

Space Philosophy: The Symmetry Hypothesis

By J. N. Nielsen

Abstract

The *terrestrial/extraterrestrial symmetry hypothesis* is introduced, according to which space travel changes nothing in respect to philosophy, implying that there is no distinctive space philosophy. Arguments for and against the symmetry hypothesis are explored, breaking down the question into the five branches of philosophy, metaphysics, epistemology, logic, aesthetics, and ethics. A possible way forward in the analysis of the symmetry hypothesis is suggested through a distinction between trivial and non-trivial philosophical ideas, such that change in trivial ideas is a merely contingent argument against the symmetry hypothesis, leaving philosophy essentially unchanged, while change in non-trivial philosophical ideas passes beyond the threshold of merely contingent change and makes space philosophy essentially different from terrestrial philosophy, in which case the symmetry hypothesis is essentially falsified. Potential directions for research into the symmetry hypothesis are suggested.

Keywords: Space philosophy, symmetry, space exploration, triviality, non-triviality, G. H. Hardy.

The Symmetry Hypothesis

Is there a justification for space philosophy as a distinct discipline? Does the fact of space travel, space exploration, and space science have any substantive bearing upon philosophical thought? Should there be a space philosophy that develops in the light of human space exploration experiences? Or, on the contrary, should philosophy recognize no distinct division of space philosophy, and should we therefore hold that space travel, space exploration, and space science have no relevance whatsoever to philosophy?

To examine these questions more closely, we formulate the *terrestrial/extraterrestrial symmetry hypothesis*, or simply the *symmetry hypothesis*, as a foil to the distinctiveness of space philosophy. The symmetry hypothesis maintains that there is a thorough-going symmetry between philosophical problems in a terrestrial context and philosophical problems in an extraterrestrial context. In short, according to the symmetry hypothesis, nothing is changed in philosophy by the advent of space travel; human life and the human condition in outer space remain philosophically symmetrical with human life and the human condition on Earth. Philosophical problems remain relevant as they were formulated prior to the advent of space travel, but nothing is added to, subtracted from, or altered within any philosophical problem, and no philosophical theory intended to resolve a philosophical problem needs to be expanded, narrowed, or altered as a result of space exploration.

If the symmetry hypothesis can be shown to be false, then space philosophy can be shown to be a distinct and justified discipline; if the symmetry hypothesis can be shown to be true, then space philosophy is no distinct discipline at all. In the latter case, we can posit a future in which philosophical research continues, and human beings who do in fact live and work in space contribute to the formulation and resolution of philosophical problems, but the fact that philosophers live and work in space is an irrelevant contingency with no bearing upon their philosophical research, so that if such contributions constitute a major advance in philosophy (or a major decline in philosophy), this advance (or this decline) is to be entirely attributed to the intellectual capacity of the individual philosophers, or to their intellectual milieu, and never to the distinctive life circumstances (i.e., extraterrestrial circumstances of living in outer space) of the individual philosopher, in contradistinction to the life circumstances of all philosophers to date, which have been exclusively terrestrial circumstances.

The symmetry hypothesis is a null hypothesis for space philosophy, and the possibility of confirming or disconfirming the symmetry hypothesis suggests in turn the possibility of a Type I error (rejection of a true null hypothesis; a false positive) or a Type II error (failure to reject a false null hypothesis; a false negative). The symmetry hypothesis incorrectly rejected would mean that space philosophy is *not* distinctive, though arguments purport to demonstrate its distinctiveness. For example, the human experience in space could be such as to disorient our abilities and falsely imply that something is changed by human experiences in outer space, e.g., by the Overview Effect,¹ when in fact nothing is changed. On the other hand, failure to reject a false symmetry hypothesis would mean that space philosophy *is* distinctive (or *ought* to be treated as a distinct discipline), though arguments purport to demonstrate its non-distinctiveness. For example, our inability explicitly to formulate a subtle and elusive difference between terrestrial experience and extraterrestrial experience (or between knowledge derived from terrestrial experience and knowledge acquired from extraterrestrial experience) could falsely imply that nothing is changed when in fact there is a change, but we are not capable of explicitly formulating or measurably quantifying that change.

Arguments For and Against

Perhaps the most obvious argument in favor of the symmetry thesis is the conception of the universe adopted in contemporary science, obtained by rejecting a two-tier universe in which conditions and laws are fundamentally different on Earth and in space. In Ptolemaic cosmology and its medieval elaborations, below the sphere of the Moon, the sublunary world operates according to one set of laws (objects move in straight lines and seek their lowest level), while above the sphere of the Moon, the

¹ Frank White, *The Overview Effect: Space Exploration and Human Evolution* (Boston: Houghton Mifflin, 1987).

superlunary world operates according to a different set of laws (objects move in circles and remain within their proper heavenly sphere).

If the cosmological principle is understood to entail that space is both homogeneous and isotropic, then spatial phenomena ought to be the same here (on Earth's surface) as there (in outer space), and it is the implicit adoption of the cosmological principle with the advent of the scientific revolution that is the death knell of Ptolemaic cosmology and the nativity of Copernican cosmology.

Experimentation in empirical science recognizes several symmetries—e.g., symmetry in space, symmetry in time—however, symmetry of scale generally fails to obtain.² An experimental apparatus constructed an order of magnitude larger, or an order of magnitude smaller, than the apparatus of a canonical experiment may not produce the same observational outcomes as the canonical experiment.³ The microscopic world must sometimes be explained according to different scientific theories than those that explain the macroscopic world, and vice versa. Yet an experiment performed in the Milky Way galaxy should give the same result as the same experiment performed in the Andromeda galaxy (translation in space), and an experiment performed today should give the same result as the same experiment performed a thousand years from now (translation in time).

What symmetries obtain, or fail to obtain, in philosophical ideas? Taking the traditional five branches of philosophy as the basis for the subdivision of the discipline, the symmetry hypothesis can be narrowed to more specific parameters, analogous to the symmetry parameters of space, time, acceleration, and scale in empirical science:

Metaphysical asymmetry obtains when metaphysical formulations (metaphysical problems and theories) of terrestrial philosophy do not coincide with metaphysical formulations of extraterrestrial philosophy.

Epistemological asymmetry obtains when epistemological formulations of terrestrial philosophy do not coincide with epistemological formulations of extraterrestrial philosophy.

Logical asymmetry obtains when logical formulations of terrestrial philosophy do not coincide with the logical formulations of extraterrestrial philosophy.

² Richard Feynman, *The Character of Physical Law* (Cambridge, MA: MIT Press, 1985).

³ Further elaboration of the scientific conception of symmetry can be found in Hermann Weyl, *Symmetry* (Princeton, NJ: Princeton University Press, 1952) and Eugene P. Wigner, *Symmetries and Reflections: Scientific Essays of Eugene P. Wigner* (Bloomington: Indiana University Press, 1967).

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Ethical asymmetry obtains when ethical formulations of terrestrial philosophy do not coincide with the ethical formulations of extraterrestrial philosophy.

In each case of the above permutations, symmetry is obtained when formulations of terrestrial and extraterrestrial philosophy precisely coincide, and asymmetry when they fail to coincide. In the former case, terrestrial philosophy can be taken whole and be applied unchanged to human life in outer space, and this displaced philosophy remains equally valid and relevant (or equally irrelevant) to human life, notwithstanding the changed context. Let us now frame some arguments for each of these symmetries:

Metaphysical symmetry argument: no terrestrial being placed in extraterrestrial space alters the metaphysical structure or cognition of the world—it does not rearrange the furniture of the world, adding to, subtracting from, or altering that ultimate furniture, nor does it add to, subtract from, or alter the joints at which nature is to be carved—but the spatial placement of actually existing objects is a paradigm of a contingent property with no metaphysical significance.

Epistemic symmetry argument: the same conditions that would be the ground of distinctive human experiences in outer space, from which distinctive forms of knowledge might be framed, are grounds upon which we should reject this experience as not being normative of the human condition, and therefore an insufficient ground for the formulation of novel knowledge.

Logical symmetry argument: following the epistemic symmetry argument above, if we ought to reject non-normative epistemic claims following from human experience in space, no novel forms of reasoning are called forth by novel forms of knowledge; knowledge remains invariant despite space exploration. Therefore, logic remains invariant with respect to human knowledge, even in light of space exploration.

Aesthetic symmetry argument: while novel experiences of natural beauty may follow from space exploration, we could only find these experiences beautiful (or ugly) on the basis of principles and judgments that are identical to our aesthetic principles and judgments in a terrestrial context. Without these invariant principles and judgments, we would not be able to

judge any of the natural beauties afforded by space exploration as beautiful (or ugly). Therefore, any claim of novel forms of beauty requiring novel aesthetic principles or judgments is self-defeating.

Ethical symmetry argument: parallel to the argument for aesthetics, any novel moral experiences that follow from space exploration could only be judged to be moral experiences on the basis of invariant moral principles and judgments derived from our terrestrial experience. Without these invariant moral principles and judgments, we would be unable to identify these novel experiences as being moral (or immoral). Therefore, any claim of novel forms of moral experience requiring novel moral principles or judgments is self-defeating.

If any of the above arguments are valid, the symmetry hypothesis is true in regard to that branch of philosophy. If any of the above arguments are invalid, the null hypothesis, here the symmetry hypothesis, is false, but we have taken it to be true on the basis of an invalid argument, which is then a false negative, constituting a Type II error.

Let us also frame a possible form of asymmetry for each of the above permutations:

Metaphysical asymmetry argument: insofar as human being is a form of being *simpliciter*, the presence of human being in outer space is a distinct metaphysical state-of-affairs that does not obtain in the absence of space travel. Therefore, space travel results in a novel metaphysical state of affairs, which can be formulated as a novel metaphysical theory.

Epistemic asymmetry argument: distinctive human experiences in outer space, such as the experience of zero gravity and microgravity, and the experience of the Overview Effect, are novel empirical states-of-affairs that can be formulated as human knowledge. Therefore, space travel results in novel epistemological outcomes.

Logical asymmetry argument: distinctive human experiences in outer space require novel forms of reasoning to be assimilated to the extant body of scientific knowledge. Therefore, space travel necessarily results in the introduction of novel principles of reasoning, and novel applications of existing principles of reasoning.

Aesthetic asymmetry argument: distinctive human aesthetic experiences in outer space expand the scope of the appreciation of natural beauty. Eventually, human works of art created in outer space will analogously expand the scope of artistic beauty. An expansion in the scope of aesthetics through the expansion of the possibilities of natural and artistic

beauty constitutes a qualitative change in the context of aesthetic principles and judgments, requiring novel interpretations of traditional aesthetic principles and judgments, or the introduction of new aesthetic principles and judgments.

Ethical asymmetry argument: parallel to the argument for aesthetics, distinctive human moral experiences in outer space expand the scope of human moral action. An expansion in the scope of moral action through the expansion of the possibilities of human action in outer space constitutes a qualitative change in the context of moral principles and judgments, requiring novel interpretations of traditional moral principles and judgments, or the introduction of new moral principles and judgments.

If any of the above arguments are valid, the symmetry hypothesis is false, at least in part. If, on the contrary, any of the above arguments are invalid, terrestrial/extraterrestrial symmetry obtains, at least in part. In this latter case, the null hypothesis, here the symmetry hypothesis, is true and we have rejected it (if only in part) on the basis of an invalid argument, which here constitutes a Type I error.

The arguments formulated above are not to be taken as definitive or exhaustive; the failure of any one argument does not demonstrate the indefensibility of a given aspect of symmetry or asymmetry, as other arguments could be adduced. These arguments are presented only as exhibits to illustrate some dimensions of the symmetry hypothesis, as narrowed to traditional branches of philosophy. This narrowed scope is intended to sharpen our focus on possible areas of asymmetry between terrestrial and extraterrestrial human experience, and the formalization of that experience in human knowledge.

While further elaboration of these arguments might afford an exploration of the problem posed by the symmetry hypothesis in greater detail, and a more detailed and comprehensive analysis might be necessary to map the precise symmetries and asymmetries between human terrestrial and extraterrestrial experience exhaustively (or to demonstrate an exhaustive symmetry that proves the symmetry hypothesis), none of these arguments appears definitive, and nor does a definitive argument present itself *prima facie* along with the formation of the problem of the symmetry hypothesis. One approach to the clarification of the symmetry hypothesis, and thus its confirmation or disconfirmation, may come about from just such an effort toward an exhaustive mapping. However, another approach may be possible.

A Possible Way Forward

Metaphysics has always sought a purely symmetrical account of the world, in the sense that a metaphysical theory ought to be invariant with respect to mere

contingencies, or even with respect to the “trivial and undignified objects” lacking the Forms that Plato has Socrates enumerate in the *Parmenides*,⁴ including hair, mud, and dirt.⁵ This metaphysical imperative to transcend the contingent and the trivial is complementary to the metaphysical pursuit of perfect generality and foundational depth in its formulations, which would seem to exclude the contingent and the trivial. An account of non-trivial philosophical ideas may provide a way forward in clarifying exactly what is at issue with the symmetry hypothesis.

While a precise or formal distinction between trivial and non-trivial philosophical ideas, presumably based on trivial and non-trivial experience, will probably elude us, we can appeal to an intuitive conception of non-triviality proposed by G. H. Hardy in *A Mathematician’s Apology*⁶ to distinguish trivial from non-trivial mathematics. Hardy considered trivial mathematics to be “repulsively ugly and intolerably dull,”⁷ but he did not stop at noting the “permanent aesthetic value”⁸ of non-trivial mathematics. For Hardy, pure mathematics consists of serious theorems that contain significant ideas. Significant mathematical ideas are characterized by generality and depth.⁹

Generality is further explicated in terms of being “a constituent in many mathematical constructs,” and “used in the proof of theorems of many different kinds.”¹⁰ Moreover, “The relations revealed by the proof should be such as connect many different mathematical ideas.”¹¹ Of depth Hardy says, “mathematical ideas are arranged somehow in strata, the ideas in which stratum being linked by a complex of relations both among themselves and with those above and below. The lower the stratum, the deeper (and in general the more difficult) the idea.”¹² Hardy also notes that the most beautiful theorems of pure mathematics exhibit “*unexpectedness*, combined with *inevitability* and *economy*.”¹³ The properties of unexpectedness, inevitability, and economy, however, are not given an (informal) exposition in his *Apology* as are the ideas of generality and depth.

The unexpected, we can observe, derives from fundamental connections not explicit at a superficial level, but which manifest themselves at a deeper level. For all practical purposes, this is the metaphysical distinction between appearance and reality. Hardy is

⁴ Plato, *The Collected Dialogues of Plato, Including the Letters*, ed. Edith Hamilton and Huntington Cairns (Princeton, NJ: Princeton University Press, 1985).

⁵ Plato, *Collected Dialogues*, 924.

⁶ G. H. Hardy, *A Mathematician’s Apology*, foreword by C. P. Snow (New York: Cambridge University Press, 1976).

⁷ Hardy, *A Mathematician’s Apology*, 140.

⁸ Hardy, *A Mathematician’s Apology*, 131.

⁹ Hardy, *A Mathematician’s Apology*, 103.

¹⁰ Hardy, *A Mathematician’s Apology*, 104.

¹¹ Hardy, *A Mathematician’s Apology*, 104.

¹² Hardy, *A Mathematician’s Apology*, 110.

¹³ Hardy, *A Mathematician’s Apology*, 113.

thus suggesting that trivial mathematics is the mathematics of appearances, while non-trivial mathematics is the mathematics of reality. Analogously, trivial philosophy can be understood as the philosophy of appearances, while non-trivial philosophy is the philosophy of reality, and it is metaphysical by definition. Reality (and any metaphysical account of reality) is here understood to be symmetrical with respect to all appearances, and thus invariant in respect to trivial matters.

Translating Hardy's conception of non-trivial mathematics into a conception of non-trivial philosophy is straightforward at this point: significant philosophical ideas are characterized by generality and depth, and the most beautiful philosophical ideas exhibit unexpectedness, inevitability, and economy. (One property that Hardy notably did *not* note as characterizing significant ideas is that of *simplicity*, but we will observe that simple ideas are often fundamental ideas, and that they often exhibit the properties that Hardy ascribed to the lowest stratum of ideas; a connection between the fundamental and the simple is assumed below.)

We may compare Hardy's conception of depth to Gödel's attempts throughout his later life to penetrate the principles that underlie the axioms of set theory. From a formal point of view, the axioms of set theory are foundational, but we know that there are many different axiom systems that can be adopted for the exposition and development of set theory. This implies that there are deeper principles that are manifested in all axiom systems of set theory, and it is from these deeper principles—the *reality* of set theory, rather than its mere appearance—that we derive the common understanding of all these axiom systems as all being concerned with set theory.

Gödel, like Hardy, struggled with formulating adequate intuitive conceptions of formal ideas. (In mathematics, as in logic, and indeed in philosophy, there is always a tension between intuition and formalization.) Gödel appealed to the works of Leibniz and Husserl in his attempts to clarify fundamental ideas in formal thought. Hao Wang recounts Gödel's efforts to formulate the underlying principles of set theory in *From Mathematics to Philosophy*¹⁴ and *A Logical Journey*.¹⁵ With Gödel and Hardy's attempt to elucidate the most fundamental stratum of mathematics, one is reminded of Kierkegaard's observation in his *Concluding Unscientific Postscript* of the relation of the wise man to simplicity:

When a servant-girl weds a day-laborer everything passes off quietly, but when a king weds a princess it becomes an event.... It is thus that the wise

¹⁴ Hao Wang, *From Mathematics to Philosophy* (London: Routledge & Kegan Paul, 1974), 189–90.

¹⁵ Hao Wang, *A Logical Journey: From Gödel to Philosophy* (Cambridge, MA: MIT Press, 1996), 280–81.

man is related to the simple. The more the wise man thinks about the simple ... the more difficult it becomes for him.¹⁶

Significant mathematical ideas and significant philosophical ideas share this character: the more we think of them, the more difficult they become. Significant philosophical ideas mark the work of philosophers whose ideas have been passed down to us by tradition: Plato, Aristotle, Descartes, Hume, Kant, and so on. We readily recognize them even if we cannot adequately define them.

Given the metaphysical imperative to pursue non-trivial formulations of generality and depth that exhibit unexpectedness, inevitability, and economy, the question for space philosophy is whether the translation of a philosophical problem from terrestrial circumstances to extraterrestrial circumstances fulfills or frustrates this metaphysical imperative. If human experience in space, and human knowledge formulated on the basis of this extraterrestrial experience, is unexpected, inevitable, and economical, then human experience in outer space is non-trivial, and its formulation as knowledge may be assumed to issue in greater epistemic generality and depth.

We have reason to believe that this is the case, in the same way that astrobiology is providing distinctive insights into biology, which, to date, as been terrestrial biology, but which is now being formulated in a cosmological context in astrobiology. Thus also human experience, once exclusively terrestrial experience, is now being formulated in a cosmological context, both as a result of the growth of scientific knowledge, that places human beings within the cosmos scientifically understood, and as a result of space exploration, which provides a perspective on the cosmos that is not available to terrestrial experience. These conditions provide distinctive insights into human experience, which, to date, has been a terrestrial experience, but which is now being expanded to incorporate extraterrestrial experience.

Once an astronaut has been launched into outer space, the acquisition of the perspective of outer space in *inevitable* (barring trivial objections such as the possibility of an accident upon launch); at least some aspects of the experience of space flight are *unexpected* (despite extensive training and preparation); how parsimony ought to be understood in this context is not immediately obvious, but insofar as human experience in outer space requires no special accommodation to be distinctive from terrestrial human experience, and is therefore *unexpected*, it can be identified as *economical*. From this unexpected, inevitable, and economical experience of outer space, its eventual formulation as human knowledge suggests greater generality and depth as human experience is enlarged in scope and scale, though the full realization of this promise will only come in the fullness of time.

¹⁶ Søren Kierkegaard, *Kierkegaard's Concluding Unscientific Postscript*, trans. David F. Swenson, completed by Walter Lowrie (Princeton, NJ: Princeton University Press, 1944), 143.

The Utility of the Symmetry Hypothesis

The symmetry hypothesis can be employed to probe for essential novelty in any philosophical domain related to space travel. In considering apparently new questions in philosophy of technology, philosophy of history, or philosophy of religion, *inter alia*, which may appear to be posed for the first time by the intersection of space exploration with technology, with history, or with religion, *inter alia*, we can pose the question in terms of the symmetry hypothesis in an attempt to determine from the outset whether the novelty of the question is as it appears to be.

The utility of the symmetry hypothesis is not limited to probing the philosophical possibilities of space exploration. In some respects, human life has changed very little or not at all since the speciation of *Homo sapiens* (or even before), while in other respects the human condition has changed beyond measure, and with each disruptive change to the human condition we can pose the symmetry hypothesis anew. Does any philosophical novelty result from the Neolithic Agricultural Revolution? The Industrial Revolution? The internet? Artificial intelligence?

The symmetry hypothesis recommends itself—and, in recommending itself, exhibits a kind of symmetry across disciplines—as a way to examine apparent novelty in human experience philosophically. When any new technology presents human beings with apparently novel philosophical questions, we can ask of that new technology whether it raises philosophical questions that are asymmetrical with respect to the philosophical tradition to date. Thus, with the many ethical dilemmas posed by novel biotechnologies—reproductive technology, gene editing, longevity, etc.—we can ask whether the *status quo ante* exhibits a symmetry with human life after the introduction of the technological innovation in question.

In part, the extrapolation of the symmetry hypothesis to technological changes in human life other than space exploration constitutes a thesis in the philosophy of technology, but it is possible to formulate a version of the symmetry hypothesis that is not due to technology: suppose that some mutation occurs in a human population that causes a bifurcation of humanity into two or more species. Two forms of humanity, two species of human beings (i.e., two species of the genus *Homo*), are the result, each capable of speech and reason. Each can ask itself whether the human condition before the speciation event was philosophically symmetrical with the human condition(s) after the speciation event. With human speciation merely postulated in this way, and without any biological details on a future human speciation, it cannot be said whether the symmetry thesis obtains or fails to obtain, and whether it does may depend upon the particular nature of any changes that attend a given human speciation event.

A Final Reflexive Observation

Looking at the symmetry hypothesis reflexively, we can see that, as formulated in terms of terrestrial/extraterrestrial symmetry, it is a distinctive problem of space

philosophy, and it seems to be non-trivial insofar as it is not easily dismissed (or non-trivially affirmed); i.e., it is neither intuitively nor *prima facie* true or false. If the symmetry hypothesis itself is non-trivial, then it demonstrates that at least one philosophical problem distinctive to space philosophy is non-trivial, which means that some part of space philosophy is a distinctive and justified discipline.

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Editors’ Notes: Returning to the *Journal of Space Philosophy* for the second time, independent scholar J. N. “Nick” Nielsen poses an existential challenge, suggesting that perhaps there is no such field as space philosophy after all—and thus that the continued publication of this journal might not be justified. In true academic fashion, Nielsen proceeds to argue multiple sides of the debate, before offering a way forward. Thankfully he concludes that our pursuits are non-trivial and provides a worthy addition to the literature ... and an exciting conclusion to this landmark issue of the JSP. **Mark Wagner and Gordon Arthur.**