"Ancient civilizations across the world started building the powerful mathematical toolkit powering today's science but failed to discover the most important number of all: zero. This well-written book is a fascinating interdisciplinary expedition to unearth zero's best-kept secrets."

– Professor Max Tegmark, Massachusetts Institute of Technology, USA, author of *Our Mathematical Universe* and *Life 3.0*

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"Was everything born from Nothing, or has Nothingness always been impossible? Trying to understand Zero might help us to answer such questions. Zero has been central to battles in mathematics, in philosophy, in religion, and in the sciences. Those battles, and the cultural backgrounds to them, are described in this fascinating volume."

– John Leslie, Professor Emeritus of Philosophy, University of Guelph, Canada, co-editor of *The Mystery of Existence: Why Is There Anything At All?*

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"This book is a fascinating compilation of reflections on Zero – the digit, the symbol, the concept – from a plethora of perspectives: mathematical, scientific, philosophical, theological, spiritual, historical, linguistic, artistic. Once again proving that there is a great deal to say about nothingness, and that there's always a new angle to find no matter which page of the book you choose to open."

– Vinod Subramaniam, President, University of Twente, The Netherlands

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"To the ancient Greeks, a number was the ratio of commensurable quantities. How then could one divide a distance by a time? Time and distance are incommensurable. It took the human race over a thousand years to figure out how to divide distance by time and thus arrive at the concept of velocity. We could finally outrun Zeno's tortoise. In another three hundred years we had celestial mechanics and a few hundred more we walked on the moon. Zero is much harder. Zero is the number of elements in the empty set, the number of things that are not equal to themselves. What is that number?

Depending on the consistency of our arithmetic, the empty set contains either nothing or everything. Is our arithmetic consistent? Thanks to Gödel's incompleteness theorem we know that we will never know. At least we know that we can stop asking. But we can't stop wondering how we got here, not knowing whether everything is nothing or not. This book may not let the fly out of this bottle but it will do something better, it will create wonder. Wonder is after all a wonder. It's over the moon. Enjoy this book."

– Roger M. Cooke, Emeritus Professor of Applied Decision Theory at the Department of Mathematics at Delft University of Technology, The Netherlands and Chauncey Starr Senior Fellow at Resources for Future in Washington

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"The classical Chinese rice bowl was painted with the image of a tiger. The inept forms show that none of the painters had ever seen the actual animal. They imagined a tiger. The dictionary says that imagination is the faculty of making mental images of things that are not present. Seeing the Sun setting over the ocean, we imagine that we are riding an immense spinning sphere, even though our senses tell us that this is absurd. But we can even imagine things that have no image, that are not even things – such as numbers, and especially the number zero – as is shown in this fascinating book. Even more than our image of the cosmos, zero is an ultimate product of imagination. Imagination and creation are twins. In mathematics and in art, something exists as soon as it has been imagined. A flying tiger, everlasting love, the square root of a negative number; even theorems are conceived before they are proven, or proven to be wrong. And zero, symbolic for science and for art. We can make visual images of things that are not present. In French, zero is *l'Oeuf*, the egg-shape, pronounced as 'love' in the game of tennis. Zero is love, the love for zero in this volume celebrates imagination."

– Dr Vincent Icke, Professor of Theoretical Astrophysics and visual artist

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The Origin and Significance of Zero

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The Origin and Significance of Zero

An Interdisciplinary Perspective

Edited by

Peter Gobets
Robert Lawrence Kuhn

BRILL

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This book is printed on acid-free paper and produced in a sustainable manner.

This volume is a tribute to the life and legacy of Peter Gobets, whose vision, commitment, creativity, ingenuity, insight, persistence and passion transformed a phantasmal dream into reified reality – apropos, perhaps, of zero itself, from empty placeholder to axial number. Peter was our Commander Zeronaut (as Peter called us explorers of the truth behind the discovery or invention of zero), and, as fate would have it, he departed Mothership Earth on 5 March 2024, just days before publication. Peter's laser-sharp focus and dedication towards the study of zero, his charm in engaging scholars, scientists, artists, entrepreneurs and captains of influence, all combined to actualize the project, realizing the holding of various zero events and the publishing of this zero monograph – the culmination of Peter's 50-year vision and accomplishment.

In addition, it is dedicated to the memory of René Samson, chairperson of the Zero Project Foundation from its launch in 2015 until his untimely passing in 2019. René was not only an accomplished scientist with wide professional interests, including in mathematics and physics, co-authoring two of the chapters in this book, but he was also a gifted composer of modern classical music (https://renesamson.nl/en/).

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Foreword

Next to one, zero is the most common symbol in today's digital world, which often uses symbols, signs and concepts without knowing their true meaning and origin. Such a situation is not unique to today's society; similar phenomena have occurred many times in the history of civilization. We are simplifying the world by studying it more and more deeply and thoroughly with technologically advanced analytical tools and instruments, basing our conclusions on evidence and repeatable observations, of which there are never enough, and as a result, the intensity of research and the scope of the new knowledge we acquire is increasing significantly. At the same time, for several decades already, society has not been able to keep up with and absorb all of this newly generated knowledge, nor are scientists, who make their discoveries in narrow fields of knowledge, able to do so.

This knowledge can no longer be acquired through traditional methods and techniques. It is possible that a new field theory and support from artificial intelligence will soon be needed to extract the necessary knowledge from the overflowing container of scientific research. However, such generalization is lagging behind. Likewise, a fundamental reassessment of scientific research strategies themselves is also lagging, often without recognizing the diversity of intellectual traditions around the world, which are rooted in different cultures with different views on the meaning and consequences of human action. In this context, the Zero Project is a kind of cross-cultural encounter that enables experts from different cultures to carry out something like a 'syncing of the clocks' regarding the concept of Nothing.

An essential problem is that scientists, in their single-minded focus, find it difficult to accept the significance of the discoveries and research priorities of their colleagues in other fields. From this point of view, alongside intercultural dialogue, it is equally important to support interdisciplinary approaches, and this is also where the Zero Project shows initiative.

The aim of this monograph is to present different arguments, approaches and perspectives of scholars from different points of knowledge and experience in research. Such an approach has been very rare in recent decades, and it is therefore important that The Zero Project Foundation has taken note of the need for this perspective and provided its support.

At the same time, the *Expertise Center on Zero* is a wonderful initiative for the future development of the discussion forum, and we hope to involve doctoral students and young scholars from a variety of disciplines in its audience,

thus giving them the opportunity to directly assess their knowledge and gain motivation and inspiration for future research, including targeted research on the invention/discovery of zero.

Professor Valdis Segliņš
Vice-Rector, University of Latvia

Preface

Zero should need no introduction. It is meaningful in its representation of Nothing and significant in humanity's mathematical and philosophical development. This volume, *The Origin and Significance of Zero: An Interdisciplinary Perspective*, exemplifies the Zero Project, which explores the origin or origins of zero, and the role and impact of zero, in world intellectual history.

I come to zero via Nothing.[1] Since a child, I have been haunted by Nothing. When I was 12, in the summer between seventh and eighth grades, a sudden realization struck such fright that I strove desperately to blot it out, to eradicate the disruptive idea as if it were a lethal mind virus. My body shuddered with dread; an abyss had yawned open. Six and a half decades later I feel its frigid blast still.

Why not Nothing? What if everything had always been Nothing? Not just emptiness, not just blankness, and not just emptiness and blankness forever, but not even the existence of emptiness, not even the meaning of blankness, and no forever. Wouldn't it have been easier, simpler, more logical, to have Nothing rather than something?

The question would become my life partner, and even as I learned the rich philosophical legacy of Nothing, I do not pass a day without its disquieting presence. Here we are, human beings, conscious and abruptly self-aware, with lives fleetingly short, engulfed spatially and temporally by an ineffable, unimaginably vast, seemingly oblivious cosmos.

Call all-that-exists, anywhere, anytime, and in any form, 'Something.' Why is there Something rather than Nothing? Why is there anything at all? Of all the big questions, this is the biggest. The ultimate puzzle. The mystery of existence.

This biggest question seems unfathomable, impenetrable, uncrackable. But are there ways to probe? Can we learn about Nothing? Can we learn from Nothing?

Some scientists claim that the universe came from Nothing. But what's the nature of their kind of Nothing? That's where the confusion lies.

A milestone on my journey to Nothing was engaging with the philosopher John Leslie, who for decades had focused on Nothing and whom I had come to know through our discussions on *Closer To Truth*, the US public television

1 This Preface is derived, in part, and developed further, from R. L. Kuhn, "Levels of Nothing," *Skeptic Magazine*, Vol. 18, No. 2, 2013, and R. L. Kuhn, "Why Not Nothing," in J. Leslie and R. L. Kuhn (eds.), *The Mystery of Existence: Why is there Anything At All?* (Chichester: Wiley-Blackwell, 2013).

series that I created and host.[2] Together, we co-edited a book of readings and commentaries on our favorite ultimate question.[3] *The Mystery of Existence: Why is there Anything At All?* – long in gestation – presents the ideas of contemporary thinkers as well as others throughout intellectual history, grouped under five possible 'solutions' to the 'Why-is-there-Something-rather-than-Nothing?' puzzle: (1) a blank is absurd; (2) no explanation needed; (3) chance; (4) value/perfection as ultimate; and (5) mind/consciousness as ultimate.

Nothing has entered public discourse.[4] But how to progress on Nothing? I set a limited goal: clarifying Nothing. What do we mean by Nothing? When scientists, philosophers, people in general, speak about Nothing, to what are they referring? Are they referring to the same kind of No-Thing? Again, that's where the confusion lies.

My approach is to distinguish what I call 'Levels of Nothing,' and to use these Levels of Nothing to standardize discussions about Nothing.

Start by lumping together everything that exists and might exist – physical, mental, Platonic, spiritual, God, other non-physicals. As for the physical, include all matter and energy, space and time, all the fundamental forces of physics, and all the laws and principles that govern them (known and unknown); as for the mental, imagine all kinds of consciousness and awareness (known and unknown); as for the Platonic, gather all forms of abstract objects (numbers, logic, forms, propositions, possibilities – known and unknown); as for the spiritual and God, embrace anything that could possibly fit these non-physical categories (if anything does); and as for 'other non-physicals' – well, I just want to be sure not to leave anything unclassified.

Lump together literally everything contained in ultimate reality. Now call it all by the simple name 'Something.' Why is there 'Something' rather than 'Nothing'?

Note that Nothing is not an odd kind of Something, called 'Nothing,' that is existing. Rather, Nothing is defined by negation: No Thing, No Something.

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2 Why is there Something rather than Nothing?, the ultimate question, is a continuing theme of *Closer To Truth* (www.closertotruth.com), the public television/PBS series that I created and host, and is co-created, produced and directed by Peter Getzels. For many *Closer To Truth* television episodes and videos on Nothing, see https://closertotruth.com/search-results/?searchwp=Nothing.

3 Leslie and Kuhn, *The Mystery of Existence*.

4 Jim Holt, *Why does the World Exist: An Existential Detective Story* (New York: Liveright, 2012); Michael Shermer, "Much Ado About Nothing," *Scientific American* (May 2022); Lawrence Krauss, *A Universe from Nothing: Why There Is Something Rather Than Nothing* (New York: Free Press, 2012); David Albert, "On the Origin of Everything," *The New York Times* (March 23, 2012); Ross Andersen, "Has Physics Made Philosophy and Religion Obsolete," *The Atlantic* (April 24, 2012).

So, why Not Nothing?

From this point, what guides me, I must admit, is more gut feeling, less clever reasoning, which is why no argument has ever dissuaded me from continuing to think, following Leibniz,[5] that Nothing, no world, would be simpler and easier than any world, that Nothing would have been the least arbitrary and 'most natural' state of affairs.

As I have continued to think about Nothing, I have continued to think that Nothing 'should,' in some sense, have obtained, and the only reason I accept the fact that Nothing does not obtain is not because of any of the arguments against Nothing,[6] but because of the raw existence of Something – because in my private consciousness I am forced to recognize that real existents compose Something.

In other words, an a priori weighing of Nothing vs. Something (from a timeless, explanatorily earlier perspective) would, for me, tip the balance heavily to Nothing, but for the fact of the matter. Thus, since I have no choice but to recognize that there is Something, I have no choice but to conclude that, if I eschew brute fact, there is some foundational force, selector, productive principle or, more likely, a type of necessity – some deep reason – that brings about the absence of Nothing.

None of this seems credible. Perhaps embrace brute fact?

I reject the argument that because there is an infinite number of possible worlds of Something, and only one possible world of Nothing, therefore the probability of a Nothing world is precisely zero (one divided by infinity). I reject this argument because it assumes that the prior weighting of a Nothing possible world is equal to that of *each* of the infinite number of Something possible worlds. To me, on the contrary, the prior weighting of a Nothing possible world exceeds the sum of *all* of the infinite number of Something possible worlds.

I cannot rid myself of the conviction that Nothing would have obtained had not something special somehow superseded or counteracted it. Yes, I know that seems circular – and many well-regarded philosophers say, 'So there's a world not a blank; what's in any way surprising about that?' 'There has to be something or other.'[7] But I just can't help feeling that those who do not take

5 Gottfried Leibniz, *The Principles of Nature and Grace* (1714).

6 Arguments against Nothing include asserting that Nothing is unimaginable, nonsensical, meaningless or absurd, or as soon as something is possible it must exist somewhere. Some would have God's necessary existence as proscribing Nothing.

7 See Bede Rundle, *Why there is Something rather than Nothing* (Oxford: Oxford University Press, 2006).

Nothing seriously are passing right over the problem most probative of ultimate reality.

Defining 'Nothing' may seem simple – no thing, not a thing. But what's a 'thing'? I invoke the term 'thing' in the most general possible sense, and therefore, given some possible notions of Nothing, it is no contradiction to find 'things' that compose these different kinds or levels of Nothing. Teasing apart these constituent things, as if scaffolds or sinews of Nothings, may help enrich understanding of the nature of Nothing, yielding a taxonomy that arrays opposing kinds of Nothing that could be conceived and might have existed.

This taxonomy is structured as a deconstruction or as a dissection, as it were, a reverse layering, a peeling, a progressive reduction of the content of each Nothing in a hierarchy of Nothings. As such, this taxonomy takes its heritage from the so-called Subtraction Argument, which seeks to show that the absence of all concrete objects would be metaphysically possible. (Stated simply, the Subtraction Argument works by imagining a sequence of possible worlds each containing one fewer concrete object than the world before, so that in the very last world even the very last object has vanished. It is no surprise that complexities emerge.[8])

Developing this way of thinking, there might be nine levels of Nothing, with a general progression from Nothing most simplistic (Nothing 1) to Nothing most Absolute (Nothing 9). (Nine is not a magic number of levels of Nothing; cut differently, there could be more levels, or fewer.)

Each level of these Nothings can be criticized. My point here is not so much to argue the legitimacy or conceptual contribution of any one kind of Nothing, but rather to construct an exhaustive taxonomy of all potential or competing Nothings, and a taxonomy in which those Nothings are mutually exclusive. If so, then one level of Nothing must be the most correct in some fundamental sense, even if we cannot adjudicate among them (i.e., adjudicating among levels 5 to 9; we can reject levels 1 to 4 immediately as they are obviously not scientifically sufficient).

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8 For the Subtraction Argument, see the following: T. Baldwin, "There might be nothing," *Analysis* 56 (1996): 231–38. G. Rodriguez-Pereyra, "There might be nothing: the subtraction argument improved," *Analysis* 57 (1997): 159–66. G. Rodriguez-Pereyra, "Metaphysical nihilism defended: reply to Lowe and Paseau," *Analysis* 62 (2002): 172–80. Alexander Paseau, "The Subtraction Argument(s)," *Dialectica* 60(2) (2006): 145–56. For the opposing view, that it is metaphysically not possible that there would be no concrete objects, see the following: D. M. Armstrong, *A Combinatorial Theory of Possibility* (Cambridge: Cambridge University Press, 1989); David Lewis, *On the Plurality of Worlds* (Oxford: Blackwell, 1986); E. J. Lowe, "Why is there anything at all?" *Aristotelian Society Supplementary* Volume 70 (1996): 111–20. See also, Roy Sorensen, "Nothingness," *Stanford Encyclopedia of Philosophy* (2009).

Following are the nine levels of Nothings.

1. Nothing as existing space and time that just happens to be totally empty of all visible, observable objects (particles and energy are permitted) – an utterly simplistic, pre-scientific view.
2. Nothing as existing space and time that just happens to be totally empty of all matter (no particles, but energy is permitted – flouting the law of mass-energy equivalence). Another easy reject.
3. Nothing as existing space and time that just happens to be totally empty of all matter and energy.[9]
4. Nothing as existing space and time that is by necessity – irremediably and permanently in all directions, temporal as well as spatial – totally empty of all matter and energy.
5. Nothing of the kind found in theoretical formulations by physicists, where, although space-time (unified) as well as mass-energy (unified) do not exist, pre-existing laws, particularly laws of quantum mechanics, do exist. And it is these laws that make it the case that universes can and do, from time to time, pop or 'tunnel' into existence from 'Nothing,' creating space-time as well as mass-energy. (It is standard physics to assume that empty space seethes with virtual particles, reflecting the uncertainty principle of quantum physics, where particle-antiparticle pairs come into theoretical or mathematical being, and then, almost always, in a fleetingly brief moment, annihilate each other.)
6. Nothing where not only is there no space-time and no mass-energy, but also there are no pre-existing laws of physics that could generate space-time or mass-energy (universes).
7. Nothing where not only is there no space-time, no mass-energy, and no pre-existing laws of physics, but also there are no non-physical things or kinds that are concrete (rather than abstract) – no God, no gods, and no consciousness (cosmic or otherwise). This means that there are no physical or non-physical beings or existents of any kind – nothing, whether natural or supernatural, that is concrete (rather than abstract).
8. Nothing where not only is there none of the above (so that, as in Nothing 7, there are no concrete existing things, physical or non-physical), but also

9 As an example of an objection to a kind of Nothing, some would resist the idea that there could be space and time that had been emptied of existing things. The 'relational' theories of space and of time assume that emptying space and time of existing things is impossible, because space is the system of spatial relations between things, and time is the system of temporal relations between things.

there are no abstract objects of any kind – no numbers, no sets, no logic, no general propositions, no universals, no Platonic forms (e.g., no value).

9. Nothing where not only is there none of the above (so that, as in Nothing 8, there are no abstract objects), but also there are no 'possibilities' of any kind. (It is recognized that possibilities and abstract objects overlap in that possibilities are an abstract object, though allowing that the two concepts can be distinguished, such as in the possibility of there being abstract objects.)

Nothings 1 through 7 progressively remove or eliminate existing things, so that a reasonable stopping point – a point at which we might well be thought to have reached (what I hesitatingly call) 'Real Nothing' or 'Absolute Nothing,' the metaphysical limit – would be Nothing 7, which features no concrete existing things (no physical or non-physical concrete existents) of any kind.

Nothings 8 and 9 go further, eliminating non-concrete objects, things, existents and realities. Do they go too far? Many philosophers assert that neither Nothing 8 nor Nothing 9 is metaphysically possible, arguing that the claimed absence of abstract objects and/or possibilities would constitute a logical contradiction and hence abstract objects and/or possibilities exist necessarily.

This necessity of abstract objects and/or possibilities could be important because, as John Leslie points out, among the realities which aren't concrete things, or which do not depend on the existence of concrete things, and thus cannot be eliminated, there may be some realities that are plausible candidates for explaining the world of concrete things (i.e., value, Platonic good).[10] In this way of thinking, the crucial distinction is between realities that seemingly can be eliminated and realities that seemingly cannot be eliminated, rather than any particular way of distinguishing between levels of nothingness or particular ways of defining nothingness.

I like to point out that among all these levels of Nothing, one of the 'lesser Nothings' – that is, a kind of Nothing with more 'things' in it – is the Nothing of physicists, Nothing Level 5.

What physicists contemplate – the sudden emergence or 'tunneling' of universes from 'Nothing' – is fascinating and indeed may be cosmogenic, but the tunneling process or capacity itself is not Nothing.[11] The Nothing of physicists

10 See sections 3.7, 3.8, and 3.9 in the taxonomy of possible generators or creators of the universe, in my essay, R. L. Kuhn, "Why This Universe?" *Skeptic Magazine*, Vol. 13, No. 2 (2007): 36.

11 That the universe may have popped or tunneled into existence via some sort of cosmic spontaneous combustion, emerging from the 'nothing' of empty space (i.e., vacuum energy generated by quantum fluctuations, unstable high energy 'false vacua'), or from 'quantum tunneling' (Alex Vilenkin, *Many Worlds in One: The Search for Other Universes*

is thick and rich with the complete set of the laws of physics, and so between physicists' Nothing and Absolute Nothing lies a vast, unbridgeable gulf.

On this taxonomic scale, physicists' Nothing, as Nothing Level 5, is barely halfway to utter, Absolute Nothing. If physicists' Nothing were in reality Absolute Nothing (i.e., bedrock ultimate reality, with no lower Nothings), the laws of quantum physics (or whatever might turn out to be the most fundamental physical laws underlying quantum physics) would have to be either impossible to remove (meaning that eliminating them would involve logical contradiction) or a brute fact about existence beyond which explanation would be meaningless. Few would argue that the ultimate laws of physics are logically necessary, not contingent, and I doubt I could ever get over the odd idea that something so intricate, so involved, so organized and so accessible as the complete laws of physics would be the ultimate brute fact as the furniture of Absolute Nothing.

As a separate consideration, philosophers of religion argue that (if there is a God) God is a 'necessity,' meaning that it would be impossible for God not to exist – God must exist in all possible worlds – thus precluding Nothing 7 (which has no non-physical concrete things such as God but still has abstract objects) and crowning Nothing 6 (which has no space-time, no mass-energy, no laws of physics, but still has God and other non-physical things) as the metaphysical limit of what is to be explained.[12]

(New York: Hill and Wang, 2006), may be the proximal cause of why we have a universe in the first place, but cannot be the reason, of itself, why the universe we have works so well for us. Universe-generating mechanisms of themselves, such as unprompted eternal chaotic inflation or uncaused nucleations in space-time, can only address the fine-tuning problem of our universe by postulating innumerable universes, perhaps an infinity of universes, a vast multiverse, in which the laws of physics must reset randomly in each universe, and must be, in some sense, primordial and foundational. Nor can vacuum energy or quantum tunneling or anything of the like be the ultimate cause of the universe, because, however hackneyed, the still-standing, still-unanswered question remains 'from where did those laws come?'.

12 The question of whether God, assuming God exists, would be 'necessary'– which means that God would exist in all possible worlds – has beset philosophers and theologians for centuries. The much-debated now commonly refuted Ontological Argument for the existence of God, which defines God as 'a being than which no greater can be conceived,' leads to the claim that God is necessary because necessity is a higher perfection than contingency. Richard Swinburne originally asserted that God is a 'factual necessity' but not a 'logical necessity' in that the non-existence of God would introduce no logical contradiction (*Closer To Truth*). Swinburne later strengthened God's necessary existence to a kind of 'metaphysical necessity' where God is both the necessary and sufficient cause of God's own existence, and so gives a probability of 1 to the probability of the effect. Swinburne said he was not convinced of this, but it did seem more plausible than any other answer to 'Why is there anything at all?'; it provides a genuine intermediate possibility between

I find the move of imputing necessity to God, especially logical necessity, challenging. Moreover, based on the levels of Nothing in this taxonomy, it would seem less of a leap to imagine a world without God (Nothing 7) than to imagine a world without abstract objects (Nothing 8). For the traditional God, that won't do.[13]

God being contingent and God being logically necessary. He developed this idea (including explaining the sense in which 'cause' is being used analogically) in R. Swinburne, *The Coherence of Theism: Second Edition* (Oxford: Oxford University Press, 2016), chapter 14 (private communication). Timothy O'Connor defends God's necessity in his monograph on the topic. Timothy O'Connor, *Theism and Ultimate Explanation: The Necessary Shape of Contingency* (Oxford: Blackwell, 2008).

13 The relationship between God and abstract objects is particularly troublesome for those who believe that God created and sustains all things and who privilege above all else God's absolute sovereignty (aseity). The reason is that abstract objects, many philosophers believe, exist necessarily, which means that it would be impossible for abstract objects not to exist, which further means that it makes no sense for even God to have created them. What would it take to create the idea of the number 3 or the truth that 1 + 2 = 3 or the reality that squares are not round? How could such ideas, truths, realities even conceivably be created? Peter van Inwagen calls abstract objects 'putative counterexamples' to the thesis that God has created everything. But if abstract objects do exist necessarily, then wouldn't God's mental life be encompassed by blizzards or swarms of infinities of infinities of abstract objects, not only which God would not have created but also over which God could exercise no control? The problem posed by abstract objects for a God whose sovereignty must be absolute is complex and requires metaphysical analysis. Consider two of the more general ways to defend God's sovereignty (aseity): 1) Deny that abstract objects are real, in that numbers, universals, propositions and the like are mere human-invented names with no correspondence in reality (nominalism, fictionalism); and/or 2) claim that abstract objects are thoughts in the mind of God. Van Inwagen rejects both ways; he must therefore defend the position that there are besides God other uncreated beings and he thus prefers to restrict God's creation of 'all things visible and invisible' to 'objects that can enter into causal relations' (which excludes abstract objects). Peter Van Inwagen, "God and Other Uncreated Things," in Kevin Timpe (ed.), *Metaphysics and God* (London: Routledge, 2009). On the other hand, William Lane Craig rejects the view that 'there might be things, such as properties and numbers, which are causally unrelated to God as their Creator.' Craig says that 'Abstract objects have at most an insubstantial existence in the mind of the Logos,' adding, 'If a Christian theist is to be a Platonist, then, he must, it seems, embrace absolute creationism, the view that God has created all the abstract objects there are.' However, Craig himself resolves the conundrum by espousing nominalism and fictionalism, by judging Platonism to be false – so that those pesky abstract objects no longer exist and thus no longer undermine God's sovereignty. See William Lane Craig, *God and Abstract Objects: The Coherence of Theism: Aseity* (New York: Springer, 2017) and his more popular version, William Lane Craig, *God Over All: Divine Aseity and the Challenge of Platonism* (Oxford: Oxford University Press, 2018). Richard Swinburne argues that abstract objects, which seem to contradict his concept of God, are fictions; the only things that are true or false are human sentences

Cosmic visions are overwhelming, but I am sometimes preoccupied with another conundrum. How is it that we humans have such farsighted understanding after only a few thousand years of historical consciousness, only a few hundred years of effective science, and only a few decades of cosmological observations? Maybe it's still too early in the game. Maybe answers have been with us all along. This is a work in process and diverse contributions are needed.

Setting aside my taxonomy and consulting my gut, I come to only two kinds of answers. The first is that there can be no answer: Existence is a brute fact without explanation. The second is that at the primordial beginning, explanatorily and timelessly prior to time, some thing was self-existing. The essence of this something necessitated its existence such that non-existence to it would be as inherently impossible as physical immortality to us is factually impossible.

Various things or substances could conceivably contain this deeply centered self-existing essence, from the most fundamental meta-laws of physics to diverse kinds of consciousness, one of which could be God or something like god. Perhaps even these explanations are too mundane and bedrock is so bizarre that abstract objects or pure possibilities somehow harbor generative powers.

Why is there Something rather than Nothing? Why is there anything at all? Why Not Nothing? If you don't get dizzy, you really don't get it.

This is the mystery of existence and this is the foundation of *Closer To Truth*, our web resource and US public television series on cosmos, life, consciousness, and meaning.

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The Zero Project's working hypothesis is that to account for the 'otherwise inexplicable emergence of the mathematical zero in the historical record relatively recently,' the invention/discovery of zero may have been facilitated by the prior evolution of a sophisticated concept of Nothingness or Emptiness (as it is understood in non-European traditions); and conversely, inhibited by the absence of such a concept of Nothing, or an active aversion to it, in the West. While the Zero Project's working hypothesis is supported by a majority of the authors in this volume, I myself am 'passionately neutral.'

I am perennially skeptical of all 'just so stories' of untestable hypothesis, such as in evolutionary psychology. While I would find the philosophical nexus

(*Closer To Truth*). Also, Matthew Davidson, "God and Other Necessary Beings," *Stanford Encyclopedia of Philosophy* (Stanford, 2009).

between mathematical zero and philosophical Nothingness intellectually satisfying, my tastes are no substitute for definitive research.

So, this is my question, and my challenge, to the Zero Project: Where is the evidence that the philosophical Nothingness or Emptiness in the East was a precursor – or more challenging, a driver – of the mathematical zero that emerged? More specifically, what might such evidence to support this working hypothesis even look like? Moreover, how to falsify what I might consider the default, base case, that mathematical zero emerged via the less lofty midwife of, say, 'mathematical agriculture'?

No doubt, the concept of zero is both a critical event in intellectual history and a milestone in the development of mathematics, science, and technology. The exploration of zero's origin, culturally and linguistically as well as mathematically and philosophically, could elicit novel ideas and new ways of thinking. Thus, reversing the explanatory arrow of putative causation, could the broader philosophical significance of zero reveal transcendental ideas of Nothing, Emptiness, Void, Blank as features of reality to be apprehended and appreciated and perhaps applied to entirely new categories of thought? Indeed, as described above, 'Nothing' is a prime *Closer To Truth* leitmotiv and driving theme.[14]

Nothing also commands global fascination. Well over half of *Closer To Truth* audiences are outside of the US and it is satisfying to see viewers from across the globe, from dozens of diverse countries, engaging with the profound philosophical issues and implications of Nothing.

In this sense, the diverse, contemporary global interest in Nothing parallels the diverse, historical global development of zero. Zero is humanity's treasure, cutting across religions, regions, races, ethnicities, genders, ages, educational levels, income levels, and social class. Perhaps recognizing the broad origin and ubiquitous impact of zero can play a small part in catalyzing human harmony in a fractious world.

Closer To Truth co-creator and producer/director Peter Getzels and I are pleased to collaborate with the Zero Project, to provide our wholehearted endorsement, in bringing the origin and impact of zero to global audiences.[15] We will interview several of the contributors to this volume for a miniseries on the Zero Project to be streamed on the *Closer To Truth* website

14 See footnote 2.

15 'The Zero Project – International Conference/Workshop on Zero,' October 3, 2021, video, https://youtu.be/W59_tyUHfKo. Closer to Truth, 'Is Zero More Than Nothing? Introducing the Zero Project,' October 8, 2021, video, https://youtu.be/bUVN7E1wiBs.

(www.closertotruth.com) and *Closer To Truth* YouTube channel (over 580,000 subscribers as of August 2023).

The Zero Project is a tribute to the commitment of its board of trustees – 'Team 0,' as they like to call themselves – and to the vision of its founder and organizer, Peter Gobets, co-editor of this volume, whose ingenuity, insight, passion, and persistence transformed a phantasmal dream into reified reality – apropos, perhaps, of zero itself, from empty placeholder to axial number.

Our appreciation to the outstanding scholars and thinkers in this volume. Their interdisciplinary nature characterizes and distinguishes the thrust of this volume, and of the entire Zero Project, from prior explorations of zero.

The Zero Project is both for, and not for, Nothing.

Robert Lawrence Kuhn
Closer To Truth
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