From Physics to Metaphysics: A New Way

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Abstract: Brian Cox, at the end of his fifth episode in the 2021 BBC series *Universe*, says that big questions like, "why is there anything at all?" are scientific questions about nature. The paper challenges this form of naturalism by drawing on the work of V. J. Stenger, who derived virtually all the great laws of physics *L* from some physical knowledge and from a principle of point-of-view-invariance used by physicists in their enquiries. We will call this result *R*. The move from *R* to metaphysics is motivated by *R* having the oddity that *L*, operating from the Big Bang, are derivable from premises that include something that appears billions of years later, namely physicists using the above principle. The move is only justified if it can overcome two blockers: #1 that *R* is explicable wholly within the resources of the natural sciences; #2 that *R* is a brute fact. Either way, seeking a further explanation is not justified. I show these blockers logically cannot hold. Seeking a metaphysical explanation of *R* is therefore justified. It is shown that it is not unreasonable to conclude the universe is structured according to the laws of physics by God, the creator of the universe *ex nihilo*, in order that the universe be knowable through empirical enquiry, by embodied rational agents, using the principle of point-of-view-invariance.

Keywords: laws of physics; physicalism; point-of-view-invariance; *Universe* (2021 BBC series)

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Throughout my lecturing career, I have encountered several matters that make it difficult for many students to even grasp a Christian account of the scientific view of the universe. One is the sense that the Christian Bible is out of date for anyone with a scientific view of the world. Another is the problem of natural evil, that is, all the pain and death brought about by natural processes such as tsunamis, genetic disorders, the evolution of life on the planet, where such processes are supposedly created by a loving God. Another is the pervasive naturalism of modern culture. Naturalism is the doctrine that nature is all there is. Scientific naturalism says that nature answers to all the objects, relationships, and processes that are identified in the well-established natural sciences.[1] Finally, students would like, if not a proof of God, then, a sense that there are rational grounds for belief in God, especially given pervasive naturalism and the exciting and relentless expansion of the natural sciences, especially physics and cosmology. Our culture is saturated by the natural sciences, technology, and the free market economy. Many people absorb from this milieu the view that there is no purpose or moral order written into the universe, and nothing beyond the universe. Here I draw on what Charles Taylor calls the "immanent frame,"[2] meaning that many people envisage living a good life without any reference to anything transcendent, and get on living it.

In this paper I address two of these issues; pervasive naturalism, and the sought-after rational grounds for belief in God. Naturalism doesn't necessarily present itself in philosophical terms.[3] An example

1 E. B. Davis and R. Collins, "Scientific Naturalism," in G. B. Ferngren, *Science and Religion*: *A Historical Introduction* (Baltimore: John Hopkins University Press, 2002), 322.

2 C. Taylor, *A Secular Age* (Cambridge, MA: Belknap Press of Harvard University Press, 2007), 589. See also ibid., 548, 566.

3 The most philosophically developed form of scientific naturalism is physicalism. David Papineau, "The Rise of Physicalism," in *The Proper Ambition of Science*, ed. M. W. Stone and J. Wolfe (Routledge: London, 2000); David Stoljar, 'Physicalism', *Stanford Encyclopaedia of Philosophy* at http://plato.stanford.edu/entries/physicalism/ (2001); James Ladyman and Don Ross, *Everything Must Go: Metaphysics Naturalised* (Oxford University Press, 2007). As well as defenders of physicalism, there are its critics. C. Hemple, "Reduction: Ontological and Linguistic Facets," in *Essays in Honour of Ernst Nagel*, ed. S. Morgenbesser et al. (New York: St Martin's Press, 1970). See Papineau, "The Rise of Physicalism," 183

is the conclusion by Brian Cox in the last episode of his excellent BBC series, *Universe*. The first episode explores our cosmic origins examining how stars bring meaning to the universe. The second explores whether we are alone in the universe. The third tells how a new space mission has uncovered the history of the Milky Way. The fourth is about the super massive black hole at the centre of our galaxy. The fifth asks why we are here. This episode journeys back 13.8 billion years to the origin of the universe.

At the end of the fifth episode, Cox tells us four things. First, at some length he tells us that scientific enquiry is amazing, given the breadth, depth, and detail of its discoveries about our universe. As a crucial example, he highlights the cosmic microwave background radiation—the most ancient light in the universe. He also notes how much we have learned, though we are located on the tiny speck of our planet in this vast universe. Second, he identifies big questions like "why does anything exist?" and "why do we exist?" Cox grants that to many people these don't sound like questions for science. They are more like questions for philosophy and perhaps even theology. But, third, Cox thinks they *are* scientific questions because they are questions about nature, which we can only answer by looking outwards, beyond the stars, not by looking within ourselves. Fourth, as we engage the universe, we not only ask questions, but we also begin to find answers, by which he means scientific answers.

Cox's assurance that science can provide an answer to the big questions such as "why does anything exist?" is surprising. A couple of years ago, my atheist colleague Dr Kristian Camilleri and I were saying to a class in "God and the Natural Sciences" that if your question is "why is there anything at all?" science won't help you with an an-

for his response to Hemple. See also J. Haught, *Is Nature Enough? Meaning and Truth in the Age of Science* (Cambridge University Press, 2006); C. Cunningham, *Darwin's Pious Idea: Why the Ultra-Darwinists and Creationists both Get It Wrong* (Grand Rapids, MI: Eerdmans, 2010); S. Ames, "The Rise and Consequences of Scientific Naturalism," in *Anthropos in the Antipodes*, ed. R. Horner, P. McArdle, and D. Kirchhoffer (Melbourne: Mosaic Books, 2013); S. Ames, "Critique of Daniel Dennett's, *From Bacteria to Bach and Back: The Evolution of Minds*," *Journal of Bioscience & Bio Engineering* 3:1 (2022): 1–7.

swer. Straightaway a young man shot up his hand and said, "you mean science hasn't yet provided an answer." This second-year student was deeply into mathematics and physics. We affirmed the distinction he was making, but not its application in this case. Our claim was not based on a gap in scientific understanding, to be closed by further research. Our claim was based on the fact that any scientific answer necessarily draws on what already exists to do the explaining. Logically, it is unable to explain why there is anything at all. The student accepted this answer and even laughed. It is not a deep or complex point. Of course, we acknowledged that in making this point we were neither claiming nor denying that there is an answer to the question. Everyone knew that Kristian and I have different answers to that question. We left the question open for students to consider. Our point was simple, and it struck me that this student had reached second year university without this having been pointed out before. Doubtless he was not alone.

In what follows I accept Cox's views about where to *start* to seek answers to the big questions, namely the amazing breadth and success of scientific enquiry. This will lead to a critique of the pervasive naturalism of contemporary culture, but not by rehearsing the familiar discussions about physicalism, which shows the need of an ontology richer than that assumed by scientific naturalism. Instead, a new way to make the journey from physics to a richer metaphysics is presented, using the work of physicist and atheist Victor Stenger. In daily talk, people do not make recourse to metaphysics, they rather tell stories. But every story told (or play performed, or movie made) is set within some world and will carry indications of the *kind of world* it is in which the story unfolds. For the story, this is reality. Here, metaphysics is a worldview. It is an account of reality and perhaps some idea of how we know it.[4]

4 For a technical account of the meaning of metaphysics, see Neil Omerod, "Bernard Lonergan and the Recovery of a Metaphysical Frame," *Theological Studies* 74 (2013): 960–982. Ormerod (ibid., 963) returns to Aristotle's distinction between metaphysics as first philosophy and other "sciences" such as mathematics and physics. Cf. Aristotle, *Metaphysics* 4.1, 10003a24. See also J. Loux, *Metaphysics: A Contemporary Introduction* (Oxford: Clarendon, 1998).

In summary, my approach starts from the relentless expansion of the natural sciences and voices a disciplined speculation based on this very successful form of human enquiry. I will show that the speculation entails two unavoidable questions: "why is there anything at all?" and "why is what there is structured—and structured the way it is?" The evidence for this speculation comes from finding answers to these two questions, which support each other and survive strong challenges.

A Speculation

The speculation is based on three observations about human enquiry. First, any particular research in the natural sciences presupposes that what is being enquired into is intelligible and open to rational explanation, though without prejudice to the forms of intelligibility and the forms of rationality that may be called for. This presupposition is what gets enquiry going and keeps it going. Second, history shows the incessant character of human enquiry, especially the last 450 years of scientific research that continues providing explanations of more and more of the universe in completely natural terms. Third, human enquiry conducts itself and envisages itself as continuing. It does not envisage itself as coming to an end. Human enquiry begins from wonder and proceeds through the continuing eruption of questions on a quest for a true understanding of whatever it researches. The natural sciences powerfully exemplify this dynamic process. Even if institutions (secular or religious) suppress enquiry, questions continue to erupt!

Let us recognise these aspects of human enquiry by the speculation that "all there is, is fully intelligible." Of course, the speculation may lead nowhere—it might prove to be nonsense, or lack any interesting consequences, or there may be no evidence for it beyond the above motivation, and much against it.

Some clarifications are called for and some challenges are noted. Our speculation does not entail that everything is fully intelligible to us now. Human enquiry will never be faced with a brute fact for which there is no explanation. Furthermore, enquiry is not faced with an in-

finite regress of explanations of the way things are, for then the fully intelligible becomes unintelligible. There are at least three ways the proposition can be challenged. First, a direct challenge is the open ontological question, "Is all there is fully intelligible? After all, the universe may be a brute fact." But do we not risk falling into a gaps argument if we assert that something is a brute fact, when without a larger argument all we can mean is that we have not yet filled the gap in our explanation?

While this proposition does not entail that everything is fully intelligible to us now, it does lead us to expect there ought to be answers for at least the two big questions mentioned above: "why is there anything at all?" and "why is the universe structured—and structured the way it is?" The speculation that all there is is fully intelligible cannot be fulfilled if there is only an infinite regress of explanations. It can only be fulfilled if there is something that explains the existence of everything else, the very nature of which explains its existence, which is to say its existence does not depend on anything else, but rather it exists necessarily. This is the idea of God, the creator of all there is *ex nihilo*—that is to say, not from preexisting stuff.[5] Such a God would have complete understanding, including self-understanding and being self-explanatory. As Ward comments, "being self-explanatory, after all, does not entail that anyone else can understand the explanation, only

5 With some differences, here I am very much influenced by B. Lonergan, *Insight: A Study of Human Understanding*, ed. F. E. Crowe and R. M. Doran (Toronto: Lonergan Research Institute of Regis College and University of Toronto Press, 2000), chs 19–20; B. Lonergan, "The General Character of the Natural Theology of *Insight*," in *Philosophical and Theological Papers 1965–1980: Collected Works of Bernard Lonergan*, vol. 17, ed. R. C. Croken and R. M. Doran (Toronto: Lonergan Research Institute of Regis College and University of Toronto Press, 2004), 1–10; B. Lonergan, *Method in Theology* (New York: Herder and Herder, 1972), 101–103; R. Spitzer SJ, *The Soul's Upward Yearning: Clues to Our Transcendent Nature from Experience and Reason* (San Francisco: Ignatius Press, 2015), ch. 3 and Appendix 2; K. Ward, *Rational Theology and the Creativity of God* (Oxford: Basil Blackwell, 1982); K. Ward, "God as a Principle of Cosmological Explanation," in *Quantum Cosmology and The Laws of Nature*, ed. R. J. Russell, N. Murphy, and C. J. Isham (Vatican City State and Berkeley, CA: Vatican Observatory Publications and the Centre for Theology and the Natural Sciences, 1996), 247–262; K. Ward, "God as the Ultimate Information Principle," in *Information and the Nature of Reality: From Physics to Metaphysics*, ed. P. Davies and N. H. Gregersen (Cambridge University Press, 2010), 282–300.

that it exists."[6] Nor, I would add, does it entail that no one can ever come to understand the explanation. Lawrence Krauss concedes that if God is understood as the cause of all causes, then there is no regress of explanations.[7] Our argument understands God as the cause of all causes and will go on to address Krauss' further claim that there is no evidence for the idea of God.

Here is the beginning of an answer to the first question: "why is there anything at all?" It is a beginning of an answer given that, for example, the claim that God exists necessarily has been criticised on the grounds that a God existing necessarily cannot but act necessarily, including creating necessarily. This necessity excludes freedom from the act of creation and from what is created. This would contradict the freedom manifest in human living, including human enquiry. It would also contradict any idea of God creating freely. This well-known difficulty is noted by Ward[8] and Paul Davies.[9] The latter sees this as a fatal difficulty for the idea of God, citing Ward, but without considering Ward's extensive answer to this difficulty in the last chapter of his *Rational Theology*.

Help with this difficulty is also given by Peter Laughlin,[10] who discusses divine necessity and created contingence in Aquinas. A key point for Laughlin is what kind of necessity is meant when God is said to be necessary. For example, did Aquinas intend "logical necessity" when he spoke of God being necessary? Laughlin shows that this is not the case. The problem we are discussing comes from assuming "that if God is the first and necessary cause then there can be no contingent

6 Ward, *Rational Theology*, 8.

7 L. M. Krauss, *A Universe from Nothing: Why There is Something Rather Than Nothing* (New York: Free Press, 2012), 167, 170. Here, Krauss concedes that if God is understood as the cause of all causes, then there is no regress of explanations.

8 Ward, *Rational Theology*, 7–8.

9 P. Davies, *The Goldilocks Universe: Why is the Universe Just Right for Life?* (London: Allan Lane, 2006), 231; P. Davies, "Universe from Bit," in *Information and the Nature of Reality*, 66.

10 P. Laughlin, "Divine Necessity and Created Contingence in Aquinas," *The Heythrop Journal* (2009): 648–657. Laughlin's article is also highly influenced by Lonergan's work *Grace and Freedom* as a reading of Aquinas on these issues.

proximate causes and *ipso facto* there are no contingencies." The assumption is that whatever comes from, or is brought about by a necessary being, proceeds necessarily (so Neoplatonism). Laughlin argues this assumption is not a problem for Aquinas, for whom creation "is not logically necessary since the proposition 'God does not create' does not by itself entail a contradiction. Indeed, creation is not required by some ineluctable logic or by the nature of deity so that God could not have willed not to create." Rather, if it is open to God to choose between creating and not creating, once having created, it is no longer open to God not to create. "Whatever God wills, then, in the act of willing cannot be changed but God's will remains free to choose what it is that God will in fact will. The acts of God's will are thereby only conditionally necessary in this sense, they are not absolutely necessary for God."[11] Laughlin concludes by quoting Aquinas's point that no absolute necessity can be inferred from the divine will.[12]

Based on our speculation, an answer is also to be expected to the second question, "Why is the universe structured—and structured the way it is?" A reasoned answer is possible only when some idea of how the universe is structured is identified. Many will think of the laws of physics as at least part of the answer and so, in part, our question becomes, "Why is the universe structured according to the laws of physics?" An answer may be reached starting from the work of Victor J. Stenger.

Physics according to Stenger

V. J. Stenger, especially his 2006 book, *The Comprehensible Cosmos*,[13] derives the laws of physics for classical physics, relativistic physics (special and general), quantum mechanics, the standard theory of particle physics, and statistical mechanics.[14] The laws are well known. What is of interest for us here is in how he pursues the derivations.

11 Laughlin, "Divine Necessity," 654.
12 Laughlin, "Divine Necessity," 655.
13 V. J. Stenger, *The Comprehensible Universe: Where Do The Laws of Physics Come From?* (New York: Prometheus Books, 2006).
14 See the table of the basic laws of physics in Stenger, *The Comprehensible Universe*, 113–114.

Stenger starts by considering the kind of objectivity physicists seek in making models of reality. He illustrates this by contrasting the observations physicists make to observations from a subjective point of view, such as taking a photograph. "Instead, physicists seek *universality,* formulating their laws so that they apply widely and do not depend on the point of view of any particular observer. In that way, they can at least hope to approach an accurate representation of the objective reality that they assume lies beyond the perceptions of any single individual."[15] This claim is supported by a brief sketch of science's history of increasing objectivity from Galileo to Einstein. Here, objectivity means that what is observed is not dependent on the position or reference frame of the observer. "This does not mean that the Universe looks the same at every point of space and time." Rather, "while all phenomena may not look the same in detail, they can be modelled in terms of the same underlying principles."[16] Stenger's key idea is this: "Physics is formulated in such a way to assure, as best as possible, that it does not depend on any particular point of view or *reference frame*. This helps make possible, but does not guarantee, that physical models faithfully describe an objective reality, whatever that may be." He claims that when our models are the same for all points of view, "then the most important laws of physics, as we know them, appear *naturally*." A model "should be able to successfully describe in a repeatable, testable fashion a whole class of observations of the same general type; enable the predictions of other unexpected observations; and provide a framework for further applications, such as in technology or medicine."[17]

The key idea amounts to the principle of point-of-view invariance (hereafter, *PPOVI*): "*Point-of-view invariance:* The models of physics cannot depend on any particular point of view."[18] Stenger readily shows that this principle requires the description of reality as invariant to the translation of the origin of the spatial coordinate system (space-translation), the rotation of a spatial coordinate-system (space-rotation),

15 Stenger, *The Comprehensible Universe,* 15, 55, 65.
16 Stenger, *The Comprehensible Universe,* 56, 157–159.
17 Stenger, *The Comprehensible Universe,* 9, 10, 15.
18 Stenger, *The Comprehensible Universe,* 57.

and the translation of the origin of the time variable (time-translation). He also designates invariance as symmetry, for example a sphere is invariant under rotation about any axis.[19] Stenger shows that conservation of energy follows from time-translation invariance, conservation of linear momentum follows from space-translation invariance, and angular momentum is conserved by any space-rotation invariance. The conservation laws "are simple consequences of the symmetries of space and time," or, equivalently, "from point-of-view-invariance" using space and time as a framework for constructing models that have invariance under time-translation, space-translation, and space-rotation. Stenger asks:

> where does point-of-view invariance come from? It comes simply from the apparent existence of an objective reality—independent of its detailed structure. Indeed, the success of point-of-view invariance can be said to provide evidence for the existence of an objective reality . . . If we did not have an underlying objective reality, then we would not expect to be able to describe observations in a way that is independent of a reference frame.[20]

If symmetry is the star performer of twentieth century physics, "broken symmetries" are no less important. Stenger discusses symmetry violations, arguing broken symmetry is a fundamental fact about the universe.[21] He counts broken symmetries as a good thing, "at least from a human perspective. Without this complexity and diversity, the Universe would be a dull place indeed, and furthermore we would not be here to be bored by it."[22]

From *PPOVI* and other assumptions and principles (e.g., Noether's Theorem[23]), Stenger elegantly derives all the laws of classical, relativistic and quantum physics (Mathematical supplements A to G).

19 Stenger, *The Comprehensible Universe*, 57.
20 Stenger, *The Comprehensible Universe*, 187. In my opinion, this is a hint of metaphysical realism underlying *PPOVI*.
21 Stenger, *The Comprehensible Universe*, 97–106.
22 Stenger, *The Comprehensible Universe*, 102.
23 Stenger, *The Comprehensible Universe*, 58.

This is an impressive *tour de force*. Stenger is clear: "The principle of point-of-view-invariance . . . is an eminently testable, falsifiable principle. So far, it has not been falsified."[24] Nothing guarantees the agreement. The universe might have turned out to be otherwise.

Significantly, Stenger does not claim to derive *all* the laws of physics, such as the second law of thermodynamics, which says that the entropy of an isolated system must remain constant or increase with time. He points out that a broken vase does not reassemble itself. It is not a universal law of physics.[25] It holds at the macroscopic level, describing the average behaviour of systems of many particles, but not at the molecular level and below (atomic, nuclear, subnuclear).

This *PPOVI* concerns the models of reality physicists produce and are consistent with the kind of objectivity they seek. These models cannot depend on any particular point of view. The models are then to be tested empirically. This is a principle about model construction and testing. It is an epistemic principle, guiding physicists' enquiries into the universe. Physicists and their construction and testing of models are an essential presupposition of this principle. The principle does not specify any model, but rather governs the production of any model. Thus, this principle is not reducible to some actual model of reality that meets the requirement stated by the principle, for example a model possessing certain kinds of symmetry.

I accept Stenger's derivation of the laws of physics shown in his supplements A to G, and now want to draw conclusions from this part of his work. The derivations (not just the conclusions) may be gathered and represented as *R: PPOVI, AOA => L*. *AOA* stands for "all other assumptions" (e.g., about time, space, and matter), which Stenger uses in his arguments to derive the laws of fundamental physics *L*. The *L* are the conclusion to Stenger's argument, but *R* is needed to represent the whole argument. After all, these derivations are what are distinctive about Stenger's work. The derivations show that the fundamental laws

24 Stenger, *The Comprehensible Universe*, 161.
25 Stenger, *The Comprehensible Universe*, 21–22, 117.

of physics appear to conform to *PPOVI*. As noted, nothing guarantees the agreement. The universe might have turned out to be otherwise.

The subtitle of Stenger's book asks, *Where do the laws of physics come from?* The derivations already discussed do not answer this question, for they do not explain how the universe appears to have been operating according to these laws from the earliest moments after the Big Bang. To seek help on this subtitle, we turn to his account of the origin of the universe. Stenger's account of the universe's origin sums up physics with the view that the known symmetries are the low energy consequences of the breaking of high energy symmetries. The breaking of symmetries "could be dynamical, that is, the result of some 'lawful' higher process lying still undiscovered." More simply, symmetries could be broken spontaneously, "by a phase transition analogous to the breaking of symmetry when a magnet cools below the Curie point."[26] Symmetry breaking is a violation of *PPOVI*. It corresponds to a particular viewpoint being singled out. In the spontaneous symmetry breaking, the underlying model remains symmetric. Symmetry breaking does not contradict the idea of *PPOVI*.

Exactly what that higher symmetry is still has to be discovered. *PPOVI* simply requires symmetry without specifying any particular symmetry group. Stenger's view is that empirical and theoretical indicators show that supersymmetry (invariance under transformations between bosons and fermions) will likely be part of any future unified model.

Stenger rejects the suggestion that the fine tuning of physical constants for life is the result of an external natural causal agent or "some agency beyond nature" designating a particular set of constants.[27] Nor does he follow physicists who believe that the parameters currently determined by experiment will eventually be derived from some set of basic principles. "It seems highly improbable, however, that any purely natural set of principles would be so intimately connected to the biological structures that happened to evolve on our particular planet." In his view it is more likely that life evolved in response

26 Stenger, *The Comprehensible Universe*, 166.
27 Stenger, *The Comprehensible Universe*, 168.

to the physical parameters characterising our universe. Spontaneous symmetry breaking would mean the values of the constants arose by accident. "If we had an ensemble of universes, then the parameter values in our Universe arose from a random distribution—with no external, causal agent designating one particular set." Stenger's view is that the "observable universe, in fact, looks just as it would be expected to look in the absence of any such agent. The laws of physics are . . . 'lawless laws' that do not arise from any plan but from the very lack of a plan. They are the laws of the void."[28]

By *void*, Stenger means a vacuum that has zero vacuum energy. Various possible ways of thinking about zero energy are considered, viz., super-symmetric vacuum: negative energy solutions for the energy field. The issue is "how to get matter from a symmetric void."[29] Stenger appears to offer two answers, which I will not discuss here, in terms of quantum tunnelling and of the collapse of the symmetric void.[30] While I have questions about these answers, I will show that my larger argument has no need to resolve these and other possibilities, including a multiverse. I can happily wait upon these matters to be resolved scientifically.

Moving from Physics to Metaphysics: Can the Move Be Justified?

The Motivation

The theme of this paper is the move from physics to metaphysics and so the motivation for this move is sought from within physics. Previously, the motivation for espousing scientific naturalism was the expanding success of scientific explanations, the basis for a positive induction that every question about our universe will be similarly answered. Here it

28 Stenger, *The Comprehensible Universe*, 169.
29 Stenger, *The Comprehensible Universe*, 148.
30 Stenger, *The Comprehensible Universe*, 150, 170.

is found in Stenger's derivations of the form of the laws of physics *L*, which may be summarised as *R*: *PPOVI, AOA => L*.

There is an apparent oddity in *R*. The *L*, operating since very soon after the Big Bang, is explained in terms of *PPOVI* which refers to a principle used by enquirers that only show up billions of years later. This seems odd and leads to the question: is *R* true of the *L* and so true of the *L* operating from the earliest moments after the Big Bang? *PPOVI* yields laws that hold for all viewpoints and reference frames, including those located soon after the Big Bang. If we answer affirmatively, then we may wonder how does it come about that the *L* operating from the earliest moments after the Big Bang are derivable from premises that nontrivially include *PPOVI*, which refers to physicists conducting their enquiries billions of years later?

From a different angle, anyone working from a strongly naturalistic standpoint may be skeptical about this question, not giving it much weight and certainly not allowing anything to be built on a mere question. This skepticism would aim to show how *R* can be explained wholly within the resources of the natural sciences and physics in particular.[31] After all, *R* has been obtained using these resources. If the oddity of *R* is only apparent, explicable after all in terms of the resources of the natural sciences, there would then be no justification for seeking a metaphysical explanation of *R*. Call this, blocker #1. Also, if it were reasonable to interpret *R* as a brute fact and therefore without further explanation, there would be no justification for seeking a metaphysical explanation of *R*. Call this, blocker #2. It can be shown that the resources of the natural sciences are logically unable to explain *R*. Blocker #1 is defeated. It can be shown that, logically, it is unreasonable to treat *R* as a brute fact. Blocker #2 also is defeated.

31 E. Carlson and E. J. Olsson, "Is Our Existence in Need of Further Explanation?" *Enquiry* 41:3 (1998): 255–275.

How Blockers #1 and #2 Are Defeated

Blocker #1 seeks a physical theory T_{phys} that explains R. In brief, a physical theory T_{phys} is:

- a "blind" causal explanation of physical events and processes; "blind" means no final causes, goals, purposes built in;
- the causal explanation is described mathematically and aims to derive a mathematical description of what is to be explained;
- open to empirical testing.

Blocker #1 would be T_{phys} => *R*. A series of problems are foreseeable:

- *R* is the wrong kind of explanandum for any T_{phys}
- *R* is a rational inference. It stands in the logical space of reasons, not in the very different logical space of subsumption under natural laws.[32]
- Logically, *R* can never be obtained from any T_{phys} (as defined).
- T_{phys} has to provide *PPOVI* for the derivation of *R* to succeed.
- If T_{phys} includes *PPOVI*, then T_{phys} is not "blind." *PPOVI* is about physicists pursuing valued epistemic ends guided by *PPOVI* in some universe, which T_{phys} at least in this way envisages.
- Can T_{phys} lead to *PPOVI*?
- No. Physics alone cannot do this; it took the evolving processes of the 13.7-billion-year-old universe (physical, chemical, biological, and cultural) to bring about the existence of enquirers guided by *PPOVI*.

Conclusion: Any physical theory (so construed) logically cannot explain *R*. Blocker #1 fails.

32 W. Sellars, "Empiricism and the Philosophy of Mind," in *The Foundations of Science and the Concepts of Psychology and Psychoanalysis*, ed. H. Feigl and M. Scriven (University of Minnesota Press, 1956), 253–329; J. McDowell, "Naturalism in the Philosophy of Mind," in *Naturalism in Question*, ed. M. De Caro and D. Macarthur (Harvard University Press, 2004), 91–105.

Blocker #2 claims it is reasonable to treat *R* as a brute fact about the universe. Consider the following argument concerning *R*:

- If no scientific or nonscientific explanation of *R* is possible, *R* is a brute fact.
- No scientific theory can explain *R*.
- No nonscientific explanation of *R* is possible.
- Therefore, *R* is a brute fact.

The argument is valid. But if we reject the conclusion, as stated in the final dot point, which of the three preceding premises will we reject?

- *R* established above.
- Says what is meant by a brute fact.
- This is the failure of blocker #1.
- Says that there is nothing outside or beyond what the natural sciences can tell us, that can explain *R*.

How shall we assess this last point? An initial question is how do we know that no non-scientific theory can explain *R*? That would be the case only if we assumed scientific naturalism with its methodological, epistemic, and metaphysical theses. The latter says that all there is is what physics says there is, or complex configurations of the same. But with *R* we are concerned with something that scientific theories logically cannot explain, something beyond the scope of scientific theories.

PPOVI is obtained initially quite independently of knowing the evolutionary cosmology of the 13.7-billion-year-old universe. It is obtained by rational enquirers, with certain aims and some general beliefs about rationality and about how the world operates deciding what standards rationally ought to be met by actions directed to achieve valued epistemic ends. Analogous considerations have their place in practical actions like shooting an arrow from a bow to hit a target. We know about rationality because human beings instantiate rationality,

whereby they think and act for various reasons, but this is known independently of how the origins of that instantiation might be explained.

This is one argument for thinking of *PPOVI* as something beyond the theories of natural science, yet *PPOVI* is nontrivially involved in explaining the form of the laws of fundamental physics *L*, as shown in *R*. This provides rational grounds for wondering if something beyond the natural sciences might explain *R*. But the penultimate dot point would lead us to expect any such explanation to be impossible. Hence the last dot point should be set aside as unreasonable. Therefore, the last dot point does not follow, and we reasonably set aside the claim that *R* is a brute fact. Note that this result is not based on Leibniz' principle of sufficient reason. Blockers #1 and #2 fail. We are therefore justified in seeking further—beyond the resources of the natural sciences and physics in particular—a metaphysical explanation of *R*, including the oddity in *R*.

A Metaphysical Explanation of R

Seeking such an explanation is guided by the question, "What must minimally be assumed to hold to explain *R*?"

Any explanation of *R* must provide *PPOVI*. Whatever provides *PPOVI* is something that has language, that has access to the logical space of reasons, and thereby logic and mathematics, and it knows about intentionality—*PPOVI* assumes embodied rational agents (humans or aliens) in a universe (whether our universe only or within a multiverse) pursuing valued epistemic ends concerning that universe.

These are very good grounds for saying that *only* something capable of rational thought can provide *PPOVI*. This "something" should be thought of as some kind of rational agent, "*RA*." A rational agent must be assumed because thought alone is not enough to explain the existence of any universe or multiverse however conceived. To explain how *R* holds for our universe, we must assume that *RA* envisages a universe at least for which *R* holds, as in the preceding paragraph. That is, we must minimally think of *RA* envisaging a universe at least operating

according to *L* and for which *AOA* holds, for which *PPOVI* also holds, and that the universe so envisaged eventually produces embodied rational agents capable of pursuing valued epistemic ends guided by *PPOVI*.

We may properly treat this as the end/purpose *RA* envisages for this universe. This *purposive* explanation arises from within the argument rather than being imposed. (This purposive explanation at least invites the question of whether this end may be included in any larger end *RA* possibly envisages for this universe.) For *R* to be true of an existing universe, *RA* must also be understood as somehow bringing about this envisaged, but so far in this argument, not existing universe. Meeting this requirement would allow the developing explanation to be an answer to the question: Why is the universe structured and structured according to the laws of physics?

If the argument from Stenger's work to this point was all we had to go on, a Kantian note would be that the most we could claim would be that *RA* is the architect of the envisaged universe, to be produced from some pre-existing stuff. We began the argument, however, from a speculation starting from the observation that human enquiry presupposes that what is being enquired into is intelligible and open to rational explanation, but without prejudice to the forms of intelligibility and rationality that may be called for. Based on the relentless expansion of human enquiry that is apparently unending, the speculation generalises that presupposition by assuming that all there is, is fully intelligible. That generalised presupposition blocked the idea of an infinite regress of explanations of the universe and the idea of the universe being a brute fact. The generalised presupposition entailed the expectation of answers to two unavoidable questions: "why is there anything at all?" and "why is the universe structured—and structured the way it is?" Based on Stenger's work, we have the beginning of an answer to the second question. This supports the generalised presupposition and therewith the first question. Earlier we found the beginning of an answer to the first question by arguing to the idea of God, the creator of all there is *ex nihilo*—that is to say, not from preexisting stuff. Should we think that God creates *RA* or identify God as *RA*? If the

first, then God must at least already have all the characteristics of *RA,* allowing us to identify God as *RA*. This is the simplest explanation of Stenger's result *R*.

We may conclude that God the creator of the universe *ex nihilo* has structured the universe (at least) in term of the laws of physics in order that the universe be knowable by embodied rational agents (human or alien) though empirical enquiry guided by *PPOVI*.

Discussion

The paper presents a new way of proceeding from physics to metaphysics, largely drawing on a speculation about the universe, based on: the relentlessly expanding success of the natural sciences; the observation that any scientific enquiry presupposes that what is enquired into is intelligible and open to rational explanation; and Stenger's derivation of the laws of physics from premises that include *PPOVI*. Stenger's result has an oddity that the laws of physics operating in the universe including from the earliest moments after the Big Bang are derived from premises that include *PPOVI,* an assumption about what only shows up billions of years later. The oddity could be tested and refuted by showing it can be explained entirely within the resources of physics. It is shown that this testing fails in principle. This critique of scientific naturalism is independent of other criticisms in circulation (see n. 3), and so contributes something new to the literature on scientific naturalism and physicalism in particular.

Generalising the presupposition of human enquiry led to having to face the questions "why is there anything at all?" and "why is the universe structured—and structured the way it is?" Answering the second question began by noting that the laws of physics must surely count as partly identifying how the universe is structured. Drawing on Stenger's work, the argument led to the conclusion that the laws of physics are the way they are in order that the universe be knowable by embodied rational agents conducting empirical enquiries in the light of *PPOVI*. This leads to the expectation of other laws or other ways the universe

is structured to bring such embodied agents into existence, and this may be pursued for example together with Daniel Dennett[33] and Paul Davies.[34] This line of thought leads to the expectation of a solution to the hard problem of consciousness, which may be pursued, for example, in conversation with Robert Spitzer[35] and Daniel A. Helminiak,[36] concerning proposed solutions to this problem.

Challenges, Strengths, and Limitations of This Argument

Two important challenges have been raised in discussions. The first claims that my use of *PPOVI* represents a category mistake, because *PPOVI* is a methodological principle guiding research not an ontological principle, making ontological proposals. This claim is correct and concurs with Stenger's thought that if "the models of physicists can be used to successfully describe previous observations and predict future ones, then we can use them without getting into metaphysical questions."[37] It turns out, however, that *PPOVI* can lead to ontological consequences for anyone embracing scientific naturalism. This is shown in my discussion of blockers #1 and #2. The challenge does not attend to this argument justifying the move from physics to metaphysics. In my opinion, there is also a hint of metaphysics in Stenger's view of physicists as seeking "universality," or an "accurate representation of the objective reality that they assume lies beyond the perceptions of any single individual."

A second challenge is that there may be alternative approaches aiming to explain why the laws of physics are the way they are. If so, would Stenger's result be all that significant, when there may be other premises *X,* such that *X* => *L?* If this were the case, why build

33 D. Dennett, *From Bacteria to Bach and Back: The Evolution of Minds* (Allen Lane, 2017).

34 P. Davies, *The Demon in the Machine: How Hidden Webs of Information Are Solving the Mystery of Life* (Allen Lane, 2019).

35 Spitzer, *The Soul's Upward Yearning*, ch. 6.

36 D. A. Helminiak, *Brains, Consciousness and God: A Lonerganian Integration* (Albany: Suny Press, 2015), chs 4 and 5.

37 Stenger, *The Comprehensible Universe*, 8.

anything based on *R*? I accept this as a proper concern. The search for contenders for such an *X* is evident, for example, in the work of P. Davies[38] and Roberto M. Unger and Lee Smolin,[39] though with derivations only as promissory notes. On the other hand, B. Roy Frieden[40] has actually derived many of the laws of physics starting from Fisher information. This is the form of information introduced by R. A. Fisher at Cambridge, in the 1920s, who showed that Darwin's theory of evolution by natural selection and Mendel's genetics made sense statistically. Later, the mathematical form of what came to be called "Fisher information," in honour of Fisher's earlier research, showed up independently in the work of Harald L. Cramer[41] and C. Radhakrishna Rao.[42] They were theorising about how to measure a quantity that is subject to "noise" and so is fluctuating around some mean value θ. It is known as "classical measurement theory." Their celebrated result is the Cramer-Rao Inequality (*CRI*): $I\, e^2 \geq 1$, where e^2 is "the mean square

38 Davies, "Universe from Bit."

39 R. Unger and L. Smolin, *The Singular Universe and The Reality of Time* (Cambridge University Press, 2015).

40 B. R. Frieden, *Science from Fisher Information: A Unification* (Cambridge University Press, 2004); B. R. Frieden and A. G. Gatenby, eds, *Exploratory Data Analysis Using Fisher Information* (London: Springer Verlag, 2007). Frieden's work has been criticised by D. Lavis and R. Streater, "Physics from Fisher Information," *Studies in the History and Philosophy of Modern Physics* 33B:2 (2002): 327–343; for example, that his earlier derivation of quantum mechanics in effect assumed the De Broglie hypothesis. Frieden subsequently showed how the hypothesis can be derived from his "Fisher information" approach to physics. See B. R. Frieden and B. H. Soffer, "De Broglie's Wave Hypothesis from Fisher Information," *Physica A—Statistical Mechanics and Its Applications* 338:7 (2009). A senior physicist, T. Kibble, once required me to provide evidence, independent of Frieden, for thinking there was any fundamental connection between Fisher information and physics. I sent him the following paper which he had not known, but which he conceded that did indeed provide that evidence. S. L. Braunstein and C. M. Caves, "Statistical Distance and the Geometry of Quantum States," *Phys. Rev. Let.* 72:22 (1994): 3439–3443. These brief comments on Frieden's work are drawn from my (unpublished) PhD thesis at the University of Melbourne, 2005, "Cosmology and the Metaphysics of Enquiry: Towards a Non-Materialist Metaphysical Research Programme that Explains and Derives the Fundamental Laws of Nature."

41 H. L. Cramer, *Mathematical Methods of Statistics* (Princeton University Press, 1946).

42 C. R. Rao, "Information and Accuracy Attainable in the Estimation of Statistical Parameters," *Bull. Calcutta Math. Soc.* 37 (1945): 81–91.

error in the measurement-estimates of the fluctuating parameter" and *I* is the "Fisher information."

Of interest is that the approaches of Stenger and Frieden make human enquiry central to the derivation of the laws of physics. Stenger assumes reality exists independently of what human beings know about it and draws the conclusion that physicists' view of the universe cannot be dependent on a particular viewpoint. This is the basis of his *PPOVI*, central to his derivations of *L*. Frieden starts from classical measurement theory to determine the mean value of a fluctuating parameter. This argument is set within the space and time of classical physics. Frieden shows how this leads to "Fisher information" *I*, and the derivation of the Lorentz transformation, with the result that *I* is shown to be invariant and covariant under the Lorentz transformation. This provides a different basis for arriving at point of view invariance. Further comparison of the two approaches would highlight the role of Noether's theorem in Stenger's approach (see n. 17) and "Fisher information" which has the mathematical form of what is called an "action integral."[43] Stenger's result is summarised, *R: PPOVI, AOA => L*, where-

43 The mathematical form of Fisher information *I* is called an "action integral." It is natural in the sense that it follows logically from the assumptions from which the Cramer Rao inequality ($I\,e^2 \geq 1$) is derived. These assumptions concern the measurement of a parameter of a system undergoing fluctuations. The measurement proceeds by a probe particle fired at and interacting with the system to be measured. This happens under ideal epistemic conditions (e.g., no noise from the measurement system; see Frieden, *Science from Fisher Information*, 98). In this context and from other properties of Fisher information *I*, Frieden forms another action integral *K* characterising the measurement interaction. Frieden postulates that *K* has the property that an infinitesimal variation of *K*, denoted by δK, is zero, i.e., $\delta K = 0$. To put the matter briefly, $\delta K = 0$ allows Frieden to use the rich mathematical resources of Lagrangian Mechanics (so named after famous French mathematician Joseph-Louis Lagrange, 1736–1816). The use of these resources leads to second order differential equations of the kind we see in the laws of physics. This is the basis for Frieden's derivations of many of the laws of physics. The extremum principle $\delta K = 0$ is also a symmetry principle and so makes connections to Noether's Theorem mentioned earlier. See Frieden, *Science from Fisher Information*, 3 for an important comment on the use of Noether's Theorem. For standard texts on the physics and mathematics, see J. B. Marion and S. T. Thornton, *Classical Dynamics of Particles and Systems* (Fort Worth: Saunders College Publications, 1995), 214–217; H. Goldstein, *Classical Mechanics* (Massachusetts: Addison-Wesley, 1959), 37–38.

as Frieden's result may be summarised $R_F{:}E_F$, AOA_F => L, where E_F represents idealised parameter measurement, AOA_F stands for "all other assumptions," and the subscript F indicates Frieden's approach. That comparison will be for another time, as will comparing any other approaches to deriving the laws of physics, especially as they take account of dark matter and dark energy. A third challenge is based on studies examining whether physical constants vary over time.[44] Stenger's argument has basic physical constants invariant over time, which is still the standard view.

A limitation of the argument in its present stage refers to its theology as undeveloped in several ways. Philosophically, the idea of God entered the argument as an answer to the question "why is there anything at all?" Which is a thread in a larger canvas of natural theology for which I would especially commend Spitzer's *The Soul's Upward Yearning*. It is what allowed me to draw on Aquinas via the work of Laughlin's "Divine Necessity." Spitzer's argument would reframe the idea of God used here, just as it reframes the idea of God as the architect of the universe. This still larger idea of God would call us to engage questions such as what kind of world should we expect God to create.[45] Another limitation (and strength) refers to the fact that the argument leaves open an answer to how the universe was structured the way it is. Part of that answer will be given by physicists working on the physics of this question, and I wonder what theology might contribute. For example, my colleagues wanting to understand how God supposedly create all there is *ex nihilo*. Another limitation is that no appeal has been made to the Christian understanding of the vulnerable yet invincible triune God.[46] This is a methodological limitation because this is where I want to begin to engage those who do not share this or any understanding of

44 M. R. Wilczynski et al., "Four Direct Measurements of the Fine-Structure Constant 13 Billion Years Ago," *Science Advances* 6:17 (2020), DOI: 10.1126/sciadv.

45 S. Ames, "Why would God use evolution?" in *Darwin and Evolution in Interfaith Perspectives*, ed. J. Arnould (Adelaide: ATF Press, 2009), 105–126.

46 Among many works, see E. M. Conradie, *The Earth in God's Economy: Creation, Salvation and Consummation in Ecological Perspective* (Zurich: Lit Verlag, 2015).

God, who happily live and work within a naturalistic view of the world and its accompanying narrative.

A strength of the argument is that the conclusion is independent of whatever physicists finally conclude about a multiverse. A consequence of the multiverse idea in its various forms (though not its motivation) is a "Darwinian" style objection to any purposive account of why the universe is structured the way it is. That objection does not apply here since my argument does not depend on rejecting the multiverse idea. A purposive answer to why the universe is structured, and structured the way it is, is arrived at from within the argument, rather than being imposed. This purposive answer does not trouble nor is it troubled by Darwinism. It provides a purposive account of natural laws that undergird the operation of the universe including Darwinian evolution. It means the "Watchmaker" is not blind, though the full purpose of God in creation is not thereby revealed. Allow me to illustrate. The room where I am working is filled with "blind" processes that have been set in place for a range of purposes. This is also true of the blind processes in our universe. (We need to be careful about the inference from blind to purposeless.) The designers of my workspace had their immediate purpose and their ultimate purpose. Even if we could infer the former from the blind processes (back engineering), in order to know the latter we would need the designers to disclose or reveal their ultimate purpose. We have not yet considered any argument for the idea of God having any ultimate purpose, nor for God disclosing or revealing such a purpose for the created universe.[47]

Another strength is that the argument allows an answer to why empirical enquiry by embodied rational agents is so important that it is included within (part of) the purpose for which the universe is created by God. The question returns us to the earlier discussion. While God exists necessarily, but not with logical necessity, God freely creates all there is *ex nihilo*. The created world reflects this freedom. Therefore, pure thought alone will not be able to deduce the correct understanding

47 For an indication of such an argument see Ames, "Why would God use evolution?" 112, 116–122.

of the God-given, contingent processes of this universe. To approach that understanding, enquirers will have to investigate the particular processes with their senses. The above argument also leads us to think the created world will reflect the rationality of God, but without prejudice on the part of enquirers to the forms of intelligibility and rationality that might be called for in understanding the world; and, I would add, even more so to do with attempts to understand God. Therefore, enquiry into the universe must be sensory, intelligent, and rational. This goes some way towards characterising empirical inquiry. This argument leaves for another time an account of why God would be interested in such empirical inquiry taking place in this created universe.

Conclusion

This overall argument brings to light an account of divine purpose as immanent in the operation of the universe according to blind natural laws. This argument has nothing to do with Intelligent Design, Anthropic principles, Fine Tuning, nor the old argument *from* design. It is not a "gaps" argument, nor does it entail deism, and makes no use of Leibniz' principle of sufficient reason. It is unaffected by whatever turns out to be physicists' conclusion about the multiverse proposal. This is an argument from physics to metaphysics. It is metaphysics because it goes beyond physics to what physics does not enquire into. It is not a physical explanation, but an explanation of the physical in terms of the purpose for which the laws of physics are the way they are.

It is however a metaphysics of enquiry sustaining the principle of point-of-view invariance. Given its key result, it logically cannot conflict with empirical enquiry. This argument is certainly not a science stopper! It logically cannot inhibit either empirical or theoretical enquiry in physics or any other science. On the contrary, it strongly encourages the continuing exploration of both physics and metaphysics as deeply in accord with why the universe is the way it is.

Brian Cox rightly praises the scope and detail of our scientific knowledge of the … planet. While he acknowledges this contrast, the

contrast does not itself lead to any wondering about how this is possible. Presumably, this is because the scope of scientific methods of enquiry and the empirical vindication they offer is well known. The contrast between the speck and its vast context does lead to big questions, such as "why is there anything at all?" and "why are we here?" Cox takes these as questions about nature and as scientific questions, as if there are no other kinds of questions about nature. This paper offers an answer to these big questions, not a scientific answer, but a metaphysical one entirely friendly to the sciences.

Victor Stenger derived a great many of the great laws of physics, and the derivation entailed an oddity. This paper identifies and explains the oddity, after showing that the natural sciences logically could not explain it. Another way of stating the oddity is that the people telling the scientific story of the universe cannot be properly located within the story. Stenger also cited the famous statement of Einstein, that the most incomprehensible thing about the universe is that it is so comprehensible. This paper begins to indicate how we might make the stunning comprehensibility of the universe comprehensible.

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