

The Scientific Character of Philip Hefner’s “Created Co-Creator”

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Philip Hefner’s understanding of the human as a “created co-creator” has been formative for various accounts of theological anthropology, particularly as theologians consider the relationship between continuing creation and the eschatological future. Co-creation theologies have been instrumental in exploring the theological implications of emerging technologies that allow us to manipulate both human and non-human nature. Ted Peters, for example, builds on Hefner’s understanding of co-creation in his own articulation of future-oriented human freedom.¹ Ronald Cole-Turner, as well, highlights the co-creative agency of humans in his cautiously optimistic response to human genetic enhancement.²

Hefner’s “created co-creator” model is the product of a long history of interacting with natural scientists, and an interest in fostering dialogue between science (particularly evolutionary biology) and theological enquiry. Hefner is blunt in his assertion that “theology as explanation is dead unless it learns to integrate within itself elements of scientific understandings that undergird explanation for our time in history”.³ It is not surprising, therefore, that his account borrows much from scientific methodologies. Hefner adopts the scientific research programme structure developed by Hungarian philosopher of science Imre Lakatos.

At the heart of a Lakatosian research programme is the “hard core” — the basic idea. Generally the nature of the claims in the hard core means that it cannot be directly falsified or verified - it is “‘irrefutable’ by the methodological decision of its proponents”.⁴

1. Ted Peters, *Playing God? Genetic Determinism and Human Freedom*, 2nd (New York: Routledge, 2003), 125.

2. Ronald Cole-Turner, “Biotechnology and the Religion-Science Discussion,” in *The Oxford Handbook of Religion and Science*, ed. Philip Clayton (Oxford: Oxford University Press, 2008), 929–944, 942–943.

3. Philip Hefner, *The Human Factor: Evolution, Culture, Religion* (Minneapolis: Fortress Press, 1993), 219.

4. Imre Lakatos, *The Methodology of Scientific Research Programmes*, ed. John Worrall and Gregory Currie, vol. 1 (Cambridge: Cambridge University Press, 1978), 48.

Instead, these claims can be indirectly upheld or rejected through the testing of associated “auxiliary hypotheses”.⁵ These take the form of ‘observational’ hypotheses that are flexible with respect to observed anomalies; they can be adjusted in response to counter-instances and thus “bear the brunt of tests” in service to the hard core.⁶

A Lakatosian research programme articulates a set of methodological rules: the *negative heuristic* “tell us what paths of research to avoid” while the *positive heuristic* tell us “what paths to pursue”.⁷ In a bona fide research programme the auxiliary hypotheses must be formulated in accordance with the positive heuristic i.e. they must represent an increase of knowledge.⁸ The negative heuristic redirects the burden of proof away from the hard core to the “protective belt” of auxiliary hypotheses.⁹ These hypotheses can then be reformulated in response to falsifying data, while the hard core remains intact. As Nancey Murphy points out, a certain “dogmatism” is required for scientific progress - the negative heuristic allows space for a theory to be fully developed instead of prematurely discarded.¹⁰ The key evaluative criteria of a scientific proposal for Lakatos is its fruitfulness in generating new insights.¹¹ A research programme is eventually discarded if it is judged to be degenerative (i.e. no longer producing new ideas) and waning in influence rather than progressive.¹²

Hefner is not the only, or even the first, theologian to find the Lakatosian structure valuable for theological explanation. Early in her career, Murphy adopted a Lakatosian framework in areas of her work (and Hefner owes much to Murphy’s interpretation of Lakatos), however she later rejected Lakatos’ model in favour of Alasdair MacIntyre’s understanding of rationality.¹³ In a conversation in *Zygon: Journal of Science and Religion*, Wolfhart Pannenberg accepted Hefner’s application of a Lakatosian framework to Pannenberg’s own theological work.¹⁴ Robert Russell considers the work of Imre Lakatos to be of great value for theological thought, while Karl Peters, Philip Clayton and Gregory Peterson all engage with the model in their theological construction.¹⁵

5. Lakatos, *Methodology of Scientific Research Programmes*, 48.

6. *ibid.*, 48.

7. *ibid.*, 47.

8. *ibid.*, 95.

9. *ibid.*, 48.

10. Nancey Murphy, *Theology in an Age of Scientific Reasoning* (Ithaca, NY: Cornell University Press, 1990), 60.

11. (Lakatos, *Methodology of Scientific Research Programmes*, 52).

12. *ibid.*, 48.

13. Murphy, *Theology in an Age of Scientific Reasoning*; Nancey Murphy, “Wind and Spirit: A Theological Autobiography,” *Dialog* 46, no. 3 (2007), 306; Hefner, *The Human Factor*, 23.

14. Philip Hefner, “The Role of Science in Pannenberg’s Theological Thinking,” *Zygon* 24, no. 2 (1989), 146–148; Wolfhart Pannenberg, “Theological Appropriation of Scientific Understandings: Response to Hefner, Wicken, Eaves, and Tipler,” *Zygon* 24, no. 2 (1989), 258–259.

15. Robert Russell, “Cosmology from Alpha to Omega: Response to Reviews,” *Zygon* 45, no. 1 (2010), 238; Karl Peters, “Empirical Theology in Light of Science,” *Zygon* 27, no. 3 (1992); Philip Clayton,

Though Hefner acknowledges a lack of consensus concerning the falsifiability of theological ideas¹⁶, he nevertheless sets out to construct theological proposals within the parameters of a scientific research programme (i.e. he contends that potential falsifiers and permissible conditions can be identified with respect to the claims he places in the hard core).¹⁷ Furthermore, the theological task requires that “theological statements will be used in theory-construction that conforms to the criteria of falsifiability and fruitfulness”.¹⁸ The current objective is to examine the “fit” of Hefner’s “created co-creator” model within the structure of a Lakatosian research programme, and whether he achieves the stated objective of articulating his theological claims in the form of hypotheses subject to scientific falsification. Though Lakatos’ model has been widely criticised, the focus here will not be on the validity of the model itself as an explanation of scientific knowledge acquisition.¹⁹ Instead, Hefner’s claims will be considered with respect to their scientific character more generally. As Hefner insists that the protective belt of hypotheses are empirically testable, the scientific testability and evidential support for each hypothesis will be evaluated. Though Hefner often uses the term “science” in generic ways, the scope here will largely concern insights from evolutionary biology and evolutionary psychology in particular (and climatology to a lesser extent) as most relevant to Hefner’s claims.

Hefner’s oft-cited summary statement on the subject of the “created co-creator” actually functions as the hard core of his proposal within the Lakatosian framework.

Human beings are God’s created co-creators whose purpose is to be the agency, acting in freedom, to birth the future that is most wholesome for the nature that has birthed us – the nature that is not only our own genetic heritage, but also the entire human community and the evolutionary and ecological reality in which and to which we belong. Exercising this agency is said to be God’s will for humans.²⁰

Having provided this empirical description of human nature, Hefner proceeds to articulate a theological theory within a Lakatosian framework that aims to explain the

Explanation from Physics to Theology: An Essay in Rationality and Religion (New Haven: Yale University Press, 1989); Gregory Peterson, “The Scientific Status of Theology: Imre Lakatos, Method and Demarcation,” *Perspectives in Science and Christian Faith* 50 (1988).

16. Hefner, *The Human Factor*, 25.

17. *ibid.*, 25.

18. Philip Hefner, “Theology’s Truth and Scientific Formulation,” *Zygon* 23, no. 1 (1988), 268.

19. Several major criticisms of Lakatos are provided by Paul Feyerabend, “Consolations for the Specialist,” in *Criticism and the Growth of Knowledge*, ed. Imre Lakatos and Alan Musgrave (Cambridge: Cambridge University Press, 1970), 197–230, 125; Thomas Kuhn, “Logic of Discovery or Psychology of Research?,” in *Criticism and the Growth of Knowledge*, ed. Imre Lakatos and Alan Musgrave (Amsterdam: North-Holland Publishing Co., 1970), 1–24, 143; A. F. Chalmers, *What Is This Thing Called Science?*, 2nd ed. (Milton Keynes: Open University Press, 1982), 125; Alan Musgrave, “Method or Madness? Can the Methodology of Research Programmes Be Rescued from Epistemological Anarchism?,” in *Essays in Memory of Imre Lakatos*, ed. Paul Feyerabend, Robert Cohen, and Marx Wartofsky (Dordrecht: D. Reidel Publishing Company, 1976), 458–491, 457;

20. Hefner, *The Human Factor*, 27.

empirical description and form part of the normative grammar of Christian faith.²¹ Building on this core claim, he elaborates on the “theological theory” by breaking down its essential aspects into “core elements” and identifying various “auxiliary hypotheses” associated with each that can be tested for their fruitfulness and thus support the core of his proposal.

Core Element 1

The first “core element” is as follows: “The human being is created by God to be a co-creator in the creation that God has brought into being and for which God has purposes.”²² He summarises this in the more recognised term “created co-creator.” The adjective “created” denotes the “conditionedness” of human beings, both as located within an ecosystem and as recipients of a genetic nature that is bestowed on the individual rather than chosen. Humans did not place themselves within the evolutionary process, thus are not superior to any other creatures within the same ecosystem.²³ Rather, humans are characterised by a sense of belonging among all creatures.²⁴

“Co-creator”, on the other hand, emphasises the freedom of humans to make decisions and construct contextualising narratives in which these decisions are made.²⁵ Hefner considers co-creation a distinctive quality of humans, though he warns against its application in service to anthropocentric ends.²⁶ Yet the co-creator remains contingent on God as creator and is creative in a derivative sense.²⁷

This brings us to the auxiliary hypotheses that Hefner assigns to the understanding of humans as “created co-creators”. The first of these concerns teleonomy, the apparent purposefulness of various structures and processes in biological systems (unlike ‘teleology’, teleonomy does not ascribe purposefulness to human or divine intent). While Hefner believes that *teleological* claims about nature can only be asserted on the basis of faith, *teleonomic* responses to certain biological structures and processes can be discerned empirically.²⁸ He argues for a teleonomic axiom that hypothesises the purpose and meaning of something based on its structure.²⁹ Theologically, Hefner argues for a

21. Hefner, *The Human Factor*, 32.

22. *ibid.*, 35.

23. *ibid.*, 36.

24. Philip Hefner, “The Foundations of Belonging in a Christian Worldview,” in *Belonging and Alienation: Religious Foundations for the Human Future*, ed. Philip Hefner and Widick Schroeder (Chicago, IL: Centre for the Scientific Study of Religion, 1976), 161–180, 163.

25. Hefner, *The Human Factor*, 38.

26. *ibid.*, 38–39.

27. *ibid.*, 39.

28. *ibid.*, 39.

29. *ibid.*, 40.

version of natural law theology by grounding this teleonomic axiom in God’s creative action.³⁰ Both naturalistic and theological perspectives “would conclude that nature is all we possess as the chief source for understanding what the world is about”.³¹ He formulates the testable hypothesis as follows:

Hypothesis 1

Integral to *Homo sapiens* and its evolutionary history are certain structures and processes, the requirements for whose functioning may be said to constitute, at least in a tentative way, goals and purposes for human life.³²

Hefner preempts challenges to this hypothesis on the basis of the naturalistic fallacy, arguing that the teleonomic axiom does not involve crass, unreflective moves from is to ought, but rather speaks in tentative and careful ways of both the possibility and the necessity to make such moves.³³ According to Hefner, this hypothesis is testable in the same way that all descriptions of structures and processes can be evaluated for their accuracy and adequacy.³⁴ Hefner argues that the meaning and purpose of creatures must be continuous with the equipment they are endowed with.³⁵ Humans are equipped with “self-awareness, decision-making, action, and self-assessment based on the reception of complex feedbacks” – Hefner argues that this natural equipment is a good fit for the purpose of the created co-creator.³⁶ It is this fit that can be subjected to testing. Hefner speaks in terms of kinship, citing nucleotide sequence comparisons and comparative morphological studies as evidence for human continuity with processes applicable to the “whole of nature”.³⁷ He presents the ecological model as empirical support for the natural structures in which humans live.³⁸

There are plenty of scientific studies to support the continuity of human morphology with that of other species. Until it was superseded by molecular analyses, comparative morphology (comparing observable characteristics between species) was the major tool underpinning the construction of phylogenies (branched diagrammes representing the order in which a groups of species share a common ancestor).³⁹ Entire “trees of life” are built through the identification of homologous structures in two separate species that

30. Hefner, *The Human Factor*, 40.

31. *ibid.*, 40.

32. *ibid.*, 40.

33. *ibid.*, 58.

34. *ibid.*, 41.

35. *ibid.*, 59.

36. *ibid.*, 58-59.

37. *ibid.*, 65.

38. *ibid.*

39. Mark Ridley, *Evolution*, 3rd ed., 425 (Oxford: Blackwell Publishers, 2004).

are derived from a common ancestor. Advances in molecular analyses have only added to what was already inferred from the cruder morphological comparisons.⁴⁰

The notion that structure in some way implies function is also well attested in scientific thought. In molecular biology, for example, functional protein studies infer information about the putative function of a protein based on structural elements and the underlying DNA sequence. Among its many applications, this principle underpins the prediction of transmembrane proteins through the identification of coding regions for hydrophilic protein segments (i.e segments able to cross a membrane) using the entire genome sequence of an organism.⁴¹ As many similar examples could be offered, Hefner can reasonably claim that this first hypothesis receives some support from available scientific evidence.

Yet there is a difference between inferring function from structure and Hefner's more ambitious claim that purposes and goals can be constituted by natural structures and processes. Scientists would generally balk at extrapolating a larger purpose or goal from the structure of an organism. The debate surrounding teleology in the natural sciences was well underway at the time of Hefner's writing, and continues today. An exploration of this debate is beyond the current scope, however Luisi provides a helpful summary.⁴²

While Hefner does use the term "teleonomy" in place of teleology, it is questionable whether the function of "created co-creator" can be extrapolated from teleonomic notions alone. Some would argue that all uses of the term teleonomy are thinly-veiled teleological statements. There are sustained attempts to reconcile contemporary science with the notion of teleology, such as Terrence Deacon's account of emergence that rejects substance dualism in favour of property dualism.⁴³ While Hefner's choice to use teleonomic language is certainly more palatable to many scientists, the validity of defining the human as co-creator on this basis is debatable. Therefore, while parts of this hypothesis are supported by scientific conclusions, in its entirety it makes claims potentially beyond the reach of scientific discovery.

Hefner's second auxiliary hypothesis is closely related to the first:

40. A good summary of these developments can be found in Jaume Bertranpetit and Francesc Calafell, "Genome Views on Human Evolution," in *Evolution: From Molecules to Ecosystems*, ed. Andrés Moya and Enrique Font (Oxford: Oxford University Press, 2004), 260–271.

41. Anders Krogh et al., "Predicting Transmembrane Protein Topology with a Hidden Markov Model: Application to Complete Genomes," *Journal of Molecular Biology* 305 (2001).

42. Pier Luigi Luisi, *The Emergence of Life: From Chemical Origins to Synthetic Biology*, 244 (Cambridge: Cambridge University Press, 2016).

43. Terrence Deacon, *Incomplete Nature: How Mind Emerged from Matter* (New York, NY: Norton, 2012).

Hypothesis 2

The meaning and purpose of human beings are conceived in terms of their placement within natural processes and their contribution to those same processes.⁴⁴

Nature is the “progenitor” of *Homo sapiens* and thus gives insight into human purpose, with humans defined as “the diviner[s] of ultimate meanings within the natural processes”.⁴⁵ The ultimate purpose of humans is not to build up the human community, or even service to God, but rather to serve the whole creation. “The direction God-ward leads us reflexively to nature.”⁴⁶

In testing this hypothesis, “nonhuman nature may provide clues to the character and purpose of human being”, and the consequences of certain human behaviours (wholesome or destructive) toward the rest of nature are taken into account.⁴⁷ In some ways, this is an expansion of the first hypothesis, considering human function not only in light of its own structures but in the context of the structure of the entire natural order in which it is embedded. If assuming a goal or purpose based on an organism’s biological structure is problematic for some, assuming a purpose beyond the organism’s own requirements to those of other species is even less plausible to those who would reject teleological arguments. The problems associated with scientifically supporting the teleological claims of the first hypothesis thus apply to this hypothesis as well.

It is straightforward enough to argue that human behaviour has consequences for the rest of nature – such a claim would be more or less universally accepted. We can even say, as mentioned above, that it is in our best interests to act in ways that are wholesome for the rest of nature. But does it necessarily follow that the purpose of human being is therefore to act beneficially for the whole of nature? How do we understand situations in which a judgement is required over which aspect of nature to prioritise i.e. various interests are in competition? This shifts this hypothesis into the speculative realm, and if Hefner is to properly avoid challenges on the basis of the naturalistic fallacy then his proposal must retain its tentative nature. This is not a claim that can be sustained or rejected on the basis of scientific insights alone.

A pragmatic criterion for truth emerges with the second hypothesis and leads to the third:

Hypothesis 3

44. Hefner, *The Human Factor*, 41.

45. *ibid.*, 73.

46. *ibid.*, 60.

47. *ibid.*, 41.

A concept of “wholesomeness” is both unavoidable and useful as criterion governing the behaviour of human beings within their natural ambience, as they consider what their contribution to nature should be.⁴⁸

Hefner suggests that a definition of wholesomeness, which appears to be an ambiguous criterion, can be arrived at via consensus.⁴⁹ He describes the criteria for this hypothesis as pragmatic, arguing that human action will have to be “empirically discernible as in some way beneficial”.⁵⁰ Indeed, the assertion that humans should act to benefit nature is hardly objectionable. Many examples of humans acting in opposition to this goal could be provided, however Hefner is not hypothesising that all action must be beneficial, only that wholesomeness is an appropriate criterion for action.

It makes logical sense that in the context of an ecosystem, where the harming of one participant is detrimental to all, it is in the interests of humans that their action toward the rest of nature should be wholesome. This goes for all participants, however, not only those capable of conscious reflection. Such a statement does not necessarily constitute a hypothesis or merit a place in a scientific research programme. Nor does his stated means of validation with respect to this particular hypothesis – consensus. Scientific consensus has been incorrect at various points in history and this is likely to continue (hence the requirement for ongoing research and the construction of sophisticated philosophies of theory acceptance and change). If granted the status of a hypothesis, however, we might ask how the wholesomeness criterion could be falsified? By identifying a different criterion that serves equally well? The difficulty of articulating a means of falsification is another indication that the hypothesis is not adequately formulated. In this case, it appears that Hefner is stretching the understanding of what constitutes a hypothesis. His claim that wholesomeness should govern human behaviour toward the rest of nature is reasonable, though perhaps optimistic when it comes to reaching a consensus, but not significant when it comes to the scientific validation of his model.

As the first three hypotheses establish that nature is the domain for human purpose, Hefner proposes a fourth hypothesis concerned with this special status accorded to the natural order:

Hypothesis 4

Nature is the medium through which the world, including human beings, receives

48. Hefner, *The Human Factor*, 42.

49. *ibid.*, 42.

50. *ibid.*, 61.

knowledge, as well as grace. If God is brought into the discussion, then nature is the medium of divine knowledge and grace.⁵¹

In this Hefner follows the urging of Joseph Sittler, who emphasised that human history only transpires within the larger context of natural history.⁵² Hefner makes the additional point that the human mind must also be perceived as an entity of nature, citing representations of the mind's emergence in the context of evolutionary epistemology.⁵³ In his location of human meaning and purpose within the natural order Hefner challenges what he considers to be the dominant understanding of our relationship to nature.

Instead of relatedness and kinship, [prevailing symbol systems] speak of our responsibility for nature as its stewards or masters, and of the possibilities nature presents to us for exercising our creative abilities and propensities to reshape it, to make it conform to us and serve us. In the main, humans have symbolized their work upon nature as furthering its development and improving it, thus placing the weight of the good on the side of *doing unto* nature rather than accepting a place *within* it.⁵⁴

Rather, nature is "God's great project" - we must resist instrumentalising non-human nature and instead recognise that our task concerns the most wholesome future for all of nature.⁵⁵

Hefner construes this hypothesis as a truism, yet contends that it can be tested by determining the plausibility of statements about knowledge or grace derived from nature in light of our understandings of human nature.⁵⁶ This leads to the question of whether plausibility is an appropriate scientific criterion. Certainly the claim that all knowledge that humans can obtain is mediated through nature is unobjectionable – scientists would be in agreement with this. The human brain is a natural entity and the medium by which we acquire knowledge.⁵⁷

Hefner does not stop with the mediation of knowledge, however, but also hypothesises that nature mediates grace. What he means by grace is not immediately clear, especially as he distinguishes between grace and divine grace. Regardless of his meaning, however, the inclusion of divine grace in his statement puts the burden of proof (if he

51. Hefner, *The Human Factor*, 42.

52. *ibid.*, 58; c.f. Joseph Sittler, "The Sittler Speeches," in *Center for the Study of Campus Ministry Yearbook*, ed. Phil Schroeder (Valparaiso: Valparaiso University Press, 1978), 8–61, 31–32.

53. Hefner, *The Human Factor*, 61; c.f. Karl Peters, "Religion and an Evolutionary Theory of Knowledge," *Zygon* 17 (1982), 392–293; Robert Richards, *Darwin and the Emergence of Evolutionary Theories of Mind and Behavior* (Chicago, IL: University of Chicago Press, 1987), 574–593.

54. Hefner, *The Human Factor*, 67, emphasis original.

55. *ibid.*, 74.

56. *ibid.*, 42, 61.

57. The citations Hefner gives for the natural status of the mind offer scientific support of such a statement. See footnote 53.

wishes his hypothesis to be scientifically sound) on the existence of divine grace. The hypothesis that nature is the medium by which divine grace must be experienced, *should divine grace exist*, is acceptable scientifically, supported by current understandings of epistemology and potentially falsified if an instance of received knowledge unmediated by nature could be identified. As it stands, however, this hypothesis again makes claims that extend beyond the purview of scientific verification.

Core Element 2

Hefner identifies a second core element to his thesis that humans are “created co-creators”:

The conditioning matrix that has produced the human being – the evolutionary process – is God’s process of bringing into being a creature who represents the creation’s zone of a new stage of freedom and who therefore is crucial for the emergence of a free creation.⁵⁸

Hefner reduces this statement to the challenge of “interpreting the evolutionary process as the work of God” – a major challenge, in his view, for the contemporary theologian.⁵⁹ Natural selection processes, in particular, raise questions of theodicy Hefner addresses later in the volume.⁶⁰ The emphasis here is on the freedom that emerges from the evolutionary matrix. For Hefner, the unavoidability of human freedom is almost tautological, which only makes sense when he goes on to define freedom not primarily in terms of liberty or ability to shape the world but rather as a “condition of existence”.⁶¹ Despite their apparent negation of each other, freedom and determinism are dialectical for Hefner – “freedom requires the structure of determinism for its becoming” and the “casual context” is enabled by freedom “to persist in new and different ways”.⁶² Insights from the field of epigenetics “clarifies how a deterministic biological system can favour the emergence of freedom”.⁶³ While freedom and determinism can exist in conflict, producing fear, we are constantly seeking situations in which they are consonant with respect to our human destiny.⁶⁴

Associated with the conditioning matrix core element are a further two auxiliary hypotheses.

58. Hefner, *The Human Factor*, 42.

59. *ibid.*, 42.

60. (*ibid.*, 271).

61. *ibid.*, 97.

62. *ibid.*, 115.

63. *ibid.*, 116.

64. *ibid.*, 117, 121.

Hypothesis 5

Freedom characterizes human existence as the condition in which humans have no choice but to act and to construct the narratives and symbols that contextualize that action. Such contextualization provides justification, explanation, and norms for guiding and assessing the action. This condition is intrinsic to the evolutionary processes at the level of *Homo sapiens*.⁶⁵

The testability of this hypothesis is linked to its utility for understanding humans and their relationship with nature (including other humans). Hefner gives two examples to make his case: the choice of whether to prolong a parent's life using medical intervention and the development and implication of environmental policies that require assigning comparative values to different forms of life. Both instances require not only human decision but also the construction of stories that justify such decisions (like instructions to honour our parents and to serve as stewards to the creation).⁶⁶ With respect to the latter, the centrality of narrative construction to the human mind is well attested in the human sciences. Karl Peters, to use one of the examples put forward by Hefner, highlights the constructivist element of the human central nervous system – the ability to construct contextualising narratives has enabled humans to evolve as they have.⁶⁷ Hefner also cites neuroscientist William Calvin in his argument that the brain's capacity to observe and interpret information through the constructing of meaningful narratives is crucial for survival.⁶⁸ More recently this is supported by social psychologist Jonathan Haidt, who argues that the human mind is essentially a story processor.⁶⁹

The question of freedom is more complex. Scientifically speaking, Hefner points us to Theodosius Dobzhansky's exploration of genetically determined phenotype plasticity and the explanation this offers for the emergence of freedom within an evolutionary framework.⁷⁰ He cites the more recent (at the time of his writing) work of Rodney Holmes and Terrence Deacon as an extension of Dobzhansky's insight.⁷¹ More recently, Moczek *et. al.* have connected phenotypic plasticity with evolutionary innovation.⁷²

65. Hefner, *The Human Factor*, 45.

66. *ibid.*, 98.

67. Karl Peters, "Humanity in Nature: Conserving Yet Creating," *Zygon* 24 (1989).

68. William Calvin, *The Cerebral Symphony: Seashore Reflections on the Structure of Consciousness* (New York, NY: Bantam Press, 1989).

69. Jonathan Haidt, *The Righteous Mind: Why Good People are Divided by Politics and Religion*, 287 (New York: Vintage Books, 2013).

70. Hefner, *The Human Factor*, 99; c.f. Theodosius Dobzhansky, *The Biological Basis of Human Freedom*, 68 (New York, NY: Columbia University Press, 1956).

71. Terrence Deacon, "Brain-Language Co-Evolution," in *The Evolution of Human Languages*, ed. John Hawkins and Murray Gell-Mann (Reading, MA: Addison-Wesley, 1992), 49–83; Rodney Holmes, "Did *Homo Religiosus* Emerge from the Evolution of the Brain?," *Insights: The Magazine of the Chicago Centre for Religion and Science* 3 (1991).

72. Armin P Moczek et al., "The Role of Developmental Plasticity in Evolutionary Innovation," *Proceedings of the Royal Society B: Biological Sciences* 278, no. 1719 (2011).

This should not be equated with freedom, however, indeed Moczek *et. al.* struggle to reconcile the apparent paradox between the Darwinian notion that every new trait is somehow derived from an old one, and the existence of complex novel traits.⁷³ The language of freedom, and an understanding of how it fits within processes of evolution, again seems to reach beyond the explanatory capacity of science, though such an understanding may be commensurate with scientific knowledge.

The second hypothesis attached to this core element reiterates one of the central ideas in Hefner's core claim.

Hypothesis 6

Homo sapiens is a two-natured creature, a symbiosis of genes and culture.⁷⁴

We see here an idea that is prominent in Hefner's theological anthropology - human beings are the product of "biocultural" evolution. This is a natural process in which our genetic and cultural heritages combine to produce free agents that are now capable of shaping future evolution.⁷⁵ Hefner describes this "two-natured character" of humans as follows:

Homo sapiens is itself a nodal point wherein two streams of information come together and co-exist. The one stream is inherited genetic information, the other is cultural information. Both of these streams come together in the central nervous system. Since they have coevolved and coadapted together, they are one reality, not two.⁷⁶ This understanding is not original to Hefner, but draws heavily from the work of Timothy Goldsmith.⁷⁷

Hefner resists a tendency toward dualism in his insistence that both of these streams of information form one reality. Whether this dualism is completely resolved in the outworking of his model remains to be evaluated. He does acknowledge the difficulty in adequately describing the relationship between genes and culture, however he gives his own support to the symbiosis model proposed by Ralph Burhoe.⁷⁸ He also commends Gerd Theissen's interpretation of biblical faith through the lens of Burhoe's model as constitutive of a proposal for cultural evolution that transcends certain biological constraints.⁷⁹ Furthermore, Hefner argues that this complex gene-culture symbiosis

73. Moczek et al., "The Role of Developmental Plasticity in Evolutionary Innovation," 2705.

74. Hefner, *The Human Factor*, 45.

75. *ibid.*, 28-29.

76. *ibid.*, 29.

77. Timothy Goldsmith, *The Biological Roots of Human Nature: Forging Links Between Evolution and Behavior* (Oxford: Oxford University Press, 1991).

78. Hefner, *The Human Factor*, 30; c.f. Ralph Burhoe, "Religion's Role in Human Evolution: The Missing Link between Ape-Man's Selfish Genes and Civilized Altruism," *Zygon* 14 (1979).

79. Hefner, *The Human Factor*, 30; c.f. Gerd Theissen, *Biblical Faith: An Evolutionary Approach* (Philadelphia, PA.: Fortress Press, 1985).

that is the contemporary human has emerged from a deterministic evolutionary process as truly free – a freedom “rooted in the genetically controlled adaptive plasticity of the human phenotype”.⁸⁰ Yet this freedom exists in tension with conditions that are “suitable for the emergence of values”, reinforced through the evolutionary context in which they were fashioned.⁸¹ The two-natured character of human beings is antithetical to dualism, contends Hefner, as both streams of information have emerged from the one process of nature.⁸²

Hefner suggests that this hypothesis is tested and supported by a large body of relevant scientific literature. Indeed, this is possibly the most straightforward of Hefner’s hypotheses when it comes to testing. There are a wealth of studies that demonstrate the influence of cultural factors on our biological function and vice versa. Cultural food options tend to conform to preferences influenced by genetically predisposed nutritional requirements – which explains why many prefer the taste of foods high in sugar, fat and salt. Conventional evolutionary theory has been expanded to include the phenomena known as “niche construction” – the ability of organisms to modify sources of natural selection within their environment. According to Laland et al., “culture amplifies the capacity of human beings” for niche construction.⁸³ Lactose digestion is an often cited example, with genetic mutations producing lactase persistence beyond weaning increasingly distributed among particular populations since the beginning of animal domestication.⁸⁴

Similarly, the cultural activity of yam cultivation in West Africa has been associated with an increase in the frequency of the sickle cell anaemia gene in the local population, offering protection against the higher risk of malaria that comes with yam cultivation. Laland et al. do point out, however, that this is not direct causation by the cultural variable but rather the ecological variable of standing water is exerting selection pressure. They propose a particular model of gene-culture coevolution in which

instead of being exclusively responsible for allowing us to codirect our own evolution, in contrast to what happens in every other species, culture now becomes merely the principal way in which we humans do the same thing that most other species do.⁸⁵

A number of molecular signatures likely generated by cultural selection pressures have

80. Hefner, *The Human Factor*, 30. On this point Hefner refers us to Dobzhansky, *The Biological Basis of Human Freedom*.

81. Hefner, *The Human Factor*, 31.

82. *ibid.*, 102.

83. Kevin Laland, John Odling-Smee, and Marcus Feldman, “Niche Construction, Biological Evolution, and Cultural Change,” *Behavioral and Brain Sciences* 23 (2000).

84. Pascale Gerbault et al., “Evolution of Lactase Persistence: An Example of Human Niche Construction,” *Philosophical Transactions of the Royal Society B: Biological Sciences* 366 (2011).

85. Laland, Odling-Smee, and Feldman, “Niche Construction, Biological Evolution, and Cultural Change,” 137.

been identified in the human genome, with calls for cross-disciplinary studies to illuminate further the evolutionary relationship between genes and culture.⁸⁶ More recently, insights from the field of epigenetics (which was in its infancy at the time of *The Human Factor*'s publication, therefore unsurprising that Hefner only briefly mentions it) have improved our evolutionary models and afforded a place to environmental factors (some of which are cultural) in inheritable characteristics.⁸⁷ Novel patterns of brain waves have emerged since the increased usage of smartphones and other handheld internet devices, we can only speculate as to whether and how soon such changes will be reflected in the genome.⁸⁸ Therefore although there are more nuanced understandings available, it does seem evident that Hefner's hypothesis concerning the human as a gene-culture symbiont is supported by scientific accounts of coevolution.

Core Element 3

The final core element that Hefner outlines within the "created co-creator" hard core elaborates on the freedom that exists in tension with conditionedness.

The freedom that marks the created co-creator and its culture is an instrumentality of God for enabling the creation (consisting of the evolutionary past of genetic and cultural inheritance as well as the contemporary ecosystem) to participate in the intentional fulfillment of God's purposes.⁸⁹

This freedom is itself chosen by the creation, and means that the world is defined not by its past or present but rather by what it is becoming.⁹⁰ The understanding of freedom is therefore eschatological. When it comes to the participation of the creation in God's purposes, and the human role in this, Hefner understands the doctrine of the *imago Dei* to mean that "humans can be the vehicle for grace toward the creation".⁹¹ Associated with this core element are three further auxiliary hypotheses.

Hypothesis 7

86. Kevin Laland, John Odling-Smee, and Sean Myles, "How Culture Shaped the Human Genome: Bringing Genetics and the Human Sciences Together," *Nature Reviews Genetics* 11 (2010).

87. Michael Skinner, "Environmental Epigenetics and a Unified Theory of the Molecular Aspects of Evolution: A Neo-Lamarckian Concept that Facilitates Neo-Darwinian Evolution," *Genome Biology and Evolution* 7, no. 5 (2015).

88. Mari Swingle, *I-Minds: How Cell Phones, Computers, Gaming, and Social Media are Changing Our Brains, Our Behavior, and the Evolution of our Species*, 63 (Gabriola, BC: New Society Publishers, 2016).

89. Hefner, *The Human Factor*, 45.

90. *ibid.*, 46.

91. *ibid.*, 238.

The challenge that culture poses to human being can be stated thus: Culture is a system of information that humans must construct so as to adequately serve the three tasks of interpreting the world in which humans live, guiding human behavior, and interfacing with the physico-biogenetic cultural systems that constitute the environment in which we live.⁹²

This hypothesis carries a great deal of weight for the entire theory according to Hefner.⁹³ He points out that “whatever the human being acts out culturally fully implicates the genetic and ecosystem symbionts”.⁹⁴ Yet “culture is also always seeking to stretch genes and ecosystem in order to fulfill what seems from the cultural perspective to be desirable and useful novel ends.”⁹⁵

Hefner again refers us to the scientific literature for the testing of this hypothesis. He argues that neuroscientific evidence “supports the notion that our biogenetic equipment as human beings is built to sustain the formation of culture”.⁹⁶ He gives the example of the comparatively premature birth of human offspring compared with other species; the skull continues to grow long after birth in order to develop the neurological equipment necessary for culture.⁹⁷

A potential falsifier for this hypothesis would be the existence of a group of humans with no identifiable culture, who are still able to carry out Hefner’s identified tasks of interpretation, guidance of behaviour, and interaction with the environment. No known example exists, which appears to support the hypothesis. Yet the hypothesis is constituted by multiple claims. The claim that culture is constructed by humans is well-attested by the scientific literature. Karl Popper, for example, distinguished the cultural world – “the products of the human mind” – from the physical world.⁹⁸

The purpose of culture is less straightforward. Anthropologist Clifford Geertz would agree with Hefner, defining culture as “the fabric of meaning in terms of which humans interpret their experience and guide their action”.⁹⁹ Psychological explorations of culture have spoken of its function as an evolutionary adaptation.¹⁰⁰ While scientific

92. Hefner, *The Human Factor*, 48.

93. *ibid.*, 49.

94. *ibid.*, 47.

95. *ibid.*, 47.

96. *ibid.*, 163. This he relates back to the previous hypothesis that humans are gene-culture symbionts.

97. *ibid.*, 163-164.

98. Karl Popper, *Objective Knowledge: An Evolutionary Approach*, chapter 4 (Oxford: Clarendon Press, 1972).

99. Clifford Geertz, *The Interpretation of Cultures: Selected Essays*, 144-145 (New York: Basic Books, 1973).

100. See for example Jerome Barkow, Leda Cosmides, and John Tooby, *The Adapted Mind: Evolutionary Psychology and the Generation of Culture* (Oxford: Oxford University Press, 1992); Darrin R. Lehman, Chi-yue Chiu, and Mark Schaller, “Psychology and Culture,” *Annual Review of Psychology* 55, no. 1 (2004).

research into the purpose of culture remains fairly scant (and this largely seems to be carried out by human scientists, garnering less interest among physical scientists) it is possible that further developments in the field may support Hefner’s hypothesis, to the extent that its claims can be considered scientific ones. At the very least, it has not been falsified by existing scientific data.

Hypothesis 8

We now live in a condition that may be termed technological civilization. This condition is characterized by the fact that human decision has conditioned virtually all of the planetary physico-biogenetic systems, so that human decision is the critical factor in the continued functioning of the planet’s systems.¹⁰¹

Essentially all natural systems are now affected by the human cultural overlay – there are no longer any locations completely untouched by human decision.¹⁰² Again, human freedom is emphasised in this hypothesis. The “created co-creator” is the agent in technological civilisation, recognising it to be the form of the natural world “commensurate with their particular epoch in evolutionary history”.¹⁰³

There are two parts to this hypothesis – the pervasion of technology globally and the critical role accorded to humans for the planet’s future. With respect to the first, there is strong scientific corroboration when it comes what Hefner describes as the cultural overlay of natural systems. The beginning of the millennium was marked by a coordinated effort to consider the present environmental conditions at the global level, with the United Nations Environment Program issuing a report outlining the pervasive impact of human activity on the natural environment.¹⁰⁴ More recent reports from the Intergovernmental Panel on Climate Change (IPCC), which reviews, evaluates and synthesises the latest scientific research to do with climate change, offer a sobering assessment of the vulnerability of various natural systems – largely as a result of human activity.¹⁰⁵ Scientists continue to argue this point, with polar researcher Peter Wadhams capturing eloquently one example of this human impact on the natural world in his comments on the diminishing polar icecaps:

Our planet has actually changed colour. We all remember the first beautiful photograph of planet earth rising from behind the Moon, taken by the Apollo-8 astronauts, a delicate blue sphere, isolated in the cosmos, which contains all that we know of life. That sphere was white at both ends. Today, from space, the top of the world in the northern summer looks blue instead of white. We have created

101. Hefner, *The Human Factor*, 49.

102. *ibid.*, 153.

103. *ibid.*, 155.

104. United Nations Environment Program, *Global Environment Outlook 2000* (London: Earthscan, 2000).

105. Intergovernmental Panel on Climate Change, *Climate Change 2014: Impacts, Adaptation, and Vulnerability* (Cambridge: Cambridge University Press, 2014).

an ocean where there was once an ice sheet. It is Man's first major achievement in reshaping the face of his planet, and it is of course an unintended achievement, with dubious and possibly catastrophic consequences to follow.¹⁰⁶

The second part of the hypothesis concerns the centrality of humans for determining the planet's future. Again, many scientists would agree with Hefner's premise. The plethora of international climate conventions and agreements, as well as growing research into sustainable technologies, suggests that the majority of scientists and policy developers at least operate under the assumption that human action plays a critical role. Sociobiologist E. O. Wilson recently published what can only be described as a desperate plea for humans to exercise their decisive capacity in order to avert global environmental catastrophe.¹⁰⁷ Sir John Houghton, atmospheric physicist and previous chair of the IPCC urges us to take our environmental stewardship responsibilities seriously as we consider how the impact of our actions now and in the future.¹⁰⁸

Hefner's identification of the current global situation as a technological civilisation, in which human decision is decisive, is expressed in neutral terms. It could be argued, however, that the way to foster the wholesomeness of non-human creation is to reduce the impact of human activity on the rest of nature. We see this frequently today in the language of environmental advocacy groups calling for a reduction in our "ecological footprint" – possibly this framing of the problem is more helpful than simply drawing attention to the centrality of human agency.

Whether this hypothesis makes sense of novel facts, a key idea of the Lakatosian model, or explains data already available to Hefner at the time of writing is another question. As it continues to be corroborated by up-to-date research in the interaction of technology and the environment, however, this hypothesis may be considered to be validated by scientific knowledge.

Hypothesis 9

Myth and ritual are critical components of the cultural system of information and guidance. They are marked in linguistic form by declarative or imperative discourse, and their concepts are vastly underdetermined by the data of evidence. In light of human evolutionary history, these marks were necessary if culture was to serve its evolutionary function.¹⁰⁹

106. Peter Wadhams, *A Farewell to Ice*, 2-3 (London: Allen Lane, 2016).

107. Edward O. Wilson, *Half-Earth: Our Planet's Fight for Life* (New York, NY: Liveright Publishing, 2016).

108. John T. Houghton, *Global Warming: The Complete Briefing*, 357 (Cambridge: Cambridge University Press, 2015).

109. Hefner, *The Human Factor*, 49.

Hefner elaborates on the role of myth and ritual, speculating that they are the chief carriers of cultural information that both motivates and interprets human behaviour beyond the purely physiological.¹¹⁰ In agreement with Paul Ricoeur he affirms the intrinsic meaning of myth and ritual.¹¹¹ He describes their relation to each other, and to praxis: “myth portrays reality, ritual presents symbolically the action that reality requires, while praxis translates the ritual into ordinary, everyday living”.¹¹² He considers fruitful Julian Jaynes’ proposal that over three thousand years ago the human mind functioned bicamerally, with the informed right hemisphere of the brain “speaking” commands to the left (and such commands were heard and interpreted as the voice of the gods).¹¹³ Though he resists a completely adaptationist account of myth and ritual, he considers them facilitators for imprinting information.¹¹⁴

Hefner suggests that this last hypothesis is highly speculative and “has no possibility of being tested in a scientific manner”.¹¹⁵ However, it can be scrutinised for blatant scientific errors.¹¹⁶ Hefner concedes that we have no conclusive evidence when it comes to the evolutionary origins of ritual or myth, suggesting they are underdetermined by data.¹¹⁷ The non-scientific nature of this hypothesis does not invalidate its potential fruitfulness, but it does not comply with Hefner’s stated aim of articulating falsifiable hypotheses.¹¹⁸ Perhaps the inability of this hypothesis to be properly tested lies with the contemporary human stance toward the nature and reality of myth. Hefner traces the history of how humans have understood myth, from a premodern position of naive realism, through the Enlightenment debunking of myth using critical reason, to the simultaneous deconstruction and affirmation of myth – “we believe in myth under the conditions of *irony*.”¹¹⁹

Hefner does cite research suggesting that the human central nervous system has “mythopoeic requirements” (Wilson’s phrase) for ordering the information at its disposal.¹²⁰ A more

110. Hefner, *The Human Factor*, 149.

111. *ibid.*, 151.

112. *ibid.*, 156.

113. *ibid.*, 163; c.f. Julian Jaynes, *The Origin of Consciousness in the Breakdown of the Bicameral Mind* (Boston, MA: Houghton Mifflin, 1977).

114. Hefner, *The Human Factor*, 172–172; c.f. John Pfeiffer, *The Creative Explosion: An Enquiry into the Origins of Art and Religion* (Ithaca, NY: Cornell University Press, 1982), 227–228; Mihaly Csikszentmihalyi, *Tomorrow’s Mind* (San Francisco, CA: HarperCollins, 1993).

115. Hefner, *The Human Factor*, 49.

116. *ibid.*

117. *ibid.*, 159, 202.

118. *ibid.*, 25.

119. *ibid.*, 187, emphasis original.

120. *ibid.*, 185. The works cited by Hefner include Charles Laughlin, John McManus, and Eugene d’Aquili, *Brain, Symbol and Experience: Toward a Neurophenomenology of Human Consciousness* (New York, NY: Columbia University Press, 1990); Edward O. Wilson, *On Human Nature* (Cambridge, MA: Harvard University Press, 1978).

explicit scientific proposal is offered by Julian Jaynes, which Hefner approves of but also acknowledges to be speculative (and eccentric). With respect to Jaynes' theory of bicameral brain functioning, the scientific jury is still out. The theory has been controversial since its inception, however it has been suggested that neuroimaging studies support Jaynes' hypothesis.¹²¹

The underdetermination of of myth represents no problems for Hefner with respect to its unfalsifiability – the very nature and function of myth in evolutionary history requires action prior to the gathering of data that could support or falsify it.¹²² Hefner does point out, however, that this hypothesis rejects the possibility that humans could have survived this long without the information provided by myth and ritual.¹²³ A potential falsifier may therefore be the existence of human culture that does not possess any form of myth or ritual – and no examples have been discovered thus far. Despite this, the inability to specify how this hypothesis might be corroborated scientifically suggests that Hefner's characterisation of it as speculative and non-scientific holds.

How Scientific is the “Created Co-Creator” Model?

Having examined each of the the auxiliary hypotheses that constitute Hefner's “created co-creator”, we now return to the methodological framework that undergirds his model. How faithful is his theological construction to the Lakatosian structure he aims to employ?

At the close of *The Human Factor*, Hefner offers his own evaluation of how successful the “created co-creator” model is as a Lakatosian research programme. He identifies a number of novel facts associated with his model, including the referral of human meaning to nature, the emphasis on teleonomy when it comes to humans, the inclusion of the biocultural evolutionary model into his theological anthropology, more complex conceptualisations of freedom and determinism, the integration of technology into evolution and human nature, the conceptual role afforded to myth and ritual within culture, and the identification of evil and theodicy as potential falsifiers.¹²⁴ He also considers his various doctrinal reinterpretations to comprise novel facts, including the relation of nature to grace, the purpose of human existence, and his definitions of atonement, justification, and original sin.¹²⁵

121. Leo Sher, “Neuroimaging, Auditory Hallucinations, and the Bicameral Mind,” *Journal of Psychiatry and Neuroscience* 25, no. 3 (2000).

122. Hefner, *The Human Factor*, 204.

123. *ibid.*, 267.

124. *ibid.*, 268–271.

125. *ibid.*, 272–275.

Whether any of Hefner's doctrinal reinterpretations are truly novel is questionable, though they of course meet his definition of novel. The present work has not explored Hefner's theological framework in any detail, although it is likely that his reframing of certain doctrines falls outside what is generally considered theologically orthodox. The particular concern here is not the fruitfulness of Hefner's proposal, however, but instead the scientific character of the hypotheses he constructs.

When it comes to scientific corroboration, many of Hefner's auxiliary hypotheses do appear to hold up against scientific knowledge that has arisen since Hefner's formulation. Though comparative morphology is not a new discipline, the discovery of the polymerase chain reaction (PCR) technique for the amplification of DNA in the 1990s has allowed the extension of morphological studies to include traits at the molecular level.¹²⁶ Along with increasingly sophisticated bioinformatic tools, this has made a vast difference to the field of phylogenetics, which maps the relationships and evolutionary history of the various species. These developments have only confirmed Hefner's argument in the first auxiliary hypothesis that humans will exhibit continuity with the rest of nature in the realm of structures and processes.¹²⁷ Similar arguments could be made for the ongoing corroboration of Hefner's hypothesis concerning the interplay of culture and genes and the predisposition of the human mind toward narrative construction.

As argued in the previous section, however, not all of Hefner's hypotheses are scientifically valid. By attempting to explain theology in scientific terms, Hefner does theology (and epistemology more generally) a disservice. His many caveats notwithstanding, Hefner appears to have bought into the modernist privileging of scientific explanation above all other aspects of knowing. The decision to explicate theology in scientific terms falls prey to Peter Hacker's "illusion of reason" – the notion that the natural sciences and the humanities are methodologically homogenous.¹²⁸ Yet is Hefner really so unaware of this danger? Hefner acknowledges the limits to science, especially in later works. For example, he writes that "science must learn from religion that even though the ships that science builds are huge and impressive, the sea is even bigger and rougher."¹²⁹ He

126. Rafael Zardoya and Axel Meyer, "Molecular Evidence on the Origin of and the Phylogenetic Relationships Among the Major Groups of Vertebrates," in *Evolution: From Molecules to Ecosystems*, ed. Andrés Moya and Enrique Font (Oxford: Oxford University Press, 2004), 209–217, 209–210. See, for example, Thierry Backeljau et al., "Random Amplified Polymorphic DNA (RAPD) and Parsimony Methods," *Cladistics* 11 (1995). Note that molecular analyses are distinct from comparative morphology in that they do not concern observable characteristics (Ridley, *Evolution*, 425).

127. Hefner does mention nucleotide sequence comparisons, but the technology has advanced considerably since publication in 1993 Hefner, *The Human Factor*, 65.

128. Peter Hacker, *Wittgenstein: Connections and Controversies* (Oxford: Oxford University Press, 2001), 73.

129. Philip Hefner, "Spiritual Transformation and Healing: An Encounter with the Sacred," in *Spiritual Transformation and Healing: Anthropological, Theological, Neuroscientific, and Clinical Perspectives*, ed. Joan Koss-Chioino and Philip Hefner (Oxford: Altamira Press, 2006), 119–133, 130.

insists that science can raise questions which cannot themselves be resolved using scientific reasoning.¹³⁰ It seems that the critique offered of Lakatos earlier, that his model does not sufficiently account for the contextual character of scientific enquiry, does not then apply to Hefner, or at least not to the same extent. Revisiting his epistemological commitments, Hefner allows that knowledge is conditioned, pointing out that “we can neither understand nor participate in the ongoing life of faith and theology apart from the mediation of social reality”.¹³¹ Ultimately Hefner acknowledges the limitations of methodology, his verdict approaching the poetic: “Like a twig caught in the raging current of a storm-roiled river, the fruits of the method are more in the realm of hope than of certainty.”¹³²

It would appear that despite the methodological insufficiencies in Hefner’s approach to scientific knowledge, his “created co-creator” model is largely compatible with the findings of contemporary science. Perhaps Hefner’s transgression is not that he reduces theology to scientific explanations, but rather that he gives the impression that such a move can be performed. Hefner’s model is actually far richer than a scientific account alone could provide. He makes claims about human nature and reality that, while not contravened by scientific knowledge, are not evident without recourse to nonscientific sources of knowledge. That Hefner misrepresents his work is unlikely a conscious deception, and we can reasonably attribute to him the best of intentions in the project of harmonising theology and science. Ultimately, however, we can learn from Hefner’s example that theology suffers when scholars attempt to reduce it to scientific explanations. It is his fundamental commitments concerning ultimate reality that allow Hefner’s model to make sense of insights from the natural world.

Hefner’s model may also be refined and nuanced if combined with more recent developments in the area. Deacon’s account of emergence has already been offered as a more robust attempt to understand human freedom and self-awareness in a framework that is not reductionist. In recent years, Hefner has engaged with the scholarship of Donna Haraway. He suggests that Haraway’s cyborg and the “created co-creator” are sibling images.¹³³ Even then, however, Hefner still insists on reducing createdness to “kinship with the processes that have created us”.¹³⁴ This sits in uneasy tension with his contention that “we cannot avoid the question of God, because we create as if it matters”.¹³⁵

130. Hefner, *The Human Factor*, 147.

131. Philip Hefner, “The Cultural Significance of Jesus’ Death as Sacrifice,” *Journal of Religion* 60, no. 4 (1980), 427.

132. Hefner, *The Human Factor*, 152.

133. Philip Hefner, “The Created Co-Creator Meets Cyborg,” March 29, 2004, accessed February 6, 2004, <http://www.metanexus.net/essay/created-co-creator-meets-cyborg>, 5.

134. Philip Hefner, “Human Being: Questioning and Being Questioned,” *Zygon* 39, no. 4 (2004), 5.

135. *ibid.*, 7.

In his most developed exposition of the “created co-creator”, Hefner appears reluctant to bring his own theological convictions into his understanding of anthropology and the human future, yet ultimately cannot avoid doing so. More recently, looking back over his career in science and religion, Hefner offers an updated conception of the theologian’s task: they are to reflect on findings of scientific research.¹³⁶ Viewed through the lens of Hefner’s later thought as to how science and religion relate to one another, which no longer includes reference to a criterion of falsification or to Lakatosian philosophy of science, many of the methodological concerns raised here with respect to Hefner’s earlier work are alleviated.¹³⁷

This critique does not negate the potential value of the “created co-creator” for theological anthropology. An affirmation of the extra-scientific metaphysical commitments involved may give the position more worth in the eyes of many theologians (and scientists!), and the scientific commensurability of many elements recommends the model for communication in a pluralistic context. Such a synthesis of scientific and theological content provides a far more convincing response than an account derived from either scientific sources or sources more traditional for theological construction (e.g. Scripture) alone. Hefner does appear to have shifted in his views over time, referring a decade later to the “created co-creator” as a “diagnostic idea” that “interprets ordinary existence”.¹³⁸ He is content to summarise his construction as “the common experience that we are able to do things that are novel; that we are able to change the world around us and the world within us in ways that seem important and desirable”.¹³⁹

An understanding of humans as “created co-creators” has much to offer theologians in the present age, particularly as they respond to the rapid developments in technologies that may significantly affect the human future. If Hefner’s model is viewed as one that encompasses more than just a scientific approach to anthropology, and its hints of extra-scientific components such as the role of the human imagination in human becoming are fully realised, the “created co-creator” may occupy a central place in ongoing dialogue concerning the future of humanity and our role in bringing that future to pass.

136. Philip Hefner, “Life in Religion-and-Science,” *Theology and Science* 13, no. 1 (2015), 11.

137. *ibid.*.

138. Hefner, “The Created Co-Creator Meets Cyborg”, 1.

139. *ibid.*, 2.

References

- Backeljau, Thierry, Luc de Bruyn, Hans de Wolf, Kurt Jordaens, Stefan van Dongen, Ron Verhagen, and Birgitta Winnepenninckx. "Random Amplified Polymorphic DNA (RAPD) and Parsimony Methods." *Cladistics* 11 (1995): 119–130.
- Barkow, Jerome, Leda Cosmides, and John Tooby. *The Adapted Mind: Evolutionary Psychology and the Generation of Culture*. Oxford: Oxford University Press, 1992.
- Bertranpetit, Jaume, and Francesc Calafell. "Genome Views on Human Evolution." In *Evolution: From Molecules to Ecosystems*, edited by Andrés Moya and Enrique Font, 260–271. Oxford: Oxford University Press, 2004.
- Burhoe, Ralph. "Religion's Role in Human Evolution: The Missing Link between Ape-Man's Selfish Genes and Civilized Altruism." *Zygon* 14 (1979): 135–162.
- Calvin, William. *The Cerebral Symphony: Seashore Reflections on the Structure of Consciousness*. New York, NY: Bantam Press, 1989.
- Chalmers, A. F. *What Is This Thing Called Science?* 2nd ed. Milton Keynes: Open University Press, 1982.
- Clayton, Philip. *Explanation from Physics to Theology: An Essay in Rationality and Religion*. New Haven: Yale University Press, 1989.
- Cole-Turner, Ronald. "Biotechnology and the Religion-Science Discussion." In *The Oxford Handbook of Religion and Science*, edited by Philip Clayton, 929–944. Oxford: Oxford University Press, 2008.
- Csikszentmihalyi, Mihaly. *Tomorrow's Mind*. San Francisco, CA: HarperCollins, 1993.
- Deacon, Terrence. "Brain-Language Co-Evolution." In *The Evolution of Human Languages*, edited by John Hawkins and Murray Gell-Mann, 49–83. Reading, MA: Addison-Wesley, 1992.
- Deacon, Terrence. *Incomplete Nature: How Mind Emerged from Matter*. New York, NY: Norton, 2012.
- Dobzhansky, Theodosius. *The Biological Basis of Human Freedom*. New York, NY: Columbia University Press, 1956.
- Feyerabend, Paul. "Consolations for the Specialist." In *Criticism and the Growth of Knowledge*, edited by Imre Lakatos and Alan Musgrave, 197–230. Cambridge: Cambridge University Press, 1970.

- Geertz, Clifford. *The Interpretation of Cultures: Selected Essays*. New York: Basic Books, 1973.
- Gerbault, Pascale, Anke Liebert, Yuval Itan, Adam Powell, Mathias Currat, Joachim Burger, Dallas Swallow, and Mark Thomas. "Evolution of Lactase Persistence: An Example of Human Niche Construction." *Philosophical Transactions of the Royal Society B: Biological Sciences* 366 (2011): 863–877.
- Goldsmith, Timothy. *The Biological Roots of Human Nature: Forging Links Between Evolution and Behavior*. Oxford: Oxford University Press, 1991.
- Hacker, Peter. *Wittgenstein: Connections and Controversies*. Oxford: Oxford University Press, 2001.
- Haidt, Jonathan. *The Righteous Mind: Why Good People are Divided by Politics and Religion*. New York: Vintage Books, 2013.
- Hefner, Philip. "Human Being: Questioning and Being Questioned." *Zygon* 39, no. 4 (2004): 733–736.
- Hefner, Philip. "Life in Religion-and-Science." *Theology and Science* 13, no. 1 (2015): 8–24.
- Hefner, Philip. "Spiritual Transformation and Healing: An Encounter with the Sacred." In *Spiritual Transformation and Healing: Anthropological, Theological, Neuroscientific, and Clinical Perspectives*, edited by Joan Koss-Chioino and Philip Hefner, 119–133. Oxford: Altamira Press, 2006.
- Hefner, Philip. "The Created Co-Creator Meets Cyborg." March 29, 2004. Accessed February 6, 2004. <http://www.metanexus.net/essay/created-co-creator-meets-cyborg>.
- Hefner, Philip. "The Cultural Significance of Jesus' Death as Sacrifice." *Journal of Religion* 60, no. 4 (1980): 411–139.
- Hefner, Philip. "The Foundations of Belonging in a Christian Worldview." In *Belonging and Alienation: Religious Foundations for the Human Future*, edited by Philip Hefner and Widick Schroeder, 161–180. Chicago, IL: Centre for the Scientific Study of Religion, 1976.
- Hefner, Philip. *The Human Factor: Evolution, Culture, Religion*. Minneapolis: Fortress Press, 1993.

- Hefner, Philip. "The Role of Science in Pannenberg's Theological Thinking." *Zygon* 24, no. 2 (1989): 135–151.
- Hefner, Philip. "Theology's Truth and Scientific Formulation." *Zygon* 23, no. 1 (1988): 263–279.
- Holmes, Rodney. "Did *Homo Religiosus* Emerge from the Evolution of the Brain?" *Insights: The Magazine of the Chicago Centre for Religion and Science* 3 (1991): 10–14.
- Houghton, John T. *Global Warming: The Complete Briefing*. Cambridge: Cambridge University Press, 2015.
- Intergovernmental Panel on Climate Change. *Climate Change 2014: Impacts, Adaptation, and Vulnerability*. Cambridge: Cambridge University Press, 2014.
- Jaynes, Julian. *The Origin of Consciousness in the Breakdown of the Bicameral Mind*. Boston, MA: Houghton Mifflin, 1977.
- Krogh, Anders, Björn Larsson, Gunnar von Heijne, and Erik Sonnhammer. "Predicting Transmembrane Protein Topology with a Hidden Markov Model: Application to Complete Genomes." *Journal of Molecular Biology* 305 (2001): 567–580.
- Kuhn, Thomas. "Logic of Discovery or Psychology of Research?" In *Criticism and the Growth of Knowledge*, edited by Imre Lakatos and Alan Musgrave, 1–24. Amsterdam: North-Holland Publishing Co., 1970.
- Lakatos, Imre. *The Methodology of Scientific Research Programmes*. Edited by John Worrall and Gregory Currie. Vol. 1. Cambridge: Cambridge University Press, 1978.
- Laland, Kevin, John Odling-Smee, and Marcus Feldman. "Niche Construction, Biological Evolution, and Cultural Change." *Behavioral and Brain Sciences* 23 (2000): 131–175.
- Laland, Kevin, John Odling-Smee, and Sean Myles. "How Culture Shaped the Human Genome: Bringing Genetics and the Human Sciences Together." *Nature Reviews Genetics* 11 (2010): 137–148.
- Laughlin, Charles, John McManus, and Eugene d'Aquili. *Brain, Symbol and Experience: Toward a Neurophenomenology of Human Consciousness*. New York, NY: Columbia University Press, 1990.
- Lehman, Darrin R., Chi-yue Chiu, and Mark Schaller. "Psychology and Culture." *Annual Review of Psychology* 55, no. 1 (2004): 689–714.

- Luisi, Pier Luigi. *The Emergence of Life: From Chemical Origins to Synthetic Biology*. Cambridge: Cambridge University Press, 2016.
- Moczek, Armin P, Sonia Sultan, Susan Foster, Cris Ledón-Rettig, Ian Dworkin, H Fred Nijhout, Ehab Abouheif, and David W Pfennig. “The Role of Developmental Plasticity in Evolutionary Innovation.” *Proceedings of the Royal Society B: Biological Sciences* 278, no. 1719 (2011): 2705–2713.
- Murphy, Nancey. *Theology in an Age of Scientific Reasoning*. Ithaca, NY: Cornell University Press, 1990.
- Murphy, Nancey. “Wind and Spirit: A Theological Autobiography.” *Dialog* 46, no. 3 (2007): 301–310.
- Musgrave, Alan. “Method or Madness? Can the Methodology of Research Programmes Be Rescued from Epistemological Anarchism?” In *Essays in Memory of Imre Lakatos*, edited by Paul Feyerabend, Robert Cohen, and Marx Wartofsky, 458–491. Dordrecht: D. Reidel Publishing Company, 1976.
- Pannenberg, Wolfhart. “Theological Appropriation of Scientific Understandings: Response to Hefner, Wicken, Eaves, and Tipler.” *Zygon* 24, no. 2 (1989): 255–271.
- Peters, Karl. “Empirical Theology in Light of Science.” *Zygon* 27, no. 3 (1992): 297–325.
- Peters, Karl. “Humanity in Nature: Conserving Yet Creating.” *Zygon* 24 (1989): 469–485.
- Peters, Karl. “Religion and an Evolutionary Theory of Knowledge.” *Zygon* 17 (1982): 285–415.
- Peters, Ted. *Playing God? Genetic Determinism and Human Freedom*. 2nd. New York: Routledge, 2003.
- Peterson, Gregory. “The Scientific Status of Theology: Imre Lakatos, Method and Demarcation.” *Perspectives in Science and Christian Faith* 50 (1988): 22–31.
- Pfeiffer, John. *The Creative Explosion: An Enquiry into the Origins of Art and Religion*. Ithaca, NY: Cornell University Press, 1982.
- Popper, Karl. *Objective Knowledge: An Evolutionary Approach*. Oxford: Clarendon Press, 1972.
- Richards, Robert. *Darwin and the Emergence of Evolutionary Theories of Mind and Behavior*. Chicago, IL: University of Chicago Press, 1987.

- Ridley, Mark. *Evolution*. 3rd ed. Oxford: Blackwell Publishers, 2004.
- Russell, Robert. "Cosmology from Alpha to Omega: Response to Reviews." *Zygon* 45, no. 1 (2010): 237–250.
- Sher, Leo. "Neuroimaging, Auditory Hallucinations, and the Bicameral Mind." *Journal of Psychiatry and Neuroscience* 25, no. 3 (2000): 239–240.
- Sittler, Joseph. "The Sittler Speeches." In *Center for the Study of Campus Ministry Yearbook*, edited by Phil Schroeder, 8–61. Valparaiso: Valparaiso University Press, 1978.
- Skinner, Michael. "Environmental Epigenetics and a Unified Theory of the Molecular Aspects of Evolution: A Neo-Lamarckian Concept that Facilitates Neo-Darwinian Evolution." *Genome Biology and Evolution* 7, no. 5 (2015): 1296–1302.
- Swingle, Mari. *I-Minds: How Cell Phones, Computers, Gaming, and Social Media are Changing Our Brains, Our Behavior, and the Evolution of our Species*. Gabriola, BC: New Society Publishers, 2016.
- Theissen, Gerd. *Biblical Faith: An Evolutionary Approach*. Philadelphia, PA.: Fortress Press, 1985.
- United Nations Environment Program. *Global Environment Outlook 2000*. London: Earthscan, 2000.
- Wadhams, Peter. *A Farewell to Ice*. London: Allen Lane, 2016.
- Wilson, Edward O. *Half-Earth: Our Planet's Fight for Life*. New York, NY: Liveright Publishing, 2016.
- Wilson, Edward O. *On Human Nature*. Cambridge, MA: Harvard University Press, 1978.
- Zardoya, Rafael, and Axel Meyer. "Molecular Evidence on the Origin of and the Phylogenetic Relationships Among the Major Groups of Vertebrates." In *Evolution: From Molecules to Ecosystems*, edited by Andrés Moya and Enrique Font, 209–217. Oxford: Oxford University Press, 2004.