multiplication, and division. Leibniz's work on his Step Reckoner nicely illustrates his implicit awareness of meta-logical issues. For Leibniz's Step Reckoner surpassed Blaise Pascal's earlier calculating machine, the Pascaline, precisely in its ability to solve, in an algorithmic fashion, problems not only of addition and subtraction, but also of multiplication and division. With a little liberty, we may say that, in constructing his Step Reckoner, Leibniz must have had, in an intuitive sense, an ur-notion of decidability, a sense that problems of multiplication and division are decidable relative to his Step Reckoner, but not decidable relative to Pascal's Pascaline.[6]

Leibniz's intuitive sense of decidability suggests a rather different way of understanding his formal theory of contingency. Rather than thinking that contingent truths simply do not have finite proofs, perhaps Leibniz's core thought is that there is no procedure, no algorithmic process or rule, that we can follow that would allow us to find proofs of contingent propositions. Put in terms of his ideal language, Leibniz's thought would be that a proof of any necessary truth can be algorithmically found by appealing to nothing more

[6] In contemporary terms, a formal system S is decidable if, roughly, there is an effective, algorithmic procedure for telling, given any formula F of S, whether or not F is derivable in S. This is not to be confused with a second notion of decidability (known also as "formal" decidability) that applies to formulas of formal systems, and according to which a formula is formally decidable in S if and only if it is either derivable or refutable in S. As we interpret him, Leibniz's ur-notion of decidability doesn't quite match up with either of these formulations. Rather Leibniz's notion is a sort of hybrid directly applicable only to true propositions: A true proposition *p* might be said to be "Leibniz-decidable" if, relative to Leibniz's ideal language, there is an algorithmic procedure which is guaranteed to output a proof of *p*. For further discussion, see Jeffrey K. McDonough/Zeynep Soysal: "Leibniz's Formal Theory of Contingency," manuscript 2016.

than definitions in an ideal language and valid rules of substitution and inference. Proofs of true contingent propositions, however, cannot be algorithmically found by appeal to ideal definitions and logic alone. Although God can know true propositions a priori, we can determine the truth of contingent propositions only with the aid of experience. Put in terms of his work on algorithmic machines, Leibniz's central thought would be that in the case of any necessary proposition, a finite machine can in principle be constructed that is guaranteed to halt at a proof of that proposition; in the case of any contingent proposition, such a finite machine cannot be constructed. On this way of interpreting Leibniz's formal theory of contingency, the question of whether or not true contingent propositions have finite proofs is largely beside the point; what is important is whether or not there is a formal, algorithmic procedure for finding them.

In previous work,[7] we have argued in detail that on a meta-logical interpretation of the sort just sketched, Leibniz's formal theory of contingency emerges from an intuitive idea, fits well with key Leibnizian texts, and avoids pressing objections. Although we don't claim that it represents the only thread in Leibniz complicated, developing, and perhaps even inconsistent thinking about infinite analysis, we do maintain that it may well represent his most insightful and promising line of thought relating his work on infinite analysis to contingency. In the next two sections, we aim to develop Leibniz's formal theory of contingency further by taking up two additional issues not fully addressed in our earlier efforts.

## *2. Natural Philosophy and the Ideal language*

On a meta-logical interpretation, Leibniz's formal theory of contingency implies that we cannot settle the truth of contingent propositions by appealing to ideal definitions and logic alone. If we want to know that 2+3=5, appealing to definitions and logic alone is a good strategy, indeed a strategy that Leibniz thinks is in principle guaranteed to yield a definitive result. If we want to know, say, if Fido is a dog, however, appealing to definitions and logic along is not a good strategy. Unless we are hoping to get very, very lucky, to know that Fido is a dog, we must consult experience in some manner. We might ask a friend who has seen Fido, examine a picture, or try to spy Fido ourselves.

[7] McDonough/Soysal: "Leibniz's Formal Theory."

The important point is that even armed with an ideal language, we could analyze Fido's complete concept forever without discovering whether or not he is a dog. On our interpretation of Leibniz's formal theory of contingency, experience is thus essential for making progress in the natural sciences, and it is with good reason that Leibniz famously quips that he prefers "a Leeuwenhoek who tells me what he sees to a Cartesian who tells me what he thinks."[8]

In suggesting that contingent truths cannot, in practice, be established by appealing to definitions and logic alone, Leibniz does not mean to imply that definitions and logic, or an ideal language more generally, would not be of tremendous use for making discoveries in natural philosophy. Leibniz is clear that while he thinks Descartes and his followers err in neglecting experience in the natural sciences, he also thinks that others—and he often has in mind members of the Royal Society—err in emphasizing experiments to the neglect of careful reasoning and definitions. In contrast to stalwart nominalists such as Hobbes,[9] Leibniz believes that real definitions of species can be given, and he insists that those real definitions will be reflected in the structure of the terms employed in any ideal language. Given real definitions of "dog" and "mammal," for example, one should be able to deduce a priori that all dogs are mammals, and that if Fido is a dog then Fido is a mammal. Mastery of an ideal language would thus be tremendously useful for natural scientists not only for arranging and conveying scientific knowledge but even, as Leibniz often emphasizes, for making discoveries.[10]

In that case, however, we might wonder anew if experience really is necessary after all to settle all contingent truths. Leibniz thinks of each individual as belonging ultimately to a uniquely identifying species. Each of us, for Leibniz, is literally one of kind, a unique kind defined by his or her complete concept. But why then can we not deduce that Fido is a dog from his *infima species* in the same way that we may deduce that he is a mammal from his less specific species? In a sense, this question just is the key question

[8] G. W. Leibniz: "Leibniz an Huygens Hanover ce 20/30 de Février 1690," in: C. I. Gerhardt (ed.): *Der Briefwechsel von Gottfried Wilhelm Leibniz mit Mathematikern*, Berlin 1899, pp. 639–641, here p. 641.
[9] A VI, 4, 541.
[10] See, for example, A II, 1, 554.

concerning Leibniz's formal theory of contingency now dressed up in the language of kinds. On our account, Leibniz should maintain that species such as *dog* and *mammal* are abstract both in the sense that the fail to uniquely pick out one possible substance and in the sense that they are only finitely complex.[11] Being finitely complex, however, they should also be, in the sense used in our previous work, recursively enumerable. That is to say, if we were fluent in an ideal language, we should be able to systematically search through concepts such as *dog* and *mammal* in order to find any predicates they contain. In this regard, species such as *dog* and *mammal* differ from *infima species*, that is, infinitely complex, complete concepts. Complete concepts, including Fido's complete concept, are not, for Leibniz, recursively enumerable in our sense. We—even if we were armed with an ideal language or an idealized Step Reckoner—couldn't algorithmically search through them to find any sought after predicate which they contain.

Explicitly applying Leibniz's formal theory of contingency to his thinking about species concepts, however, raises another, closely related concern. For one might suppose that if Fido is a mammal he is essentially a mammal, and if he is essentially a mammal, then he is necessarily a mammal. On our meta-logical interpretation, however, Leibniz's formal theory of contingency might seem to imply that even statements such as "Fido is a mammal" and "Peter is rational" are contingent. Is this a fatal flaw either for Leibniz's theory or our interpretation of it? We think the answer is "no" on both counts, and that, in fact, Leibniz could have responded adequately to the worry about essential properties in either of two ways.

The first way would cleave closer to at least some contemporary intuitions about essential properties but would require technical resources that cannot plausibly be attributed to Leibniz himself. Contemporary philosophers are wont to suppose that the distinction between essential and accidental properties just is the distinction between a subject's (*de re*) necessary and (*de re*) contingent properties. On this scheme, if Leibniz were to say that being a mammal is essential to Fido, he would also be committed to saying that "Fido is a mammal" is necessary. And on our interpretation of Leibniz's formal theory of contingency, he would further be committed to saying that "Fido is a mammal" can be algorithmically reduced to an explicit identity statement in a

[11] For present purposes, we assume that kind concepts, for Leibniz, are finitely complex. Note, however, that on our interpretation, our point would still stand even if some Leibnizian kind concepts were infinitely complex provided that they are they are still recursively enumerable. For further discussion, see McDonough/Soysal: "Leibniz's Formal Theory."

finite number of steps. But assuming that some of Fido's properties must be counted as accidental, that in turn implies that we will need to be able to draw a distinction among the predicates contained in Fido's complete concept, so that some subset of Fido's complete concept is recursively enumerable.

As a purely technical matter, it is possible to do this. Suppose that the complete concept of Fido is something like a set of axioms about Fido (call it "A(Fido)".) Under this assumption, our interpretation of Leibniz's theory, in essence, implies that the set of all proofs from A(Fido) is not recursively enumerable, that, in other words, a Turing machine couldn't enumerate all the proofs from A(Peter). (Recall that a proof from A(Peter) is a string of formulas each of which is either an axiom of A(Peter) or follows from axioms by a logical deduction.) On this account "Fido is barking" will be contingent (roughly) if there is no algorithmic means for reducing it to an explicit identity statement. So far so good. But if we think of the complete concept of Fido as a set of axioms, then nothing rules out its including axioms such as "Fido is a mammal" or that there is a fragment of A(Fido) such that the set of proofs from it *is* recursively enumerable.[12] On our interpretation, Leibniz could thus maintain that some propositions involving a complete concept are necessary while other propositions involving the same complete concept are contingent. In that case, however, Leibniz could maintain that "Fido is a mammal" expresses a necessary proposition while also maintaining that "Fido is barking" expresses a contingent proposition.

The second way Leibniz could have responded to the worry about essential properties would drift farther from contemporary intuitions, but would not require any admittedly anachronistic technical machinery. It would require Leibniz to allow that—at least as far as his formal theory of contingency is concerned—all *de re* truths about genuine substances, even considered as merely possible, are contingent.[13] On this way of going, if "Fido is a mammal" is true, then it is, according to Leibniz's formal theory of contingency, only contingently true. And the same will hold, for example, for "Peter is rational."

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[12] Put succinctly, it is possible for a formal system whose set of proofs is not recursively enumerable to have fragment whose set of proofs is recursively enumerable. To make this more concrete, consider the example of Second-Order Arithmetic ($PA^2$). $PA^2$ is a paradigm example of a set of axioms whose set of proofs is non-recursively enumerable, but which has a recursively enumerable or "necessary" fragment that includes axioms such as "$\forall n, m\, S(n) = S(m) \rightarrow n = m$," "$\forall n\, S(n) \neq 0$;" the set of proofs from $PA^2$ is non-recursively enumerable because of the induction axiom that has a quantifier that ranges over all predicates (or sets of natural numbers).

[13] See Grua, 353.

Such implications would, of course, cut against at least some contemporary intuitions, but perhaps they should not be seen as a great cost to Leibniz himself. For, to start with, in Leibniz's time and earlier, the distinction between essential and non-essential properties wasn't typically drawn in terms of a subject's (*de re*) necessary and (*de re*) contingent properties. Famously, necessary accidents such as risibility in humans were commonly held to be non-essential and yet, in our sense, *de re* necessary. In that case, however, Leibniz might have seen it as not being such a leap to suggest that, say, Fido is essentially a dog—that doginess is part of Fido's essential nature—and yet insist that Fido is nonetheless only contingently a dog (since although the predicate *is a dog* is contained in Fido's complete concept, it cannot be "found" by an algorithmic search procedure).

Furthermore, we should distinguish between two types of propositions that one might think relevant to a discussion of essential properties. Examples of the first type would include propositions about essential properties of particular individuals, e.g. Fido is a mammal. Setting aside the formal maneuvering of our technical proposal, Leibniz's theory does indeed imply that we can't know that Fido is a dog a priori. But that might not seem like such a bad result. The temptation to suppose otherwise lessens considerably if we simply switch names: do we think that we can know a priori that, say, Morris is a dog? That Mary is a cat? Examples of the second type include propositions about essential properties of kinds, e.g. *dogs are mammals*. Although the case is complicated,[14] these sorts of propositions might seem to provide more plausible examples of propositions that should be knowable a priori, or at least knowable a priori given an ideal language and the resources of logic. But Leibniz's formal theory of contingency, even on our interpretation, needn't deny that such propositions are knowable a priori. He can allow that concepts involved in propositions involving kind concepts are only finitely complex, and thus decidable in the sense we've been using, while still insisting that propositions involving complete concepts are infinitely complex and not decidable in the relevant sense.

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[14] Namely by arguments that such statements (among others such as "cats are animals" or "Gold has atomic number 79") are a posteriori necessities. See, for example, Saul Kripke: *Naming and Necessity*, Cambridge, MA 1980, and Hilary Putnam: "It Ain't Necessarily So," in: *Journal of Philosophy* 59 (1962), pp. 658–671.

### 3. Divine Choice[15]

Above and in previous work, we have focused on one job that Leibniz assigns to his formal theory of contingency, namely, showing how statements such as "Peter is a denier of Christ" might be contingent in spite of his views on complete concepts, predicate containment, and truth. It is no accident that we have directed our attention to such cases. For it is with respect to statements such as "Peter is a denier" that Leibniz's formal theory of contingency, as we understand it, seems to be most at home. It is clear, however, that Leibniz came to think that his formal theory of contingency could also be deployed in order to help resolve a related, but distinguishable, modal difficulty. Leibniz, of course, is keen to argue that God was free in creating the actual world. By Leibniz's own lights, however, for that to be true, at least one of the three following statements must be contingent: (i) "God is perfect," (ii) "a perfect being creates the best world," (iii) "the actual world is the (uniquely) best world." Supporters and detractors alike of Leibniz's formal theory of contingency have seen it as being of little help in defending God's freedom.[16] We are more optimistic on Leibniz's behalf. In the three brief sub-sections that follow, we'd like to argue that, if it works at all, Leibniz formal theory of contingency provides him with resources for upholding the contingency of (i), (ii), and (iii).

#### 3.1 (i) "God is Perfect"

Leibniz's first strategy for securing the contingency of the actual world lies in maintaining that there is a sense in which the statement "God is perfect" is contingent. Pursing this thought, Nicholas Rescher, for example, has proposed that Leibniz's understanding of perfection is ambiguous.[17] We must distinguish between God's metaphysical perfection and God's moral perfection. God's metaphysical perfection, according to Rescher, is tantamount to a quantity of essence or potentially for existence. "God is perfect" is necessary when

[15] We would like to thank Samuel Newlands for helpful discussion of topics discussed in this section.

[16] See especially, Adams: *Leibniz: Determinist*, pp. 22–42, and R. C. Sleigh, Jr.: "Leibniz on Freedom and Necessity: Critical Notice of Robert Adams, *Leibniz: Determinist, Theist, and Idealist*," in: *The Philosophical Review* 108/2 (1999), pp. 245–277, here pp. 262–276.

[17] Nicholas Rescher: *The Philosophy of Leibniz*, Englewood Cliffs, NJ 1967, pp. 44–46, see also Curly: "Root of Contingency."

perfection is taken in this sense, and the statement "God is perfect" should therefore be algorithmically demonstrable in a finite number of steps. God's moral perfection, according to Rescher, is, however, distinct from his metaphysical perfection. While God is metaphysically perfect by necessity, he is morally perfect only contingently. The statement "God is morally perfect," unlike the statement "God is metaphysically perfect," therefore should not be algorithmically demonstrable in a finite number of steps. The contingency of the existence of the actual world can thus rest on the contingency of God's moral perfection.

Did Leibniz ever pursue this strategy? There are some texts, carefully culled by Robert Adams, that are at least consistent with supposing that he did. Perhaps Leibniz has something like this strategy in mind, for example, when he suggests that it cannot be demonstrated that "God chooses to do the most perfect"[18] and that while "it is necessary that God love himself, for that is demonstrable from the definition of God," nonetheless "that God does what is most perfect cannot be demonstrated, for the contrary does not imply a contradiction."[19] Again, Leibniz could have this first strategy in mind when he writes "the love that God bears to himself is essential to him; but the love for his glory, or the will to acquire his glory, is not so by any means."[20] Finally, it should be noted, that this strategy could be seen as dovetailing with Leibniz's general tendency to see the contingency of the world as being intimately related to God's moral perfection. Although we find the textual and circumstantial case for Leibniz's actual pursuit of this strategy far from compelling, we still maintain that Leibniz at least could have followed this first strategy, that is, that Leibniz at least could have insisted that the statement "God is morally perfect," written in an ideal language, cannot be algorithmically demonstrated in a finite number of steps.

Robert Adams, however, has vigorously objected to this first strategy for two distinguishable reasons. The first reason, as he sees it, is that the contingency of "God is morally perfect" would be inconsistent with Leibniz's take on neighboring propositions. So, for example, Adams notes that Leibniz holds (a) that it is demonstrable that God does no evil, and grants that (b) a

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[18] A VI, 4, 1454.
[19] Ibid., 1446.
[20] GP VI, 256 [§ 233]); cf. ibid., 218f [§ 175].

lesser good is a kind of evil.[21] In that case, however, Adams asks, rhetorically, "how can he [Leibniz] avoid the conclusion that it is demonstrable that God does not prefer the less perfect?"[22] This objection, however, as perhaps Adams himself would allow, seems far from conclusive. For, on this first strategy, Leibniz could allow that it is demonstrable that God does no evil on the assumption that God is morally perfect but not on the assumption that God is (merely) metaphysically perfect. Since Leibniz accepts that God is morally perfect, it is open to him to maintain that, given a proper understanding of God, we can demonstrate that God does no evil, even while allowing that, if we bracket God's moral perfection, the statement "God is morally perfect" is contingent. And, indeed, Leibniz seems to point us precisely in this direction, writing, for example, "it implies no contradiction that God should will—directly or permissively—a thing not implying contradiction."[23]

The second reason is epistemological. Adams writes, "God is more than sinless. [...] If it is not true by definition, or at least demonstrable, how is he [Leibniz] so confident that it is true at all? Surely he does not know it by experience. And he denies that it is known only by faith."[24] On our interpretation of his theory, Leibniz's distinction between necessary and contingent propositions is a formal distinction, not an epistemic distinction. Nonetheless, it does have epistemic implications, and Adams is right to insist that if Leibniz knows that God is morally perfect, and it is only contingently true that God is morally perfect, then Leibniz must know that God is morally perfect either by experience or revelation. In tilting against Bayle, Leibniz does seem to go a touch too far in saying that "we have no need of revealed faith to know that there is such a sole Principle of all things, perfectly good and wise. Reason teaches us this by infallible demonstrations."[25] Significantly, however, Leibniz never, as far as we know, explicitly claims that God's moral perfection can be demonstrated from his complete concept. Nor is Leibniz forced to maintain that God's moral perfection cannot be witnessed by experience or faith. And even

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[21] Ibid., 107 [§ 8]
[22] Adams: *Leibniz: Determinist*, p. 39.
[23] GP VI, 257 [§ 234]. There are, of course, texts on the other side (see Adams: *Leibniz: Determinist*, p. 36. On the present reading, however, such texts may be understood as asserting that God's acting sub-optimally implies a contradiction *assuming God's moral perfection.*
[24] Adams: *Leibniz: Determinist*, p. 39.
[25] GP VI, 75 [§ 44].

Leibniz's brief allusion to "infallible proofs," on which Adams's objection hangs, is shrouded in an unclear context in which Leibniz also speaks of "the triumph of true reason *illumined by divine grace*."[26] Leibniz, we submit, could easily avoid Adam's epistemological worry with at most a tiny, non-substantive revision to his enormous body of writings. All things considered, we conclude that Leibniz could secure the contingency of the actual world by maintaining that there is a sense in which the statement "God is perfect" is contingent.

### *3.2 (ii) "A Perfect Being Creates the Best World"*

A second strategy for securing the contingency of the actual world would maintain that "a perfect being creates the best world" is contingent. This would be a much less audacious route for securing the contingency of the actual world insofar as there is ample precedent for it in the works of previous thinkers. Aquinas, for example, encourages such a view when he suggests that God's perfection is consistent with God's creating any world, and, indeed with God's creating no world at all.[27] Leibniz similarly seems to affirm such a view when he writes, "God's choosing something less perfect from among many perfect things does not imply an imperfection in God."[28] To be explicit, the idea here is that "God is perfect" could be necessarily true, and yet "The actual world is the best" could nonetheless be contingently true because it is only contingently true that a perfect being creates the best world.

Although this strategy would seem to have some philosophical and textual appeal, Robert Adams has objected to it as well. While of course familiar with the texts in which Leibniz shows sympathy with this strategy, Adams nonetheless insists: "I [...] find it astonishingly un-Leibnizian and do not think it fits into his philosophical system."[29] The deepest source of Adam's rejection of this strategy is to be found in an argument he reconstructs from Leibniz's surrounding commitments. According to Leibniz, God is essentially just, and

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[26] Ibid., 76 [§ 45], emphasis added.
[27] Thomas Aquinas: *Summa contra Gentiles*, in: Id.: *Summa contra Gentiles*, transl. by Anton C. Pegis, et. al., Notre Dame, IN 1975, book i, chap. 81.
[28] A VI, 4, 1453.
[29] Adams: *Leibniz: Determinist*, p. 39.

hence wise and good. But wisdom and goodness imply a preference for the greatest good since wisdom "is nothing other than knowledge of the good, as goodness is nothing other than the inclination to do good to all, and to prevent evil unless it is necessary for a greater good or to prevent a greater evil."[30] Drawing these two points together, Adams concludes that Leibniz thus "seems unable to escape the conclusion that it is demonstrable, and hence logically necessary, that God, as an absolutely perfect being, does what is best."[31]

It is easy to see why this strategy that might seem unleibnizian. There's no doubt that Leibniz's god is essentially just, wise and good. And it is hard to see how such a god could have any reason for creating a sub-optimal world, and so it is hard to see how God's creating a lesser world wouldn't involve a violation of the principle of sufficient reason. But such issues are largely orthogonal to the question of whether or not "a perfect being creates the best world" is contingent by the lights of Leibniz's formal theory of contingency. For, first, contingency in Leibniz's formal sense does not presuppose violations of the principle of sufficient reason. If Leibniz's theory works at all, then the contingency of "Peter denies Christ" does not turn on the possibility of Peter's violating the principle of sufficient reason. What holds for Peter, in this case, holds for God in the creation case. If Adams's argument is going to gain any traction, it will therefore have to look elsewhere, and the most plausible place for it to look is to the thought that God's essential attributes entail that God creates the best. But we must be careful here as well. For Leibniz's formal theory of contingency allows him, as we've seen, to maintain that even essential properties may be contingent. A proposition's being contingent, on Leibniz's formal theory, does not imply that there are possible worlds in which the proposition's contrary is true; Leibniz's theory does not imply that if God is contingently wise, then there is a possible world in which God is not wise. It only implies that there is no algorithmic procedure for demonstrating "God is wise" from God's complete concept without the aid of experience (where we may count revelation as one form of experience). Even while upholding the principle of sufficient reason, and insisting that God is essentially wise, Leibniz, we conclude, could secure the contingency of the world by maintaining that "a perfect being creates the best world" is only contingently true.

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[30] Quoted with further references in: Ibid., p. 40.
[31] Ibid.

### 3.3 (iii) *"The Actual World is the Best"*

A third, and final, strategy for upholding the contingency of the actual world argues that it is contingent because it is contingent that "the actual world is the (uniquely) best world." There are many passages in which Leibniz seems to favor this response. He writes, for example, "But that something is the best is not demonstrable; therefore neither [is it demonstrable] that something is to be done [...] A is the best is certain but is not necessary since it cannot be demonstrated."[32] Similarly, Leibniz tells us that although the proposition "This is the best" is true, nonetheless "it is not demonstrable by a demonstration that shows that the contrary implies a contradiction. It is a contingent truth."[33] And again "'this work is most worthy' is not a necessary truth, it is an indemonstrable, contingent, truth of fact."[34]

This third strategy seems to be, in some regards, Leibniz's most promising route for defending the contingency of the actual world. It faces a wrinkle in the fact that worlds, in contrast to substances, do not seem to enjoy complete concepts of their own. And not for merely shallow reasons. Leibniz is insistent that worlds are not true unities in the way that substances are true unities.[35] Nonetheless it should be possible to smooth this particular wrinkle by simply supposing that a world's complete concept may be constructed by conjoining the complete concepts of all of its substances. And in that case, it seems quite plausible that "The actual world is the best" should turn out to be contingent. For if the concept of the actual world just is a conjunction of the complete concepts of its substances, and the complete concepts of its substances are themselves not (fully) recursively enumerable—if at least some truths involving them are not algorithmically decidable—then we should expect that the complete concept of the actual world will also not be recursively enumerable—that at least some truths involving it will not be algorithmically decidable either.

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[32] Grua, 336.
[33] Ibid., 493.
[34] Ibid.
[35] See, for example, A IV, 3, 521; GP VI, 232 [§ 195].

Leibniz thus seems well positioned to maintain that the contingency of the bestness of the actual world can be supported by appeal to his formal theory of contingency.

Precisely because this third strategy seems so attractive, however, it is worth noting that when Leibniz applies his formal theory of contingency to propositions concerning worlds he does not obviously follow the path just sketched. Rather he sometimes speaks as if the infinite analysis involved in grounding the contingency of the bestness of the actual world is an infinite analysis of God's reasons for creating one world rather than another – a comparison of the perfections of all the possible worlds.[36] Although this offers a fairly intuitive, if colorful, picture of infinite analysis, it is not clear how much it has to do with Leibniz's formal understanding of deduction and demonstration. What exactly does the divine weighing of perfections have to do with formal analysis? Although there would seem to be a promising path for applying Leibniz's formal theory of contingency to the bestness of the actual world, Leibniz's preferred route threatens to open up a gulf between the contingency of propositions such as "Peter is a denier" and propositions such as "The actual world is the (uniquely) best world." Leibniz's formal theory of contingency was almost certainly crafted with an eye towards truths of the first kind. His efforts to extend it to propositions of the second kind, although promising in some respects, may have left him with what are best thought of as two different theories of contingency bridged by a thin analogy grounded in the idea of an infinite process. Leibniz's application of his formal theory of contingency to propositions such as "The actual world is the (uniquely) best world" thus puts tremendous pressure on the unity of his formal theory of contingency.

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[36] See, for example, A VI, 4, 1517–1518; ibid., 1445.

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