

# THE BEST OF ALL ONE-MONAD UNIVERSES

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### *A Thought Experiment*

In philosophy, a thought experiment typically presents an imagined scenario with the objective of making a conjecture about the way things are. As the *Stanford Encyclopedia of Philosophy* succinctly puts it: *Thought experiments are devices of the imagination used to investigate the nature of things* (Brown & Fehige, 2014 [1994], para. 1). I make no pretense that my thought experiment contains new empirical data; it doesn't. On the contrary, this is a purely speculative exercise, an attempt to *think* the nature of being by creating a space of compossibility, so to speak, between two thinkers separated by some two hundred years: Gottfried Wilhelm Leibniz and theoretical physicist John Archibald Wheeler.

So the purpose of this essay is to make the case for a heterodox reading of Leibniz's *The Monadology* (published 1720) through the lens of Professor John Wheeler's hypothesis of the one-electron universe (proposed in 1940).

My conjecture is this: That there exists in the knowable universe only one monad; that this monad traverses time in both directions, eventually criss-crossing the entire past and future history of the universe; and that this singular monad interacts with itself countless times, thereby filling the universe with *simultaneous appearances of itself*. In the course of this article I will consider the possibility that our solitary monad is synonymous with Leibniz's God, or if the monad in question is rather a *created* substance that is alone *with* God, a notion that gains some traction thanks to Leibniz's admiration for the solipsism of Saint Teresa of Avila. I will also consider whether the one-monad hypothesis is consistent with Leibniz's own views on harmony, simplicity and perfection.

*What is an Electron?*

Before delving into either *The Monadology* or Professor Wheeler's hypothesis, it is worth asking an obvious, if crucial, question. What is an electron and what are its properties? Put simply, an electron is a negatively charged subatomic particle that is located around (but not in) the nucleus of an atom. Having no known components or substructure, electrons are usually considered to be elementary particles. In fact, electrons exhibit properties of both particles and waves, and they play an essential role in physical phenomena such as electricity, gravity, thermal conductivity, and magnetism. Furthermore, all electrons are identical.

In a telephone call made in the spring of 1940 to his doctoral student Richard Feynman, Professor John Wheeler claimed to have arrived at a solution as to why all electrons are identical. Why do electrons have the same mass, the same electric charge, and the same spin? Wheeler's answer: Because they are all the same electron; moreover, they are the same electron traveling forwards and backwards in time.

Feynman gave an account of this telephone call in his December 1965 Nobel Lecture:

*I received a telephone call one day at the graduate college at Princeton from Professor Wheeler, in which he said, "Feynman, I know why all electrons have the same charge and the same mass." "Why?" "Because, they are all the same electron!" And, then he explained on the telephone, "suppose that the world lines which we were ordinarily considering before in time and space - instead of only going up in time were a tremendous knot, and then, when we cut through the knot, by the plane corresponding to a fixed time, we would see many, many world lines and that would represent many electrons, except for one thing. If in one section this is an ordinary electron world line, in the*

*section in which it reversed itself and is coming back from the future we have the wrong sign to the proper time - to the proper four velocities - and that's equivalent to changing the sign of the charge, and, therefore, that part of a path would act like a positron."*

In other words, all electrons are manifestations of a single entity -- a single electron -- moving through time, both backwards and forwards. When it moves backwards in time, it is a positron. So not only are all electrons the *same* electron but all positrons are *also* the same electron.<sup>1</sup> If Professor Wheeler is right that this one electron is able to travel forwards and backwards in time over and over again, it effectively means it is able to appear in many different places *simultaneously*. This one electron moving back and forth some  $10^{80}$  times (10 to the power of 80 times) looks very much look like all the electrons in the knowable universe.<sup>2</sup>

According to Wheeler's theory, the single electron traces out a unique path through spacetime and this is known as its *world line*. (In physics, the world line of an electron is the sequence of spacetime events that correspond to the history of that electron.) The world line is simply the line traced by the electron as it makes its way through space and time. This inevitably means that half the world lines are directed forward in time, while the other half are curved round in the opposite direction.

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<sup>1</sup> A positron is the antimatter counterpart of an electron.

<sup>2</sup> According to a physics article on website [io9](#), if the one electron universe theory is correct, that particular particle will travel through the universe  $10^{80}$  times (10 to the power of 80 times) and will, by the end of its journey, have clocked up a staggering  $10^{105}$  years, that is 10,000 googol years, or 10 to the power of 105 years (Wilkins, 2012, para. 11).

### *Some Similarities*

Although a Leibnizian monad is immaterial, it does share some similarities with an electron. Both are elementary insofar as they have no known subcomponents; neither can be broken apart. Leibniz opens *The Monadology* with the assertion that the monad “is nothing but a simple substance,” and he clarifies this by pointing out that by “simple” he means “without parts.” A little further on, in §3, Leibniz proclaims that “where there are no parts, there can be neither extension nor form [figure] nor divisibility,” before adding that monads “are the real atoms of nature and, in a word, the elements of things.”

As I explained earlier, a positron is simply an electron moving in the opposite direction; it is *not* a different entity. We can, however, label the electron/positron as a pair. And it is on the subject of the electron/positron pair that Japanese-American physicist Yoichiro Nambu says something rather interesting. According to Nambu there is “no creation or annihilation” of the electron/positron pair, “but only a change of direction of moving particles, from past to future, or from future to past” (1950, pp. 82-94).

This is illuminating because Leibniz says something similar regarding monads. Leibniz states that a monad is neither created or annihilated, except by God: “No dissolution of these elements need be feared, and there is no conceivable way in which a simple substance can be destroyed by natural means” (*The Monadology* §4). Leibniz continues with the following assertion: “For the same reason there is no conceivable way in which a simple substance can come into being by natural means ...” (*The Monadology* §5).

In other words, not only do electrons and monads lack parts, neither can come into being or be destroyed by natural means. While most scientists rule out supernatural or divine

causes, Leibniz concedes that only God has the power to create or annihilate a monad.

Without God, it would seem that monads and electrons alike are left to their own devices.

Having outlined the one-electron theory and pointed out some similarities between an electron and a monad, my conjecture is this: All the monads that seemingly populate Leibniz's universe are actually the *one* and the *same* monad making simultaneous appearances. In this conception, our singular monad traverses the entire cosmos, interacting with itself innumerable times as it moves back and forth in time, its world line unfolding and refolding over and over, creating what Professor Wheeler describes as a "tremendous knot."<sup>3</sup>

### *Perfection, Variety and Simplicity*

According to Leibniz, God chose this world because it offered the best possible balance between the simplicity of the laws of nature and the abundant variety of phenomena. This is the reading of Leibniz that is accepted by scholars such as David Blumenfeld, who claims that it is with reference to the "variety/simplicity criterion" that "God makes his infallible choice of the best possible world" (Blumenfeld, 1995, p.383).

According to Blumenfeld, "the actual world has the greatest variety of phenomena governed by the simplest laws that are compatible with maximum variety" (1995, p.387). He adds, "Although more complex laws would accommodate as much diversity, by choosing the simplest ones that do so, God maximizes harmony without trading-off any variety at all." Notably, Blumenfeld suggests we should understand "simplicity" as "harmony."

Another Leibniz scholar, Nicholas Rescher, believes that for Leibniz, what makes this the best possible world is the remarkable balance between the the simplicity of the rules

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<sup>3</sup> All this talk of lines reminds me of the term "line-of-flight" made famous by postmodernist and Leibniz aficionado Gilles Deleuze. (See Deleuze & Guattari, 1987, p.9-10).

needed to govern nature and the plenitude of phenomena. Indeed, it is Leibniz himself who writes:

[W]e may say that in whatever manner God might have created the world, it would always have been regular and in a certain order. God, however, has chosen the most perfect, that is to say the one which is at the same time the simplest in hypotheses and the richest in phenomena. (*Discourse on Metaphysics* §6).

And in *The Monadology* he states, “And by this means there is obtained as great variety as possible, along with the greatest possible order; that is to say, it is the way to get as much perfection as possible” (*The Monadology* §58).

As well as correlating the greatest variety of phenomena with the harmony or simplicity of the laws that deliver such diversity, Leibniz asserts (again in *Discourse on Metaphysics*) that the most perfect of beings are “those that occupy the least possible space.” He continues:

When the simplicity of God's way is spoken of, reference is specially made to the means which he employs, and on the other hand when the variety, richness and abundance are referred to, the ends or effects are had in mind. Thus one ought to be proportioned to the other, just as the cost of a building should balance the beauty and grandeur which is expected. It is true that nothing costs God anything, just as there is no cost for a philosopher who makes hypotheses in constructing his imaginary world, because God has only to make decrees in order that a real world come into being; but in matters of wisdom the decrees

or hypotheses meet the expenditure in proportion as they are more independent of one another. The reason wishes to avoid multiplicity in hypotheses or principles very much as the simplest system is preferred in astronomy. (*Discourse on Metaphysics* §5)

In other words, the best world is that which boasts the simplest rules *and* the utmost diversity of things. As such, we get the greatest possible variety, with the fewest possible materials, and with the greatest possible order.

Leibniz aficionado Gilles Deleuze (1993 [1988], p.66) remarks there are two basic movements between two poles in Leibniz's philosophy: "[O]ne toward which all principles are folding themselves together" (that is, *everything is always the same thing*), and "the other toward which they are all unfolding, in the opposite way" (*everything differs by manner*). In other words, there is a folding movement toward the identical oneness of the solitary monad, and an unfolding movement towards the apparent multiplicity of its manifold appearances, which presumably form aggregates, eventually giving rise to empirical entities. In the words of Deleuze, "No philosophy has ever pushed to such an extreme the affirmation of a one and same world, and of an infinite difference or variety in this world" (1993 [1988], p.66).

### *Is God the Solitary Monad?*

The hypothesis so far is that Leibniz's infinity of monads is actually just one monad. But what, or who, is this solitary monad?

The solitary monad could, of course, be God. According to Leibniz, God is a special kind of monad: a monad without a body, a monad *sui generis*, a monad that knows everything



because it has total and clear knowledge of everything. This is the God particle *par excellence*. In *The Monadology*, Leibniz talks of the “greatness” of God,” and slaps down those critics, such as Pierre Bayle (writer of *Dictionnaire Historique et Critique*), who accuse Leibniz of “attributing too much to God” (*The Monadology* § 59).

If God is the monad in question, this monad would undoubtedly be unique, universal and “sufficient.”<sup>4</sup> Indeed, we can imagine the God-monad ‘smeared’ (to use a physics term) across the universe, both forwards and backwards in time:

We may also hold that this supreme substance, which is unique, universal and necessary, which is further a pure sequence of possible being, must be *incapable of limitation and must contain as much reality as possible*. (*The Monadology* §40)<sup>5</sup>

In this conception, the God-monad contains maximal reality, and is infinitely perfect. It alone has the prerogative that it must *necessarily* exist (*The Monadology* §45). As the postmodernist philosopher Jean-François Lyotard, in his essay “Time Today” (1991 [1988], p.60), says: “God is the absolute monad to the extent that he conserves in complete retention the totality of information constituting the world. ... As consummate archivist, God is outside time, and this is one of the grounds of modern Western metaphysics.”

And in *The Monadology*, Leibniz states:

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<sup>4</sup> “...there is only one God, and this God is sufficient” (*The Monadology* §39).

<sup>5</sup> Emphasis mine.

Thus God alone is the primary unity or original simple substance, of which all created or derivative Monads are products and have their birth, so to speak, through continual fulgurations of the Divinity from moment to moment ....”

(*The Monadology* §47)

*Is the Solitary Monad a Created Monad?*

But what if the solitary monad is not God, but a *created* monad? Indeed, Leibniz makes the assertion that “each created Monad represents the whole universe” (*The Monadology* §62). By its very name and nature, a created monad is alone in some sense. After all, the word “monad” comes from the Greek word for alone: *μόνος*, *monos*. If the monad in question is created, and if this monad is alone as its name suggests, we can say with some confidence that our solitary monad is the sole medium through which the entire universe is created.

It is well known that a monad in Leibniz’s system exists as an independent point of will and is *windowless* (*The Monadology* §7), thereby giving rise to the suspicion that the monad is a solipsistic entity. The word “solipsism,” as with the word “monad,” derives from a word meaning “alone,” (this time Latin, *solus*).

Taken to extremes, if a single solipsistic monad has no windows, and if it creates its own sense perceptions and acts on its own authority, what need is there for any other created monad? In a sense, then, our singular created monad *is* the universe in that it contains everything required for creation. And so it is *this* monad (and not the God-monad) that is smeared across the universe.

As such, this monad, which makes up the created world and represents the entire universe from its own perspective, is in a causal relationship *only* with God, its creator. The

spiritual imperative of the monad's solitary relationship with God is outlined by Leibniz in his *Discourse on Metaphysics*. He writes:

It can be seen also that every substance has a perfect spontaneity (which becomes liberty with intelligent substances). Everything which happens to it is a consequence of its idea or its being and nothing determines it except God only. It is for this reason that a person of exalted mind and revered saintliness may say that *the soul ought often to think as if there were only God and itself in the world*. Nothing can make us hold to immortality more firmly than this independence and vastness of the soul which protects it completely against exterior things, *since it alone constitutes our universe and together with God is sufficient for itself*. (*Discourse on Metaphysics* §32)<sup>6</sup>

"Only God and itself in the world ... since it alone constitutes our universe and together with God is sufficient for itself" sounds very much like our monad's situation, namely, its unique aloneness with God.

According to the University of Chicago's Professor Michael Kremer, the "person of exalted mind" cited in the above passage from *Discourse on Metaphysics* is the 16th century Spanish mystic and Carmelite nun, Saint Teresa of Avila. Indeed, in a letter to Andreas Morell, "a mystically minded correspondent,"<sup>7</sup> Leibniz says:

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<sup>6</sup> Emphases mine.

<sup>7</sup> Michael's Kremer's phrase. On the topic of Leibniz and St Teresa, I am indebted to Kremer and his 2004 paper on philosophy and solipsism, "To What Extent is Solipsism a Truth?"

As to St. Teresa, you have reason to esteem her works, I found there one day this lovely thought that *the soul must conceive of things as if there were only God and itself in the world*. This even yields a considerable reflection in philosophy, which I usefully employed in one of my hypotheses.<sup>8</sup>

As Kremer helpfully points out, Leibniz's source was probably the biography *The Life of Teresa of Jesus*, written sometime before 1567. In chapter 13, we find the following statement: “[F]or the utmost we have to do at first is to take care of our soul and to remember that in the entire world there is only God and the soul; and this is a thing which it is very profitable to remember” (ed. Peers, 1946, p.77).

Following St Teresa, we can say that besides God, there is only the created monad, “since it alone constitutes our universe and together with God is sufficient for itself” (*Discourse on Metaphysics* §32). Indeed, this monad (if we extend the religious analogy) is a kind of *arche*-soul or Logos in the sense that not only does it act as an intermediary between the transcendent Creator and creation, but it populates (or seminate) the universe with countless appearances of itself, thereby bringing the created world into being.

### *Conclusion*

I don't pretend that my hypothesis of a single monad that fills the universe with countless appearances of itself is anything other than an exercise in poetic speculation. Moreover, there are plenty of problems in the original hypothesis put forward by Professor

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<sup>8</sup> Emphasis mine.

Wheeler, such as why there are so many more electrons than positrons.<sup>9</sup> According to Feynman he raised this issue with Wheeler, who speculated (probably half-jokingly) that the missing positrons might be hiding in protons in the nucleus of atoms.<sup>10</sup> (Of course, there is also the possibility that the positrons needed to account for this shortfall might exist *somewhere* in the universe.)

Although Feynman found Professor Wheeler's one-electron universe theory hard to believe, the idea that positrons were electrons traveling backwards in time intrigued him. Years later, Feynman included the theory of the electron/positron pair in his 1949 paper "The Theory of Positrons" (1949, pp.749-759) and he incorporated the theory of reversible time into his famous Feynman diagrams, which are pictorial representations of the interactions of elementary particles.

Despite problems in both the original hypothesis of the one-electron universe and my own one-monad conjecture, the idea that we may live in a one-monad universe has certain advantages, one of which is that it goes some way in reconciling the granular and the smooth. Nature is both *discrete* (thanks to the manifold appearances of the point-like monad) and *continuous* (because of the unfolding and refolding of the world line). It could even be said that nature is an *enfolding continuum* of the one monad. Indeed, it is worth noting that Leibniz's axiom "la nature ne fait jamais des sauts" ("nature makes no leaps" or "nature does

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<sup>9</sup> Many more electrons have been observed than positrons, and electrons are thought to easily outnumber their antimatter counterparts.

<sup>10</sup> In his memoir, Wheeler made it clear that the positrons-hiding-in-protons idea was not meant to be taken too seriously: "I knew, of course, that, at least in our corner of the universe, there are lots more electrons than positrons, but I still found it an exciting idea to think of trajectories in spacetime that could go unrestricted in any direction — forward in time, backward in time, up, down, left, or right" (1998, p.117).

not jump”) embodies the idea that natural processes occur continuously (Leibniz, 1896 [1765], p.50).

Another advantage of the theory is the balance between the apparent plenitude of monads (which presumably give rise to empirical objects) and the metaphysical minimalism of the one created monad. That it may be possible to obtain a world with the greatest possible variety of phenomena from the fewest possible materials, and featuring the greatest possible order, gives the one-monad theory a strange but elegant quality. To reiterate a comment made by Deleuze in *The Fold*, “No philosophy has ever pushed to such an extreme the affirmation of a one and same world, and of an infinite difference or variety in this world” (Deleuze, 1993 [1988], p.66).

END

#### *Reference List*

Blumenfeld, D. (1995) “Perfection and happiness in the best possible world,” *The Cambridge Companion to Leibniz*. Edited by Nicholas Jolley, Cambridge: Cambridge University Press.

Brown, J.R. and and Fehige, Y. (2014) [1994] “Thought Experiments,” *Stanford*

*Encyclopedia of Philosophy* [online], viewed 15 May 2018,

<<https://plato.stanford.edu/entries/thought-experiment>>

Deleuze, G. and Guattari, F. (1987) [1980] *A Thousand Plateaus: Capitalism and Schizophrenia*. Translated by B. Massumi. Minneapolis: University of Minnesota Press.

Deleuze, G. (1993) [1988] *The Fold: Leibniz and the Baroque*. Translated by T. Conley. Minneapolis: University of Minnesota Press.

Feynman, R. (1949) "The Theory of Positrons," *Physical Review*, 76(6), pp. 749–759.

Feynman, R. (1965) "The Development of the Space-Time View of Quantum Electrodynamics," *Nobel Lecture 1965*. Available at [https://www.nobelprize.org/nobel\\_prizes/physics/laureates/1965/feynman-lecture.html](https://www.nobelprize.org/nobel_prizes/physics/laureates/1965/feynman-lecture.html)

Kant, I. (1855) [1781] *Critique of Pure Reason*. Translated by J. M. D. Meiklejohn. London: Henry G. Bohn.

Kremer, M. (2004) "To What Extent is Solipsism a Truth?," *Post-Analytic Tractatus*. Edited by B. Stocker. Aldershot: Ashgate Publishing Company.

Leibniz, G.W. (1896) [1765] *New Essays Concerning Human Understanding*. Translated by A.G. Langley. New York: MacMillan.

Leibniz, G.W. (1898) [1720] *The Monadology*. Translated by R. Latta. Oxford: Clarendon Press.

Leibniz, G.W. (1908) [1686] *Discourse on Metaphysics*. English translation by G. R. Montgomery. Chicago: The Open Court Publishing Co.

Lyotard, J-F. (1991) [1988] "Time Today," *The Inhuman*. Translated by G. Bennington and R. Bowlby. California: Stanford University Press.

Nambu, Y. (1950) "The Use of the Proper Time in Quantum Electrodynamics I," *Progress in Theoretical Physics*, 5(1), pp. 82–94.

Teresa of Avila, St (1946) [n.d.], "The Life of Teresa of Jesus," *Complete Works St. Teresa Of Avila (Volume 1)*. Translated and edited by E.A Peers. Reprinted 2002. London & New York: Burns and Oates.

Wheeler, J.A and K. Ford (1998) *Geons, Black Holes & Quantum Foam*, New York & London: Norton.

Wilkins, A. (2012) "What if every electron in the universe was all the same exact particle?," viewed 20 May 2018,

<<https://io9.gizmodo.com/5876966/what-if-every-electron-in-the-universe-was-all-the-same-exact-particle>>



