The Truly Infinite Universe

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Hegel, Hawking, and the Quantum Cosmo-logic of the Absolute

By

David James Stewart

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For J-R, there's no one I'd rather explore the infinite universe with.

TABLE OF CONTENTS

Acknowledgements x

Citations and Abbreviations xii

Introduction 1
Two Transdisciplinary Sciences Of The Whole

Chapter One 19
Inquiring into the Universe as a Whole
On Not Needing to be a Mathematician 24
Local Geometry, Global Topology, and the Question of Spatial Closure 28

Chapter Two 34
Quantum Cosmology and the Hartle-Hawking Proposal
Quantum Cosmology and the Quest for a Theory of Quantum Gravity 38
Challenges in the Quest for Quantum Gravity 39
Towards a Working Definition of "Quantum Gravity" 41
The Philosophical Roots of Quantum Gravity 42
From Classical to Quantum Mechanics to Quantum Cosmology .. 49
On Not Conflating Quantum Cosmology and Quantum Gravity .. 61
The Hartle-Hawking Proposal 63
Feynman's Sum Over Histories Method and the Wave-Function of the Universe 65
Imaginary Time and the Reimagining of Primordial Space 67
Nothing[ness] and the Quantum Vacuum 71
"Minimum Possible Nonuniformity" 74

Chapter Three 76
Hegel's Speculative Metaphysics
The Question of Hegel and Metaphysics 79
Nonmetaphysical Interpretations of Hegel 82

The Science of Thought Thinking Itself 90
"The Diamond Net" 97
Postcritical Metaphysics and the Transition from the *Phenomenology of Spirit* to the *Science of Logic* 102
The Speculative Moment 106
The Three Moments 107
The Abstract Moment of *Verstand*: The Absolute Power 108
From Abstract *Verstand* to Negative *Vernunft* 109
From Negative *Vernunft* to Positive *Vernunft*: The Difference Between Dialectical *Umschlagen* and Speculative *Gegenstoß* 115
A Case Study in Speculative *Gegenstoß*: Three Accounts of the Subject/Object Relationship 123
A Case Study in Speculative *Gegenstoß*: The Garden Narrative 126

Chapter Four 130
True Infinitude
The Contradiction and Limit(s) of the Finite 132
A Speculative Subversion of the Materialism/Idealism Dichotomy 139
Finitude, Syllogistic Logic, and the Dialectic of Contingency/Necessity 148
Circumscribed Forms of Infinitude 156
Speculative W/Holes, Substance-as-Subject, and the Pulsating Life of True Infinitude 161

Chapter Five 166
The Quantum Cosmo-Logic of the Absolute
The Mystical Dimension of Speculative Reason 167
Pre-Ontological Multiplicity: "Minimum Possible Nonuniformity" and *Geist* 170
Ontologies of Nothing[ness] 179
The Speculative Space of Imaginary Time 184

Chapter Six 189
God/World/Subject
Creatio ex Meonic Nonbeing in a Truly Infinite Universe 190
The Problem of the External God in a Truly Infinite Universe 194
The True Infinitude of the Divine Idea: A *Meonic* Rethinking of Love + Trinity 198

Primordial Transitions 202
The Tragic Reconciliation of God/World/Subject 205

Chapter Seven..... 207
Breaking Theological Boxes
The One-Sidedness of Atheistic Readings..... 208
The Stubbornness of Theistic Readings..... 212
The Half-Measure of Pantheistic Readings..... 215
The Appeal of Panentheistic Readings 217

Conclusion..... 233
Autopoietic Möbius Universes and Immortal Diamond Nets

Bibliography..... 246

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CITATIONS AND ABBREVIATIONS

By and large, the translations provided are my own. They have been influenced by previous translations, but this goes without saying. When I do quote directly from an English translation, this will be indicated by listing the translation first, followed by the corresponding German text (e.g., *EL* §79/*W* 8:168). Otherwise, the German text will be listed first and the corresponding English translation second (if available).

English translations of Hegel's works organized by paragraph will be indicated accordingly (¶), as will works organized by section (§). The numbers for the German version either refer to the page number (e.g., *Jena* 68) or to the volume and page number (e.g., *W* 8:168). With texts that include *Zusätze* ("Additions") and *Anmerkungen* ("Remarks"), these will be indicated, respectively, by "Z" and "R" with the English translation reference: e.g., *W* 8:85/*EL* §24Z2. In this example, the reference is found on the eighty-fifth page of the eighth volume of the *Werke in zwanzig Bänden* and in the second "addition" of the twenty-fourth section of the *Encyclopaedia Logic*. Again, listing the German reference first signifies that the translation is my own.

All references to abbreviated works by Hawking are to page numbers.

Writings of G. W. F. Hegel (1770–1831)

D *The Difference Between Fichte's and Schelling's System of Philosophy*. Translated by H. S. Harris and Walter Cerf. Albany: SUNY Press, 1977.

EL *Hegel's Logic: Being Part One of the Encyclopaedia of the Philosophical Sciences (1830)*. Translated by William Wallace. Oxford: Clarendon Press, 1975.

EPM *Hegel's Philosophy of Mind: Being Part Three of the Encyclopaedia of the Philosophical Sciences (1830)*. Translated by William Wallace. Together with the *Zusätze* in Boumann's text (1845). Translated by A. V. Miller. Oxford: Clarendon Press, 1971.

EPN *Hegel's Philosophy of Nature: Being Part Two of the Encyclopaedia of the Philosophical Sciences (1830)*. Together with the *Zusätze* in Michelet's text (1847). Translated by A. V. Miller. Oxford: Clarendon Press, 1970.

EPR Elements of the Philosophy of Right. Edited by Allen W. Wood. Translated by H. B. Nisbet. Cambridge and New York: Cambridge University Press, 1991.

FK Faith and Knowledge. Translated by Walter Cerf and H. S. Harris. Albany: SUNY Press, 1977.

GW Jenaer Systementwürfe II. Edited by Rolf-Peter Horstmann und Johann-Heinrich Trede. Vol. 7 of *Gesammelte Werke*. Hamburg. Felix Meiner Verlag, 1971. Cited by volume and page number.

Jena The Jena System, 1804—5: Logic and Metaphysics. Translated by John W. Burbidge and George di Giovanni. Kingston and Montreal: McGill-Queen's University Press, 1986.

L Hegel: The Letters. Translated by Clark Butler and Christiane Seiler. Bloomington, IN: Indiana University Press, 1984.

LHP Lectures on the History of Philosophy. Translated by Elizabeth S. Haldane and Frances H. Simson. 3 vols. Lincoln, NE: University of Nebraska Press, 1995. Cited by volume and page number.

LPEG Lectures on the Proofs of the Existence of God. Edited and translated by Peter C. Hodgson. Oxford: Clarendon Press, 2007.

LPR Lectures on the Philosophy of Religion. 3 vols. Edited by Peter C. Hodgson. Translated by R. F. Brown, P. C. Hodgson, and J. M. Stewart. 3 vols. Oxford: Clarendon Press, 2007. Cited by volume and page number.

PS Phenomenology of Spirit. Translated by A. V. Miller. Oxford: Oxford University Press, 1977.

SL Hegel's Science of Logic. Translated by A. V. Miller. London and New York: George Allen & Unwin Ltd., 1969.

SL (2010) *The Science of Logic*. Translated and edited by George di Giovanni. Cambridge and New York: Cambridge University Press, 2010.

W Werke in zwanzig Bänden. Edited by E. Moldenhauer and K. M. Michel. Frankfurt am Main: Suhrkamp Verlag, 1969. Accessed via www.hegel.de. Edited by Hegel-Institut Berlin. Berlin: Talpa Verlag, 2000. Cited by volume and page number.

Writings of Stephen W. Hawking (1942-2018)

BHBU Black Holes and Baby Universes and Other Essays. New York and London: Bantam, 1993.

BHT A Brief History of Time: From the Big Bang to Black Holes. New York: Bantam Books, 1988.

PIAQG "The Path-Integral Approach to Quantum Gravity." In *General*

Relativity: An Einstein Centenary Survey, edited by Stephen W. Hawking and Werner Israel, 746-89. Cambridge: Cambridge University Press, 1979.

QC "Quantum Cosmology." In *Three Hundred Years of Gravitation*, edited by Stephen W. Hawking and Werner Israel, 631-51. Cambridge: Cambridge University Press, 1987.

TOE *The Theory of Everything: The Origin and Fate of the Universe*. Beverly Hills, CA: New Millennium Press, 2002.

GD ———., and Leonard Mlodinow. *The Grand Design*. New York: Bantam, 2010.

LSS ———., and George F. R. Ellis. *The Large Scale Structure of Space-Time*. Cambridge: Cambridge University Press, 1973.

NST ———., and Roger Penrose. *The Nature of Space and Time*. Princeton and Oxford: Princeton University Press, 1996.

WFU ———., and James B. Hartle. "Wave Function of the Universe." *Physical Review D* 28:12 (December 1983): 2960-75.

INTRODUCTION

TWO TRANSDISCIPLINARY SCIENCES OF THE WHOLE

Quantum cosmology—the application of quantum mechanics to the universe in its entirety—embodies what Tolstoy referred to as the "highest wisdom . . . *the science of the whole*."[1] Still in its nascent stages, quantum cosmology stands at the cutting-edge of theoretical physics in the early twenty-first century and has quickly pushed the boundary of scientific inquiry to its known limit. In so doing it has brought new perspectives to some of the oldest philosophical questions. Due to its intimate relationship with the quest for a comprehensive theory of quantum gravity, quantum cosmology bears directly on the question of whether the universe is infinite in extent or self-enclosed. Its insistence on the ontological significance of the quantum vacuum offers unique insight into the question of why there is something rather than nothing. And all of this has far-reaching implications for what it means to say that time had a beginning, that the universe was created, and that "God" is the source of it all. Questions once reserved for the philosopher and theologian gain a renewed sense of scientific legitimacy in quantum cosmology. It is a discipline that not only challenges us to rethink some of our most basic assumptions about the nature of the universe, subjectivity, and God, but also whether or not there can be any clear lines of demarcation between science, philosophy, and theology in the first place.

In the same way quantum cosmology pushes theoretical physics to its absolute limit and expands our understanding of what counts as scientific, Hegel pushes the limits of philosophy to the Absolute and expands our understanding of what counts as theological. In and of itself, this observation is of minimal interest. As it turns out, though, the connection between these two discourses is anything but a superficial rhetorical coincidence. Quantum cosmology and speculative philosophy are both driven by the same fundamental impulse: namely, to reconcile the ostensibly irreconcilable—

[1] Leo Tolstoy, *War and Peace* (Harmondsworth: Penguin, 1976), 376 (emphasis added).

the former by the need to unify quantum mechanics and general relativity; the latter by the need to reconcile the irreconcilable as such.

The Truly Infinite Universe is about what happens when Hegel's philosophy and quantum cosmology become conversation partners. The goal, however, is not to just read quantum cosmology from the perspective of Hegel, or vice versa. Instead, the goal is to read them in tandem, to demonstrate the ways in which they can be a resource for each other by drawing out features and latencies that might otherwise remain underdeveloped or go unnoticed altogether.

If you have glanced at the table of contents, it might initially appear as if this is a book in which first a bunch of cosmology is summarized, then a bunch of Hegel is summarized, then some points of contact are noted, and finally some issues in philosophical theology are examined with reference to the aforementioned intersections. And to a certain extent this would be true. My hope, though, especially for the reader already suspicious of Hegel in general or skeptical of his relevance for cosmology and theology in particular, is that it will become clear I am doing more than just arbitrarily pairing some marginal scientific theory with an idiosyncratic interpretation of a few peripheral elements of a dated and overly complicated philosophical system.

In terms of giving a rough outline of the madness to this method, I have in mind something akin to Karen Barad's notion of "diffraction," a concept borrowed from physics describing the interactions of waves (sound, light, water, etc.).[2] The diffractive methodology of *Meeting the Universe Halfway* stands in contradistinction to so-called reflective ones, where mirroring and sameness are prioritized over difference and more subtly construed entanglements.[3] Unlike reflective or reflexive methods, where a text or cluster of ideas serves as a fixed frame of reference through which all analysis is filtered, "diffraction involves reading insights through one another in ways that help illuminate differences as they emerge: how different differences get made, what gets excluded, and how those exclusions matter."[4] The aspect of their diffractive hermeneutic that interests me here is the contention that such an approach does not fix in advance the subject and object of inquiry. This is important for a number of reasons. One is that quantum cosmology and Hegel's philosophy both present challenges to the classic subject/object dichotomy insofar as in

[2] Karen Barad, *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning* (Durham and London: Duke University Press, 2007), 28ff.
[3] Barad, *Meeting the Universe Halfway*, 29.
[4] Barad, *Meeting the Universe Halfway*, 30.

either case the thinking subject cannot be abstracted from the process of rational inquiry. Another is that neither discourse can be neatly contained within traditional disciplinary boundaries. Exactly how this works out in each context will become clear in due course.

Performing such a diffractive, cooperative reading is possible because both discourses are fundamentally *transdisciplinary* in nature. Transdisciplinarity represents a categorical break from the traditional paradigm of disciplinary research and should be distinguished from multidisciplinarity and interdisciplinarity alike.[5] The idea began appearing in the mid-twentieth century almost simultaneously in the works of Jean Piaget, Edgar Morin, and Erich Jantsch.[6] The concept lacked precise definition, however, until the late 1990s when the theoretical physicist Basarab Nicolescu wrote the *Manifesto of Transdisciplinarity*.[7] Looking to none other than C. S. Peirce for inspiration as one of the earliest exponents of transdisciplinary inquiry, Nicolescu insisted the difference between interdisciplinarity and transdisciplinarity comes down to the difference between a monologue and a dialogue: only in the latter is there a genuine give and take; the former tends to be indicative of a one-way interaction.[8]

Transdisciplinarity contends that traditional disciplinary boundaries can be impediments to truth insofar as an imperative of truth is the unity of knowledges.[9] The unity of knowledges can only be achieved when conventional disciplinary boundaries are de-absolutized and the hierarchy of disciplines is toppled. Transdisciplinarity is not interested in eradicating distinctions between disciplines inasmuch as it is interested in exploring the liminal spaces between them, as well as what lies beyond. Transdisciplinarity, therefore, is not really a mode of discourse. Nor is it even a method, for it lacks a specific object of inquiry. Instead, it is an attitude, a posture, or more appropriately, a *spirit*. One of the hallmarks of the transdisciplinary spirit is

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[5] Basarab Nicolescu, *Manifesto of Transdisciplinarity*, trans. Karen-Claire Voss (Albany, NY: SUNY Press, 2002), 107.
[6] Nicolescu, *Manifesto of Transdisciplinarity*, 1.
[7] Basarab Nicolescu, *La transdisciplinarité, manifesto* (Monaco: Rocher Publishing House, 1996); *idem*, *Manifesto of Transdisciplinarity*, trans. Karen-Claire Voss (Albany, NY: SUNY Press, 2002). See also, *idem*, ed., *Transdisciplinarity: Theory and Practice* (Cresskill, NJ: Hampton Press, 2008); *idem*, "The Need for Transdisciplinarity in Higher Education in a Globalized World," in *Transdisciplinary Theory and Practice*, ed. Basarab Nicolescu and Atila Ertas (TheATLAS, 2013).
[8] Barad recognizes the distinctly transdisciplinary nature of their diffractive methodology, though they don't mention Nicolescu or spend time differentiating it from interdisciplinarity or multidisciplinarity.
[9] Nicolescu, *Manifesto of Transdisciplinarity*, 44.

the drive to integrate the results of empirical inquiry with our deepest convictions about what the world is like, which is to say, with our metaphysics.[10] This requires us to place our most sacred presuppositional cows on the altar of critical scrutiny and relentlessly interrogate them—all, of course, in the name of pursuing truth. Transdisciplinarity and Hegel's philosophy go hand in hand in this regard. Given the inevitable transgression of traditional disciplinary boundaries that occurs in quantum cosmology, it too should be seen as being animated by a transdisciplinary spirit.

In addition to their similar transdisciplinary character and shared concern for the reconciliation of the irreconcilable, there are a number of other reasons why Hegel's philosophy and quantum cosmology make excellent conversation partners. One of the most significant has to do with the question of infinitude, an issue that repeatedly asserts itself in quantum cosmology. For instance, it shows up front and center in the quest for a theory of quantum gravity. The question of quantum gravity comes down to whether space should be understood as fundamentally quantized and discrete or as infinitely divisible. Philosophers have long been divided on how to answer this question. From a historical perspective, the crux of the matter is how one interprets Aristotle's treatment of the "actual infinite." In short, because an entity is defined as that which is bound by a surface, Aristotle argued there cannot be an infinite entity, at least not an intelligible or sensible one. Consequently, there are no "actually" infinite entities and the infinite can only have a "potential" existence.[11] Hegel picks up this line of thought. He regards the infinitely small and the infinitely great alike as a "nebulous shadowy nullities," as insufficient conceptions of that which is "truly" infinite.[12]

Infinitude also figures prominently in the question of the "shape" of the universe. Specifically, does space extend indefinitely, or is it in some way a self-enclosed whole? Many cosmologists believe a coherent theory of quantum gravity requires space to be closed.[13] From any perspective it is

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[10] In point of fact, Nicolescu speaks not of "metaphysics," but rather "philosophy of Nature" (Nicolescu, *Manifesto of Transdisciplinarity*, 65).

[11] Aristotle, *Physics* III, 204b5-206a19. Cantor, however, claimed Aristotle misunderstood the actual infinite. His theory of transfinite numbers allowed him to argue that some infinite quantities are indeed actual and not merely potential. This is the basis of his claim that "matter" is actually infinitely divisible and that a particle ought to be regarded as a "world of an infinity of different creatures." Joseph Warren Dauben, *Georg Cantor: His Mathematics and Philosophy of the Infinite* (Cambridge: Harvard University Press, 1979), 122-4.

[12] *SL* 238/*W* 5:276.

[13] Jean-Pierre Luminet, Jeffrey Weeks, Alain Riazuelo, Roland Lehoucq, and Jean-

clear that the quest for quantum gravity and quantum cosmology are closely connected. But they are not one and the same. This is important because it means the potential explanatory value of a given theory in quantum cosmology is not necessarily dependent on whether or not it unlocks all the secrets of quantum gravity.

Bottom line, it is impossible to do quantum cosmology without either explicitly addressing these questions or implicitly making assumptions about them. This calls to mind Aristotle's contention that "it is incumbent on the person who specializes in physics to discuss the infinite. And to inquire whether there is such a thing or not, and, if there is, what it is."[14] Such a sentiment is in no way restricted to philosophers who lived prior to the advent of modern science. David Hilbert thought that while "no other idea has so fruitfully stimulated the intellect . . . no other concept stands in greater need of clarification than that of the infinite."[15] The operative idea here is that the concept of infinitude does not come pre-interpreted. There are many ways it can be worked out, some more coherent than others. As David Bentley Hart aptly points out, there has never been any univocal understanding of infinitude.[16] And so when it comes to the task of discussing and clarifying the way a particular physical theory employs the concept, what is needed is a standard, something against which to measure it by.

Enter Hegel. He is a natural conversation partner for quantum cosmology in this regard because his entire philosophical edifice can be understood as a systematic response to the question of infinitude.

Another reason is that Hegel's philosophy has turned out to be nothing less than a watershed moment in the history of Western thought—in my mind, *the* defining moment up to this point. Foucault once suggested we measure the character of a philosophical discourse in terms of its "Platonic differential."[17] The idea being that as the founding figure of the Western

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Phillipe Uzan, "Dodecahedral Space Topology as an Explanation for Weak Wide-Angle Temperature Correlations in the Cosmic Microwave Background," 2, http://arxiv.org/pdf/astro-ph/0310253v1.pdf (accessed August 26, 2015).

[14] Aristotle, *Physics* III, 202b34.

[15] David Hilbert, "Über das Unendliche," *Mathematische Annalen* 95 (1926): 163, quoted in Eli Maor, *To Infinity and Beyond: A Cultural History of the Infinite* (Princeton: Princeton University Press, 1991), vii.

[16] David Bentley Hart, "Notes on the Concept of the Infinite in the History of Western Metaphysics," in *Infinity: New Research Frontiers*, ed. Michael Heller and W. Hugh Woodin (Cambridge and New York: Cambridge University Press, 2011), 255.

[17] Michel Foucault, "Theatrum Philosophicum," trans. Donald F. Bouchard and

philosophical tradition, Plato is the touchstone by which all philosophy is measured. Insofar as philosophy is a historical discourse that progresses in part by way of negating what has come before, Foucault is right that all philosophical advances bear the mark of anti-Platonism. Given the unparalleled scope of Hegel's project and the long shadow it continues to cast over the Western intellectual world, it isn't much of a stretch to suggest he has supplanted Plato as the supreme philosophical foil and become the new metric of differential. Obviously, not everyone will agree with this assessment, and that is fine. One need not endorse this idea in order to appreciate the arguments that follow.

While Hegel's reputation alone should make his conception of infinitude a worthy standard, there is of course considerable disagreement as to the nature of his reputation. Merleau-Ponty, for instance, considers Hegel to be the origin of every great philosophical achievement during the last century.[18] Similarly, Frederick Beiser maintains that if the modern philosopher wants to know the roots of their position, eventually they will have to contend with Hegel.[19] On the flip side, William Desmond, a former president of the Hegel Society of America, believes philosophical progress will inevitably require an "overcoming" of Hegel, in the sense of "bypassing" him altogether.[20] Clearly, though, even Desmond's contention that overcoming Hegel requires bypassing him lends support to my argument: only a philosopher of truly monumental import can be regarded as someone who needs to be bypassed in the first place. One can thus understand why Lacan was skeptical about any talk of philosophy having "*gone beyond* Hegel, the way one hears we have *gone beyond* Descartes."[21] For Lacan, we think we have gotten "beyond" these giants and then curiously find ourselves in more or less the same place.

All this talk about the impossibility of ever finally getting beyond Hegel in no way entails his conception of infinitude has closed the book on the question, or even that it has been the most influential, historically speaking. If anything, the often turgid and serpentine character of his writing and the high learning curve baked into his system have prevented his approach from

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Sherry Simon, *Critique* 282 (1970): 885.

[18] Maurice Merleau-Ponty, *Sens et non-sens* (Paris: Nagel, 1948), 125-6

[19] Frederick C. Beiser, "Introduction: Hegel and the Problem of Metaphysics," in *The Cambridge Companion to Hegel*, ed. Frederick C. Beiser (Cambridge and New York: Cambridge University Press, 1993), 1.

[20] William Desmond, *Desire, Dialectic, and Otherness: An Essay on Origins* (New Haven and London: Yale University Press, 1987), 4.

[21] Jacques Lacan, *Seminar, Book II* (New York: Norton 1991), 71 (Lacan's emphasis).

being as influential as it might have been. One explanation for this is that among those who do acknowledge him to be something like the West's current metric of differential, or at least in the running, he is often viewed as the paradigmatic negative example, as a sort of intellectual Icarus: see what happens when you spirit away on the Enlightened wings of self-determining Reason? While it may seem strange to say in the same breath that Hegel's philosophical vision is an undeniable watershed moment that has largely been ignored, this is basically what a lot of post-Hegelian thought has done: simply gone about its business as if Hegel never happened. Here I take a cue from Žižek, who makes a persuasive case that the post-Hegelian break with metaphysics inaugurated by Schopenhauer, Kierkegaard, and Marx, to the degree it either ignores or misunderstands core elements of Hegel's speculative project, is not a true break at all.[22] And so when Derrida says "we will never be finished with the reading and rereading of Hegel," he is absolutely right, but in a qualified sense.[23] If we ever hope to be finished with Hegel, to get beyond him in any meaningful sense, we first need to figure out how to *begin* with him; that is, how to take him seriously and approach his system with a hermeneutic of generosity so that we might learn from his achievements as well as his mistakes.

This explains how Hegel's system in general can be regarded as monumental even while major elements of it are dismissed as bogus, or as is more often the case, ignored.[24] Nowhere is this more evident than with those who insist on maintaining an unbridgeable gap between infinitude and finitude in philosophy, and between God and the world in theology. The essence of Hegel's position—meticulously worked out in the *Science of Logic*, concisely outlined in the *Encyclopaedia Logic*, elucidated with theological metaphors in his *Lectures on the Philosophy of Religion*, and present in every one of his early works in some form—is that there is no

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[22] Slavoj Žižek, *Less Than Nothing: Hegel and the Shadow of Dialectical Materialism* (London and New York: Verso, 2012), 194.

[23] Jacques Derrida, *Positions*, trans. A. Bass (Chicago: University of Chicago Press, 1981), 77.

[24] I agree with Richard Dien Winfield when he says Hegel's *Science of Logic* is an achievement of such revolutionary magnitude that almost no one knows what to do with it. Richard Dien Winfield, *Hegel's "Science of Logic": A Critical Rethinking in Thirty Lectures* (Lanham, MD: Rowman & Littlefield, 2012), 1. Similarly, for Walter Kaufmann it matters not that Hegel is mentioned so frequently in contemporary discussions when the majority of assumptions made about him are flat out wrong. Walter Kaufmann, "The Hegel Myth and Its Method," in *Hegel: A Collection of Critical Essays*, ed. Alasdair MacIntyre (Garden City, NY: Anchor Books, 1972), 23. The pattern is clear: Hegel's philosophy is either misunderstood, or just as often, completely ignored.

such gap, that such a gap is fundamentally inconsistent at every level of rational inquiry.

Evidence abounds that some of the most highly-respected philosophers, theologians, and scientists of the last two centuries have for one reason or another ignored Hegel on the issue of infinitude. Take Michael Huemer's recently published *Approaching Infinity*.[25] The essence of his argument is that we need a new theory of infinity. Fair enough. The problem with his otherwise excellent overview of paradoxes related to different conceptions of infinity is that he mentions Hegel a grand total of *zero* times. Should this not strike us, at the very least, as a little strange? And then there is Arthur Peacocke, the theologian and biochemist whose life and work continues to have a major impact on the dialogue between science and theology. Like so many contemporary theologians sympathetic to the sciences, Peacocke deplores "dualism" in nearly every form. He does think, however, that one type is justifiable on theological grounds: namely, "the distinction between the ultimate ontology of God and that of everything else, the 'creation.'"[26] William Stoeger, an astrophysicist who worked for the Vatican Observatory (and, coincidentally, was a classmate of Hawking's at Cambridge), holds a similar position.[27] He maintains that while one of the chief implications of contemporary cosmology is it renders incoherent any form of matter-spirit dualism, there should nonetheless be an exception made for the "radical dualism of God and not-God."[28] Granted, on the surface, the impulse to protect God from being collapsed into 'the world,' either in the form of pantheism or atheism, is understandable. But such a worry seems to me to be further evidence that Hegel's account of the finitude/infinitude dialectic has either been misunderstood or simply disregarded.

Hegel's answer to the question of the unbridgeable chasms native to these and other forms of dualism is *true infinitude*. As the "fundamental concept" (*der Grundbegriff*) of all philosophy, true infinitude, in my view,

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[25] Michael Huemer, *Approaching Infinity* (New York: Palgrave Macmillan, 2016).

[26] Arthur Peacocke, "Introduction: 'In Whom We Live and Move and Have Our Being'?" in *In Whom We Live and Move and Have Our Being: Panentheistic Reflections on God's Presence in a Scientific World*, ed. Philip Clayton and Arthur Peacocke (Grand Rapids, MI and Cambridge: Eerdmans, 2004), xxi.

[27] Peter Hess, "An Astronomer for God: William R. Stoeger (1943-2014)," The Science League of America Blog, entry posted May 6, 2014, https://ncse.com/blog/2014/05/god-astronomy-appreciation-william-r-stoeger-0015569 (accessed August 22, 2016).

[28] William R. Stoeger, S.J., "Key Developments in Physics Challenging Philosophy and Theology," in *Religion and Science: History, Method, Dialogue*, ed. W. Mark Richardson and Wesley J. Wildman (New York and London: Routledge, 1996), 198.

is the crowning achievement of Hegel's attempt to systematically overcome "one-sidedness" (*Einseitigkeiten*) and "externality" (*Äußerlichkeit*) in every possible sense: e.g., epistemologically, phenomenologically, ontologically, theologically, etc.[29] These two concepts, *Einseitigkeiten* and *Äußerlichkeit*, are indicative of the boldness and uncompromising rigor characteristic of Hegel's thought.

The primary form of one-sidedness speculative thought attempts to overcome is the tendency of a philosophical system to absolutize one moment of a logical entity at the expense of another. "The commonest injustice done to a speculative content," Hegel explains, "is to make it one-sided [*einseitig*], that is, to give prominence only to one of the propositions into which it can be resolved."[30] As an example, consider Kant's transcendental philosophy. In general, it tends to prioritize the moment of difference, which Hegel refers to as the abstract moment of the "understanding" (*Verstand*), downplaying the fact that difference necessarily entails some sort of relationality.[31] This type of assumption funds the dogmatic assertion that in the dialectic of infinitude/finitude, God/world, and noumenal/phenomenal, the counterparts are separated by an unbridgeable divide.[32]

There are two types of externality in Hegel's crosshairs, both of which are related to the problem of one-sidedness. First, there is the kind involved with those philosophical systems that attempt to ground themselves in external, dogmatic presuppositions. While it could be said Hegel believes

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[29] *W* 8:203/*EL* §95.

[30] *SL* 91/*W* 5:94.

[31] *W* 8:169/*EL* §80; Walter Cerf, introduction to *Faith and Knowledge*, by G. W. F. Hegel, trans. Walter Cerf and H. S. Harris (Albany: SUNY Press, 1977), xvii.

[32] As will become clear in Chapter 3, although one-sided propositions are incapable of giving full expression to speculative content, *Einseitigkeiten* is not a determination of *Verstand*. Instead, *Einseitigkeiten* results when one disregards that the concept of difference necessarily entails the concept of relationality, thereby absolutizing the moment of difference. Hegel suggests a good example of this is found in the commonsense idea that "the absolute is the unity of subjective and objective" (*EL* §82Z/*W* 8:178). This is fine as far as it goes, but it turns out to be one-sided because it places too great an accent on the moment of unity and downplays the distinctness of each determination. The opposite occurs when reflective "understanding" (*Verstand*) is separated from dialectical "reason" (*Vernunft*). In this case, one-sidedness results from overemphasizing distinctness at the expense of unity. This could lead to the curious situation where concepts are related to one another but not determined by one another, which is basically what happens in Kant's antinomies: the speculative moment is never actualized, and the result is a pair of one-sided arguments that are both apparently true, and yet ultimately irreconcilable.

his system proceeds without making any such assumptions, it would be more accurate to say he thinks his system eventually demonstrates the validity of its point of departure. Said differently, for Hegel, the only philosophical system worthy of the name is a self-grounded one. Try to resist the aforementioned temptation of slapping the "intellectual Icarus" label on him because of this. What Hegel has in mind is that in order for a philosophical system to be able to make and defend truth claims (especially "absolute" ones), it cannot collapse under the weight of its own absurdity upon becoming self-reflexive. This is what happens, for example, with empiricism. If we take "empiricism" to refer to the theory that all knowledge is derived from sense-experience, then it clearly fails to satisfy its own criteria for knowledge: i.e., the idea that all knowledge is derived from sense-experience is not itself derived from sense-experience. Upon becoming self-reflexive, the concept *empiricism* falls apart. This is a prime example of the type of external presupposition Hegel finds problematic and wants to overcome in philosophical discourse.[33]

The second type of externality can be thought of in terms of a metaphysics of difference or separation. This is the standpoint of classical metaphysics, wherein the 'in-itself' of a thing is what it is without respect to anything else. As far as Hegel was concerned, this type of thinking ultimately derives from the conventional wisdom that "the Absolute must lie beyond."[34] Speculative thought does not dogmatically assert that this metaphysics is problematic, but rather attempts to systematically demonstrate that it in fact is. The upshot is that neither the relationship between concept and reality in general (i.e., thought and being) nor any concepts or realities in particular (e.g., God/world, infinitude/finitude, etc.) can be characterized by utter irreconcilability. True infinitude gives shape to the idea that the ostensibly irreconcilable are necessary moments of one another, and just as important, never reducible one to the other. In this sense true infinitude can be thought of as an absolutely self-enclosed whole that is intrinsically dynamic, fundamentally incomplete, and inclusive of genuine otherness.

This same counterintuitive vision of self-enclosure is at the center of Stephen Hawking's groundbreaking approach to quantum cosmology, the Hartle-Hawking proposal. Also referred to as the "no-boundary" proposal, it is essentially a theory of the very early universe developed by Hawking and fellow physicist James Hartle in the early 1980s. By applying an

[33] Just to be clear, Hegel has no problem with empiricism as such. It only becomes problematic when it purports to be the final arbiter of truth and knowledge. See *W* 8:106-13/*EL* §§37-40.
[34] *EL* §24Z2/*W* 8:85.

idiosyncratic interpretation of quantum mechanics to the universe as a whole—hence *quantum* cosmology—vis-à-vis the introduction of "imaginary time" into the formalism, the Hartle-Hawking proposal paints a picture of a universe lacking temporal and spatial boundaries; or more accurately, a universe that is its own boundary—hence the *no*-boundary appellation.[35] In so doing, the proposal does away with the initial singularity, one of the most intractable features of a cosmology based solely on Einstein's theory of general relativity, and according to John Wheeler, the greatest crisis physics has ever faced.[36] This effectively allows the universe's beginning to be formalized as a quantum tunneling event, which has far-reaching implications for the relationship of time and space.[37] For starters, it means the universe is finite in age even though it lacks a definite beginning point. It also entails that the universe is a self-contained whole without anything external to it. Instead of conceptualizing infinitude as that which never ends, as that which extends indefinitely, or as that which is unimaginable in size, the Hartle-Hawking proposal thinks infinitude in terms of that which is wholly self-enclosed. This is true infinitude in a nutshell.

The idea of a self-enclosed universe is intertwined with a number of open questions in theoretical cosmology. One cannot responsibly discuss the notion of a closed universe without also addressing the questions of its local geometry (i.e., its curvature, or shape) and global geometry (i.e., its topology, or connectivity). If one is truly interested in a theory of the universe as a whole, these questions, complicated though they may be, cannot be dealt with independently. Too often, though, the opposite is the case and they are treated in isolation. When this happens the question of the universe's closure is mistakenly reduced to a matter of whether space is flat (i.e., not curved), open (i.e., negatively curved), or closed (i.e., positively curved). Observation shows space to be locally flat. That much is settled beyond a reasonable doubt. But this does not necessarily mean, as is often assumed, that space is infinitely extended. A flat local geometry is

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[35] James B. Hartle and Stephen B. Hawking, "Wave Function of the Universe," *Physical Review D* 28:12 (December 1983): 2960-75; Stephen W. Hawking, *A Brief History of Time: From the Big Bang to Black Holes* (New York: Bantam Books, 1988), 136.

[36] Charles W. Misner, Kip Thorne, and John Archibald Wheeler, *Gravitation* (San Francisco: W. H. Freeman & Co., 1973), 1198.

[37] The details of a quantum tunneling event are not important for my purposes here. What matters most is that the Hartle-Hawking proposal allows the beginning of the universe to be mathematically formalized, whereas the classical singularity is indicative of the breakdown of physical law as we know it.

indicative of an infinitely extended spatial manifold only in the context of certain topologies: namely, "simply" connected ones. In the context of topologies with a more complex connectivity, spatial flatness is indicative of self-enclosure. This is noteworthy because in nearly every cosmological study and textbook the topology of space is assumed to be simply connected (either in terms of a finite hypersphere, an infinite Euclidean space, or an infinite hyperbolic space) and "multiply" connected alternatives are rarely discussed.[38] As I write this, scientists have only just started making progress on these questions from an empirical standpoint. Because they remain deeply theoretical in nature (given technological limitations, etc.), chances are they will not be sorted out once and for all in my lifetime. This does not mean that those of us living in the early decades of the twenty-first century are unable to offer a well-reasoned response. Nor does it mean one has to accept the consensus position that we inhabit "an infinite flat universe forever expanding under the pressure of dark energy" until a new one is reached.[39]

With this in mind, my goal is to demonstrate that the Hartle-Hawking proposal's radical understanding of the universe's spatiotemporal boundaries can be legitimated by establishing the coherence of Hegel's conception of infinitude. In other words, I claim the physical universe of the Hartle-Hawking proposal and the speculative metaphysics of true infinitude are conceptually isomorphic. Working out the details of this claim will reveal two things. First, it will show there is philosophical merit to the notion of a finite universe lacking spatiotemporal boundaries. Second, it will show there is scientific merit to the notion of infinitude as an absolutely autopoietic self-enclosed whole completely bereft of externality. In this regard the Hartle-Hawking universe can be thought of as the mathematical analogue of Hegel's contention that "the universe is nowhere nailed up with boards."[40] Although Hegel's point in making this statement was to repudiate the notion that space—which he believed extended indefinitely—ought to be understood as instance of true infinitude, the sentiment is nonetheless perfectly compatible with the notion of a self-enclosed universe.

At first blush it may appear as if this book is primarily a work of philosophy. This could lead one to conclude the theological component is little more than an afterthought, an appendix one could just as easily do

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[38] Marc Lachièze-Rey and Jean-Pierre Luminet, "Cosmic Topology," *Physics Reports* 254:3 (March 1995): 9; 64, http://arxiv.org/pdf/gr-qc/9605010v2.pdf (accessed August 28, 2015).

[39] Luminet, et al., "Dodecahedral Space Topology as an Explanation for Weak Wide-Angle Temperature Correlations in the Cosmic Microwave Background," 2.

[40] *W* 9:42-3/*EPN* §254Z.

without. But nothing could be further from the truth. For it is arguably the case that the idea of an age-finite, self-enclosed universe is theologically significant in and of itself. This follows from the fact that every proposal in quantum cosmology is necessarily a theory of a Whole wholly bereft of externality. Consequently, when a theory like the Hartle-Hawking proposal is granted genuine explanatory force (i.e., not read from a purely instrumentalist standpoint, where all that matters is whether or not the math works), it stands to reason that, at minimum, "God" cannot be conceptualized as an external agency, that is, as an ultra-mundane Observer. One reason for this is if we take seriously what has been discovered about the relationship between subjective experience, the brain, and symbolic representation, it seems to be the case that, so far as we can tell, *consciousness requires embodiment*. More specifically, it appears as if consciousness must be embodied in a neurophysiological substrate, or at least it must begin that way. The basic idea here is that a self-enclosed universe quite literally leaves no room for a metaphysically external, self-conscious being. Granted, the question of consciousness is far from settled from a philosophical perspective. That said, in light of the mounting evidence for the necessary embodiment of consciousness, as far as I am concerned, if one maintains God is some sort of disembodied being capable of self-awareness and intentional agency, then the onus is on *that* person either to provide an explanatory mechanism for such a conception of agency in a non-ad hoc fashion, or to show why the mounting insights of science on this issue are not applicable in a theological context. Furthermore, I think this would have to be done without retreating behind the walls of special revelation and without playing the mystery card. While the consciousness-requires-embodiment notion in no way closes down the theological question, it definitely presents problems for certain theological paradigms. Not all, of course, but some.

Another reason why the question of the universe's shape naturally leads to the theological question has to do with the limited scope of scientific inquiry. Although theoretical cosmology deals with the universe as a whole, it is necessarily limited by its methodology, the kinds of questions it can and cannot ask, and its reliance on a set of unexplained givens (e.g., the laws of nature, the legitimacy of basic mathematical procedures, etc.). This is not evidence of some sort of defect in scientific knowledge or science itself, however. It is simply the result of what the physical sciences are and what they provide: theories about specific slices of reality. In a scientific theory of the whole these limitations inexorably lead to the idea of an ultimate Source, an uncaused Ground, or the substrate of Rationality itself. Call it whatever you like at this point. For as Hawking himself admits, at the end

of the day his cosmology has no way of explaining what it is that "breathes fire into the equations and makes a universe for them to govern," or even why "the universe bother[s] to exist" in the first place.[41] Quantum cosmology doesn't merely crack the door open for the philosophical theologian here, but rather it hangs a gigantic flashing "PLEASE ENTER" sign above the threshold. That said, in no way does this entail some sort of hierarchy of disciplines, wherein either philosophy or theology reigns supreme. Quite the contrary. At a practical level it suggests these individual disciplines do their best work when they cooperate. At a more fundamental level it suggests they are intertwined to such a degree that they cannot ultimately be disentangled.

But the most important reason why I maintain that quantum cosmology has an irreducible theological core comes down to the nature of infinitude itself. Infinitude has a long and rich tradition of being interpreted theologically. This is certainly a hallmark of speculative thought, but the Hegelian is hardly out on a limb all alone here. In the Christian theological tradition this line of thought goes back at least to the fourth century with Gregory of Nyssa, for whom infinitude became a way of naming God's limitlessness and incomprehensibility. The obvious differences between Gregory's conception of infinitude and Hegel's notwithstanding, the point is that this tradition continues in various forms to this very day.[42]

While not the source of the tradition, Hegel's philosophy takes the theology of infinitude to a whole new level. The theological significance of Hegel's contention that true infinitude is the fundamental concept of philosophy becomes even more pronounced upon recognizing that he considers "scientific" philosophy to be synonymous with "logic," and that logic ought to be understood in terms of "metaphysics" and "metaphysical theology."[43] A preliminary hint of what he means by "metaphysical theology" is found in the introduction to the *Science of Logic*, where he declares logic to be equivalent to the "exposition of God as he [sic] is in his eternal essence before the creation of nature and finite spirit."[44] Regardless

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[41] *BHBU* 99.

[42] Philip Clayton, for instance, argues that the finitude/infinitude dialectic is the baseline for any and every philosophical theology worthy of the name, identifying it as the minimal starting point for any constructive metaphysics. Philip Clayton, *The Problem of God in Modern Thought* (Grand Rapids, MI: Eerdmans, 2000), 475; 486. These ideas are consonant with Hegel's philosophy and will play key roles when we begin working out the quantum cosmo-logic of the speculative Absolute.

[43] *W* 8:80-1/*EL* §24; *W* 8:181/*EL* §85; *W* 17:419/*LPEG* 99; *W* 17:451/*LPEG* 104; *W* 5:16/*SL* 27.

[44] *W* 5:44/*SL* 50.

of what one makes of the connection between logic and metaphysical theology at this point, all that needs to be said here is as far as Hegel is concerned one cannot speak of infinitude without simultaneously speaking of God—and this is true even though the language of his philosophy is not always explicitly theological. This is not to say "infinitude" is merely a cipher for "God" in his system, but only that because infinitude cannot be conceptualized apart from finitude, there is a sense in which finitude *itself* is intrinsically theological. Herein lies one of the more important, yet easily misunderstood, elements of Hegel's system: to think the natural world is, at some level, to think God.

What we have here is an essential reciprocity of philosophical and theological/religious concepts. Generally speaking, this is due to the fact that for Hegel theology and philosophy share a common object of inquiry: God and truth, respectively.[45] Hegel does argue that in its truest form philosophy *is* theology, but he never goes so far as to collapse them into one another.[46] Of the many important differences between them, one is that religion tends to reveal truth by its content, whereas philosophy reveals truth by its form.[47] In any event, this reciprocity is nothing less than a result of the dynamics of speculative thought itself; the basic idea being contained in the concept of true infinitude, provisionally understood here as a counterintuitive mode of identity-in-difference. The upshot is that Hegel's system not only allows but actually requires the infinitude/finitude dialectic to be read in terms of the God/world relationship, and vice versa. This further shows why the question of the universe's shape is also a theological question. More importantly, it provides a key to unlocking the theological implications of the Hartle-Hawking proposal. Because Hartle-Hawking cosmology and speculative philosophy both think the shape of the universe in terms of absolute self-enclosure (i.e., true infinitude), it stands to reason that their positions on the God/world relationship would dovetail as well. With this in mind, I claim that the theology underlying Hartle-Hawking cosmology can and should be worked out in terms of Hegel's (in)famous contention that "without the world God is not God" (*ohne Welt ist Gott nicht Gott*).[48]

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[45] *W* 8:41/*EL* §1; *W* 16:28/*LPR* 77n5.
[46] *W* 17:341/*LPR* 489.
[47] *W* 17:231/*LPR* 425. It could also be said that religion deals with "representations" (*Vorstellungen*) whereas philosophy deals with "concepts" (*Begriff*e) (*W* 10:378/*EPM* §572).
[48] *W* 16:192/*LPR* 1:308n97; G. W. F. Hegel and D. P. Marheineke, *Georg Wilhelm Friedrich Hegel's Vorlesungen Über Die Philosophie Der Religion: Nebst Einer Schrift Über Die Beweise Vom Dasen Gottes,* verbesserte Auflage (Berlin: Duncker

Exactly what Hegel means by this enigmatic little phrase will be one of our guiding questions. The core ideas inherent to the Hartle-Hawking proposal will prove invaluable on this account. Although the idea that "without the world God is not God" might look and feel strange at first, if not outright absurd or heretical to some, Hegel is not trying to be cryptic. Nor he is trying to be cute or incite controversy for controversy's sake. Its opaque and ostensibly controversial character is merely a microcosm of speculative thought's underlying logic of ideality. And here we have another reason why Hartle-Hawking cosmology and Hegel's philosophy make terrific conversation partners, why a diffractive reading is so promising: the logic underlying the Hartle-Hawking proposal is essentially the logic of a properly speculative metaphysics (insofar as the logic of quantum mechanics is intrinsically "speculative" in nature—in the technical, Hegelian sense of the word).

Regardless of how one categorizes the theological position developed here—and this is not an insignificant issue—one of the most important things to see is that Hegel's philosophy and Hartle-Hawking cosmology both present a thoroughgoing challenge to the idea of a wholly external deity found in many versions of classical theism, Christian or otherwise.[49] Again, this is the God who dwells in a trans- or pre-ontological beyond, consciously chooses to create, providentially oversees creation's progress and development, occasionally (i.e., miraculously) intervenes in its outcomes, eternally determines moral absolutes, grounds all meaning, and in general guarantees a happy ending for the cosmos. Hawking believes his cosmology shows this concept of God to be a figment of the imagination. Hegel believes his philosophy shows it to be incoherent. While this reveals a basic level of agreement between Hawking and Hegel, the theological

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u. Humblot, 1840), 1:194. Because this phrase was not authored by Hegel's own hand but rather appears in lecture notes transcribed by one of his students, some scholars question whether he actually said it. See, for example, Martin J. De Nys, "Conceiving Divine Transcendence," *The Owl of Minerva* 36:2 (Spring/Summer 2005): 125. Setting aside the fact that we have no good reason not to trust Hotho's transcription, whether or not Hegel actually spoke these words verbatim is a moot point. Careful analysis of Hegel's dialectic of finitude/infinitude will show it represents his position, even if only in a metaphorical form.

[49] With respect to the general category of "classical theism," I am here taking a cue from Grace Jantzen when she points out that one of the most decisive considerations for the early Christian theologians was that God could never be "identified with the universe or any part of it because God is transcendent, infinite and unlimited." Grace Jantzen, *God's World, God's Body* (Philadelphia: Westminster Press, 1984), 101. In other words, broadly speaking, for classical theism God's personhood and agency has nothing to do with the created order, it is completely independent of it.