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THE HOLY SPIRIT AND THE PHYSICAL UNIVERSE: THE IMPACT OF SCIENTIFIC PARADIGM SHIFTS ON CONTEMPORARY PNEUMATOLOGY

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A methodological shift occurred in the sciences in the 20th century that has irreversible repercussions for a contemporary theology of the Holy Spirit. Newton and Einstein followed fundamentally different trajectories that provide radically dissimilar frameworks for the pneumatological endeavor. Pneumatology after Einstein is located in a different cosmological framework constituted by the notions of order, rationality, relationality, symmetry, and movement. These notions provide the immediate challenges to a contemporary understanding of the Spirit in the physical universe.

THE PARADIGM SHIFT IN SCIENCE from Ptolemaic to Copernican cosmology is clearly reflected in post-Enlightenment theology. The wide-ranging implications of placing the sun instead of the earth at the center of the universe marked the beginnings of both the scientific and religious revolutions of the 16th century. A century later, Isaac Newton provided for the first time a comprehensive system of physical causality that heralded space and time as the absolute constituents of experiential reality from the perspective of both natural philosophy and theology.[1] Despite the echoes

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[1] See Isaac Newton, *The Principia: Mathematical Principles of Natural Philosophy*, ed. I. Bernard Cohen and Anne Miller Whitman (Berkeley: University of California, 1999). Important are also Newton's *Opticks*, in *Great Books of the Western World*, vol. 34, ed. Robert Maynard Hutchins (Chicago: William Benton,

of these scientific revolutions in modern theology, however, the most recent paradigm shift caused by the replacement of Newtonian physics with Einstein's theory of relativity in the 20th century is hardly visible in theological reflection.

The structure of scientific revolutions, similar to the examples mentioned above, has been the frequent subject of debate in scientific circles.[2] Theologians, on the other hand, have said very little about the impact of these paradigm shifts on religious thought.[3] More precisely, the theological debates of the late modern world are still carried out essentially under the auspices of Newtonian physics and, as William Lane Craig lamented at the end of the 20th century, "in almost complete ignorance of the philosophy of space and time and without any profound knowledge of Relativity Theory."[4]

At the beginning of the 21st century, the echoes of the latest paradigm shift are compounded by the increasing interest in the concept of "spirit," which has led both scientists and theologians to the boundaries of their respective disciplines. In fact, theology itself is experiencing a paradigm shift from a widely recognized "absence" of the Spirit in theological discussion to an overabundance of works in Pneumatology since the middle of the 20th century. Post-Newtonian physics speaks of the physical universe in terms of such concepts as energy, radiation, magnetism, waves, and field theories. Recent theological investigations speak of the Holy Spirit in surprisingly similar terms, among them the notions of energy, radiation, space, force, field, and light.[5] This juncture invites questions

1952) 373–544; and *Unpublished Scientific Papers of Isaac Newton*, trans. and ed. A. Rupert Hall and Marie Boas Hall (Cambridge, UK: Cambridge University, 1962).

[2] Some popular examples are Thomas S. Kuhn, *The Structure of Scientific Revolutions*, 3rd ed. (Chicago: University of Chicago, 1996); Paul C. W. Davies, *About Time: Einstein's Unfinished Revolution* (London: Penguin, 1995); Elie Zahar, *Einstein's Revolution: A Study in Heuristic* (La Salle, Ill.: Open Court, 1989); Joseph Agassi, *The Continuing Revolution: A History of Physics from the Greeks to Einstein* (New York: McGraw-Hill, 1968).

[3] See, e.g., Thomas F. Torrance, "Newton, Einstein, and Scientific Theology," *Religious Studies* 8 (1972) 233–50; Enrique L. Dóriga, *El universo de Newton y de Einstein: Introducción a la filosofía de la naturaleza*, 2nd ed. (Barcelona: Herder, 1984); Peter E. Hodgson, "Relativity and Religion: The Abuse of Einstein's Theory," *Zygon* 38 (2003) 393–409; Roy D. Morrison II, *Science, Theology, and the Transcendental Horizon*, AAR Studies in Religion 67 (Atlanta: Scholars, 1994) 277–349.

[4] William Lane Craig, "God and Real Time," *Religious Studies* 26 (1990) 335–47, at 335.

[5] See, e.g., Jürgen Moltmann, *God in Creation: A New Theology of Creation and the Spirit of God*, trans. Margaret Kohl (San Francisco: Harper & Row, 1985); Moltmann, *The Spirit of Life: A Universal Affirmation*, trans. Margaret Kohl

regarding the commonality of presuppositions that inform the scientific and pneumatological inquiries as well as the methodological differences that distinguish both approaches. At the heart of the debate stands the question of ascertaining a common ground for an interdisciplinary approach to the function of God's Spirit in the physical universe.

I propose that the methodological shift that occurred in the sciences in the 20th century has irreversible repercussions for a contemporary theology of the Holy Spirit. More precisely, Newton and Einstein followed fundamentally different trajectories that provide radically dissimilar frameworks for the pneumatological endeavor. Theologians have, at times, attempted to use the idea of "spirit" as a metaphor for physical realities without acknowledging that a Newtonian or Einsteinian universe yield radically different results.[6] In many ways, the renaissance in Pneumatology since the middle of the 20th century has remained indebted to Newton's philosophy of nature and ignored the implications of the most recent scientific revolution.[7]

Einstein's theory of relativity challenges the fundamental concepts of Newtonian physics and the implications reached by theology on the basis of Newton's insights. In this article, I suggest that the heart of Pneumatology after Einstein is located in a different cosmological framework constituted by the notions of order, rationality, relationality, symmetry, and movement. In light of this thesis, the task at hand is threefold: Part 1 describes the fundamental differences between Newton's and Einstein's methodological trajectories with particular attention to each cosmology. This part examines Newton's and Einstein's views on the scientific endeavor, their respective methodologies, their concept of the universe, and the position of God in the cosmos. Part 2 situates the notion of "spirit" in the cosmological frameworks provided by each paradigm and examines the implications for a pneumatological approach to the physical universe in

(Minneapolis: Fortress, 1992); Joseph A. Bracken, *Society and Spirit: A Trinitarian Cosmology* (Selinsgrove, Penn.: Susquehanna University, 1991); Wolfhart Pannenberg, *Toward a Theology of Nature: Essays on Science and Faith*, ed. Ted Peters (Louisville: Westminster John Knox, 1993); Denis Edwards, *Breath of Life: A Theology of the Creator Spirit* (Maryknoll, N.Y.: Orbis, 2004).

[6] This criticism is frequently leveled at the work of Wolfhart Pannenberg. See, e.g., Mark William Worthing, *God, Creation, and Contemporary Physics* (Minneapolis: Fortress, 1996) 123–24; John Polkinghorne, *Reason and Reality: The Relationship between Science and Theology* (Philadelphia: Trinity Press International, 1991) 93; Jeffrey S. Wicken, "Theology and Science in the Evolving Cosmos: A Need for Dialogue," *Zygon* 23 (1988) 45–55.

[7] For a similar argument with regard to contemporary Pneumatology see Wolfgang Vondey, "The Holy Spirit and Time in Contemporary Catholic and Protestant Theology," *Scottish Journal of Theology* 58 (2005) 393–409.

Newton's and Einstein's system. I conclude by suggesting a foundational paradigm for Pneumatology after Einstein.

THE FUNDAMENTAL DIFFERENCES OF NEWTON'S AND EINSTEIN'S TRAJECTORIES

The title of Newton's monumental work, *Philosophiae naturalis principia mathematica*, commonly known as the *Principia*, seems to declare unambiguously the intentions of its author: to provide a philosophy of nature based on mathematical principles. Conceived in many ways as a rebuttal of Descartes's *Principia philosophiae*, Newton's philosophical principles are framed by two fundamental coordinates: nature and mathematics.[8] However, Newton explained the goals of his endeavor in contrast to both ancient geometry, which "considered *mechanics* to be of the greatest importance in the investigation of nature and science,"[9] and the undertaking of modern science "to reduce the phenomena of nature to mathematical laws."[10] In their stead, Newton proposed that "the basic problem ... of philosophy seems to be to discover the forces of nature from the phenomena of motions and then to demonstrate the other phenomena from these forces."[11] In an unpublished preface to the *Principia*, Newton explained that the goal of his endeavor "was not to give detailed explanation of the mathematical methods, nor to provide exhaustive solutions to all the difficulties therein relating to magnitudes, motions, and forces, but to deal only with those things which relate to natural philosophy."[12] As Betty Jo Teeter Dobbs has pointed out, the grand scheme of developing a comprehensive philosophy of nature lay beyond the realm of pure mathematics.

> Newton wished to penetrate to the divine principles beyond the veil of nature, and beyond the veils of human record and received revelation as well. His goal was the knowledge of God, and for achieving that goal he marshaled the evidence from every source available to him: mathematics, experiment, observation, reason, revelation, historical record, myth, the tattered remnants of ancient wisdom.[13]

[8] See Howard Stein, "Newton's Metaphysics," in *The Cambridge Companion to Newton*, ed. I. Bernard Cohen and George E. Smith (New York: Cambridge University, 2004) 256–62; I. Bernard Cohen, "Newton and Descartes," in *Descartes: Il metodo e i saggi*, ed. Giulia Belgioioso et al. (Rome: Istuto della Encyclopedia Italiana, 1990) 607–34; Richard S. Westfall, "The Foundations of Newton's Philosophy of Nature," *British Journal for the History of Science* 1 (1962/63) 171–83.

[9] Newton, *Principia* 381.

[10] Ibid.

[11] Ibid. 382.

[12] Ibid. 51.

[13] Betty Jo Teeter Dobbs, *The Janus Faces of Genius: The Role of Alchemy in Newton's Thought* (New York: Cambridge University, 1991) 7.

In his treatise on *Opticks* (1704), Newton concluded in a similar tone that "the main business of natural philosophy is to argue from phenomena without feigning hypotheses, and to deduce causes from effects, till we come to the very first cause, which certainly is not mechanical; and not only to unfold the mechanism of the world, but chiefly to resolve these and such like questions."[14] Newton was essentially interested in neither a purely mechanical nor mathematical representation of nature, both of which failed to account for a universal agent of change.[15] The philosophy of nature he produced is open to the integration of God as the ultimate cause of all phenomena in the physical universe. This pursuit demanded in the first place a definition of the methodological presuppositions that framed Newton's scientific and theological endeavor.

Newton's scientific endeavor was confronted with the limitations of observable events, i.e., experimental reality, and the universal claims made by his theoretical statements. In general, Newton had two essential methodological options available to resolve this conflict: either *analysis*, which would begin with a universal principle and work "backward" to the details of observable reality; or *synthesis*, which would begin with known phenomena and argue "forward" through their consequences to arrive at universal laws of nature.[16] Newton used both approaches (deducing principles from observable events and explaining those events through such principles).[17] Nonetheless, in light of his emphasis on natural phenomena as the starting point for natural philosophy, Newton chose to express the results of his observations primarily by way of synthesis.[18] He was not interested in an "attempt to bring everything down to equations,"[19] but to arrive from the formulations of empirical observation at a unified metaphysics of nature.[20]

[14] Newton, *Opticks* 528–29.

[15] See Dobbs, *Janus Faces of Genius* 252.

[16] See "Analysis and Synthesis: Newton's Declaration on the Manner of Their Application in the Principia," in *The Mathematical Papers of Isaac Newton*, vol. 8, *1697–1722*, ed. D. T. Whiteside (Cambridge, UK: Cambridge University, 1981) 442–59. See Niccolò Guicciardini, "Analysis and Synthesis in Newton's Mathematical Work," in *Cambridge Companion to Newton* 308; Karl-Norbert Ihmig, "Die Bedeutung der Methoden der Analyse und Synthese für Newtons Programm der Mathematisierung der Natur," in *Philosophiegeschichte und logische Analyse = Logical Analysis and History of Philosophy*, vol. 7, *Schwerpunkt: Geschichte der Naturphilosophie = Focus: History of the Philosophy of Nature*, ed. Uwe Meixner and Albert Newen (Paderborn: Mentis, 2004) 111.

[17] See Guicciardini, "Analysis and Synthesis" 321; Ihmig, "Die Bedeutung der Methoden" 116.

[18] See Guicciardini, "Analysis and Synthesis" 322.

[19] Derek Thomas Whiteside, ed., *The Mathematical Papers of Isaac Newton*, vol. 4 of 7, *1674–1684* (Cambridge, UK: Cambridge University, 1967–81) 570–71.

[20] See Guicciardini, "Analysis and Synthesis" 324; Stein, "Newton's Metaphysics" 261.

Such a task was possible only if all natural phenomena, whether on the cosmological or particular level, are indeed governed by one or a number of universally identifiable principles.

Among the fundamental principles Newton discussed in the *Principia* as forming the universal reference frame for natural phenomena are time, space, place, and motion, and among them he distinguished between "absolute and relative, true and apparent, mathematical and common."[21] This distinction helped him not only to provide a definition of each quantity but also to relate the four quantities to each other. Newton's choice emphasizes two significant aspects of nature: (1) absolute time and space are the essential qualities that apply universally to all things; (2) relative time and space are defined essentially in terms of motion. Thus, relative time "is any sensible and external measure ... of duration by means of motion,"[22] and relative space is defined as "any movable measure of dimension" of absolute space.[23] Place is defined as "the part of space that a body occupies," and motion is effectively "the change of position of a body from one relative place to another."[24] Consequently, "the place of a whole is the same as the sum of the places of the parts and therefore is *internal* and *in* the whole body."[25] In other words, relative place and motion are subject to change, yet "the order of the parts of time" and "the order of the parts of space" are unchangeable. "All things are placed in time with reference to order of succession and in space with reference to order of position."[26] Simply put, absolute time and space form the components of a single, universal reference frame for all that exists. In this reference frame, space can be measured everywhere with the same measuring rod, and time can be measured equally with the help of a standard clock. The idea of the absolute rest of these components made them an ideal coordinate system for the understanding of all natural phenomena. In fact, absolute time and space are ontologically and epistemologically necessary for the existence of all things.[27]

> Space is a disposition of being *qua* being. No being exists or can exist which is not related to space in some way. God is everywhere, created minds are somewhere, and body is in the space that it occupies; and whatever is neither everywhere nor anywhere does not exist.... And the same may be asserted of duration: for certainly

[21] Newton, *Principia* 408.
[22] Ibid.
[23] Ibid. 408–9.
[24] Ibid. 409. See Robert Rynasiewicz, "By Their Properties, Causes and Effects: Newton's Scholium on Time, Space, Place, and Motion—I. The Text," *Studies in History and Philosophy of Science* 26 (1995) 133–53, at 139–40.
[25] Newton, *Principia* 409.
[26] Ibid. 410.
[27] J. E. McGuire, "Existence, Actuality, and Necessity: Newton on Space and Time," in *Tradition and Innovation: Newton's Metaphysics of Nature* (Dordrecht: Kluwer Academic, 1995) 5.

both are dispositions of being or attributes according to which we denominate quantitatively the presence and duration of any existing individual thing. So the quantity of the existence of God … [is] eternal, in relation to duration, and infinite in relation to the space in which he is present; and the quantity of the existence of a created thing … as great, in relation to duration, as the duration since the beginning of its existence, and in relation to the size of its presence as great as the space belonging to it.[28]

What clearly emerges from this passage is that for Newton space and time are dispositions of all that exists, including God, who is eternal and omnipresent. This explanation led Newton to the conclusion that "there can be no truly empty times or places, since God is actually present with respect to all times and places whatsoever."[29] Newton labeled space and time as "modes" of existence universally, both created and divine.[30] More importantly, although eternity and infinity are modes of God's existence, Newton denied that God is simply synonymous with these universal quantities: "He is not eternity and infinity, but eternal and infinite; he is not duration and space, but he endures and is present. He endures always and is present everywhere, and by existing always and everywhere he constitutes duration and space."[31] The result is a comprehensive (though static) system that is able to portray nature as "very consonant and conformable to herself."[32] This idea of the radical conformity of nature highlights the essential characteristic of Newton's philosophy that the cosmos is governed by time and space as a universal and homogeneous frame of reference. The investigation of natural phenomena can be carried out in principle without recourse to theology. What remained to be shown was how the various phenomena could interact with one another on a scientific level.

Although "Newton remained a mechanical philosopher in some sense," as Richard S. Westfall notes, "the ultimate agent of nature would be for him a force acting between particles rather than a moving particle itself."[33] It is Newton's notion of instantaneous, universally-acting forces that emerges as the foundation for the idea of the conformity of nature and the interaction of natural phenomena.[34] The idea of conformity

[28] Newton, "De gravitatione" 136–37.
[29] McGuire, "Existence, Actuality, and Necessity" 5.
[30] Ibid. 10–12.
[31] Newton, *Principia* 941. See McGuire, "Existence, Actuality, and Necessity" 13.
[32] Netwon, *Opticks* 531; also 540. See Cohen, "A Guide to Newton's Principia" 57.
[33] Richard S. Westfall, *Never at Rest: A Biography of Isaac Newton* (New York: Cambridge University, 1980) 390.
[34] See Wolfgang Neuser, "The Concept of Force in Eighteenth-Century Mechanics," in *Hegel and Newtonianism*, ed. Michael John Petry, International Archives of the History of Ideas 136 (Dordrecht: Kluwer Academic, 1993) 383–97; R. S. Westfall, *Force in Newton's Physics: The Science of Dynamics in the*

"substituted for the matter and motion of the mechanical philosophers, a universe augmented by the presence of forces."[35] Even though he is not the first to employ the concept of force, "Newton wants to be taken as talking of forces in the abstract, as quantities unto themselves, totally without regard to the physical mechanisms producing them."[36] In this sense, the goal of Newton's endeavor can also be described as a "conception of force applicable in principle within every field of natural philosophy."[37]

The universal concept of forces provided Newton the means to make general statements about the conformity of the physical universe. The basis for his argument on the existence of forces was formed by a proposal of the unity and transformability of all matter.[38] Newton argued that "the matter of all things is one and the same, which is transmuted into countless forms by the operations of nature."[39] In Dobbs's words, "Newton had become preoccupied with a process of disorganization and reorganization by which developed species of matter might be radically reduced, revivified, and led to generate new forms."[40] Yet, an unlimited transmutability of matter would eventually threaten the very physicality of nature itself.[41] It is therefore plausible to conceive that, for Newton, the limits of transmutability "would be set by the existence of material properties which were *not* transmutable."[42] Absolute space and time constituted a universal reference frame. Yet, since these two dimensions were themselves neither material nor a property of matter, Newton's search for an invariant quality of nature developed into a much more complex philosophical and religious system of thought.

Newton was committed to the investigation of natural forces yet remained unclear on the exact characteristics of such forces and could speak of them as "spirits emitted" or "action of aether or of air or of any medium

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Seventeenth Century (London: McDonald, 1971); Max Jammer, *Concepts of Force: A Study in the Foundation of Dynamics* (Cambridge, Mass.: Harvard University, 1957) 116–46.

[35] Derek Gjertsen, "Is Nature Conformable to Herself?" in *Hegel and Newtonianism* 645–55, at 647.

[36] Westfall, *Force in Newton's Physics* 148.

[37] Neuser, "The Concept of Force in Eighteenth-Century Mechanics" 383.

[38] See J. E. McGuire, "Transmutation and Immutability: Newton's Doctrine of Physical Qualities," in *Tradition and Innovation* 262–86.

[39] Unpublished *Conclusio* to the *Principia*, in Newton, *Unpublished Scientific Papers* 341.

[40] Dobbs, *Janus Faces of Genius* 24.

[41] See Gjertsen, "Is Nature Conformable to Herself" 649–50; Ernan McMullin, *Newton on Matter and Activity* (Notre Dame, Ind.: University of Notre Dame, 1978) 10.

[42] McMullin, *Newton on Matter and Activity* 10, emphasis original.

whatsoever—whether corporeal or incorporeal."[43] The *Principia* classifies a variety of forces, among them gravity, electricity, elasticity, and resistance, yet Newton was not afraid to refer to an unknown force as "that force, whatever it may be."[44] In her pioneering study of the role of alchemy in Newton's thought, Dobbs pointed out that Newton struggled in his goal to establish a unified system of God and nature with the integration of God into the physical universe since "his Deity remained wholly 'other' and transcendental."[45] Nonetheless, "Newton's God acted in time and with time, and since He was so transcendent, He required for His interaction with the created world at least one intermediary agent. . . . Just such an agent was the alchemical spirit, charged with animating and shaping the passive matter of the universe."[46]

The importance of alchemy in Newton's thought provides an apposite entrance for theology. In principle, Newton suggested that matter was imbued with a force that could be understood as the origin of all activity.[47] He designated this force as "spirit," and although he did not explicitly have in mind the Spirit of God, Newton's thought has provided a succinct framework for modern Pneumatology. As Thomas Torrance remarks, "It was within this outlook upon God and the universe, and with concepts of this kind, that Protestant theology developed."[48] In light of this statement, it may be noted that subsequent theology has paid little attention to Newton's criticism of the trinitarian doctrine of God.[49] As Richard Westfall notes, "Newton concealed his views so effectively that only in our day has full knowledge of them become available."[50] His main quarrel was with the patristic attempts to reconcile the one substance of God with the three Persons.[51] With regard to the Holy Spirit, however, Newton was remarkably silent in his theological criticism. The silence may be attributed to the important role of the idea of "spirit" in Newton's alchemy and in the overall construct of Newton's philosophy of nature.

[43] Newton, *Principia* 588.

[44] Ibid. 405. See I. Bernard Cohen, "A Guide to Newton's Principia," in ibid. 1–370, at 55.

[45] Dobbs, *Janus Face of Genius* 12.

[46] Ibid. 13.

[47] McMullin, *Newton on Matter and Activity* 54.

[48] Torrance, "Newton, Einstein and Scientific Theology" 239.

[49] See, e.g., Thomas C. Pfizenmaier, "Was Isaac Newton an Arian?" *Journal of the History of Ideas* 58 (1997) 57–80; Richard S. Westfall, *The Life of Isaac Newton* (Cambridge: Cambridge University, 1993) 119–251; Westfall, "Isaac Newton: Theologian," in *The Scientific Enterprise*, The Bar-Hillel Colloquium 4; Boston Studies in the Philosophy of Science 146, ed. Edna Ullmann-Margalit (Dordrecht: Kluwer Academic, 1992) 223–39.

[50] Westfall, *Life of Isaac Newton* 125**.**

[51] See Louis Trenchard More, *Isaac Newton: A Biography: 1642–1727* (New York: Dover, 1934) 642–43; Pfizenmaier, "Was Isaac Newton an Arian?" 67, 73–79.

In contrast, Albert Einstein did not endeavor to establish a general philosophy of nature. Whereas Newton's work emerged from the absence of a comprehensive scientific theory of the cosmos, Einstein was confronted with the incongruence of Newton's system and the results of contemporary scientific experiment. For Einstein, science, in general, was the "endeavor to bring together by means of systematic thought the perceptible phenomena of this world into as thoroughgoing an association as possible. To put it boldly, it is the attempt at the posterior reconstruction of existence by the process of conceptualization."[52] This process required, for Einstein, a "methodological thinking directed toward finding regulative connections between our sensual experiences."[53] Although this aspect agreed with Newton, and Einstein proposed in general that science produces knowledge of the natural world, he was convinced that "the function of setting up goals and passing statements of value transcends its domain . . . , the independent and fundamental definitions regarding goals and values remain beyond science's reach."[54] As a result, Einstein's scientific trajectory is fundamentally nontheological.

Contrary to Newton, Einstein's methodology is primarily analytical and not based on synthesis. For Newton, the various phenomena of nature observed in various experiments could yield complementary results based on a single, universal frame of reference. In the 20th century, however, symmetries between different experiments could, at best, lead to the proposal of a general principle, which in turn could be described in theoretical form, a conceptualization Einstein called "theories of principle."[55]

> These employ the analytic, not the synthetic method. Their starting point and foundation are not hypothetical constituents, but empirically observed general properties of phenomena, principles from which mathematical formulae are deducted of such a kind that they apply to every case that presents itself. . . . The theory of relativity is a theory of principle.[56]

Whereas Newton's synthetic method sought to capture laws of nature based on a single frame of reference and to apply them in the same manner to all parts of the physical universe, Einstein's analytical approach sought to describe the theoretical properties of nature invariant to a particular frame of reference.[57] The immediate result of this new trajectory is a

[52] Albert Einstein, *Ideas and Opinions*, trans. Sonja Bargmann (New York: Crown, 1954) 44.

[53] Ibid. 50.

[54] Ibid.

[55] See Zahar, *Einstein's Revolution* 90.

[56] Albert Einstein, *Out of My Later Years* (Totowa, N.J.: Littlefield, Adams, 1950) 54.

[57] See Albert Einstein and Leopold Infeld, *The Evolution of Physics: From Early Concepts to Relativity and Quanta* (New York: Simon & Schuster, 1938) 156–57.

radically different perspective on space and time.[58] Pondering the cosmological difficulties of Newton's work, Einstein remarked on the infinite nature of the universe.

> As regards space (and time) the universe is infinite. . . . In other words: However far we might travel through space, we should find everywhere an attenuated swarm of fixed stars of approximately the same kind of density. This view is not in harmony with the theory of Newton. The latter theory requires that the universe should have a kind of centre in which the density of stars is a maximum, and that as we proceed outwards from this centre the group density of the stars should diminish, until finally, at great distances, it is succeeded by an infinite region of emptiness. . . . Such a finite material universe would be destined to become gradually but systematically impoverished.[59]

Einstein's critique highlights the difficulties of Newton's cosmology, which posits space and time as the absolute, nonmaterial coordinates of the physical universe. All matter contained in this system is related to these constants through the intermediate presence of the ether, while the properties of space (extension) and time (duration) are independent of matter. The general theory of relativity, on the other hand, postulates that the properties of space and time are not independent of the material universe. In the place of absolute space and time, Einstein postulates a codependent spatiotemporal universe.

As Einstein remarks, Newton's central concept of instantaneous, universally acting forces was irreconcilable with Maxwell's theory of electricity and Faraday's concept of the field developed since the 1860s.[60] Although the field was initially conceived as a mechanical *condition* of the ether, this interpretation was eventually abandoned. In its stead, the field *itself* became "the ultimate irreducible foundation stone of physical reality."[61] This development first led to the special theory of relativity, which introduced the speed of light as the limiting velocity in a new law of motion, and then to the general theory of relativity, to which Einstein ascribes the more fundamental changes in the modern conception of the physical universe.

> Quantitatively [the general theory of relativity] made little modification in Newton's theory, but qualitatively a deep-seated one. Inertia, gravitation, and the metrical behavior of bodies and clocks were reduced to the single quality of a field,

[58] For Einstein's central postulates see Michio Kaku, *Einstein's Cosmos: How Albert Einstein's Vision Transformed Our Understanding of Space and Time* (New York: Norton, 2004) 64.

[59] Albert Einstein, "Considerations on the Universe as a Whole," in *Theories of the Universe: From Babylonian Myth to Modern Science*, ed. Milton K. Munitz (Glencoe, Ill.: Free Press, 1957) 275.

[60] Albert Einstein, "Isaac Newton," *Annual Report of the Board of Regents of the Smithsonian Institution* 82 (1927) 201–7, at 205.

[61] Ibid.

and this field in turn was made dependent on the bodies. . . . Space and time were so divested, not of their reality, but of their causal absoluteness . . . , which Newton was compelled to attribute to them in order to be able to give expression to the laws then known.[62]

Space and time were necessary, universal coordinates for the exposition of Newton's laws. While Einstein preserved the necessity of space and time, he rejected their absolute and independent character. As he elucidates, in contrast to Newton, "space and time cannot be defined in such a way that differences of the spatial coordinates can be directly measured by the unit measuring-rod, or differences in the time co-ordinate by a standard clock."[63] Instead, the general theory of relativity intimately bound together the extension of space to the duration of time.[64] Einstein's former teacher Herman Minkowski remarked succinctly, "Henceforth space by itself, and time by itself, are doomed to fade away into mere shadows, and only a kind of union of the two will preserve an independent reality."[65] Einstein maintained with Newton that space and time were epistemologically necessary for the existence of all things. Their ontological quality, however, was bound to each other as codetermining coordinates of the physical universe.

Einstein observed that in Newtonian physics, "the two-dimensional continuum can be split into two one-dimensional continua: time and space."[66] The missing conjunction in Einstein's space-time, which had held Newton's space *and* time in their absolute position as omnipresent active participants in all natural phenomena, joined together what had been separated. "The splitting of the two-dimensional continuum into two one-dimensional ones seems, from the point of view of the relativity theory, to be an arbitrary procedure without objective meaning."[67] As a result, the relative measure of space and time is not identical in all reference frames. In fact, the symmetry of space-time is changed by passing from one reference frame to another. Ontologically, space-time remains a disposition of all existing things, albeit not in an "absolute" manner.

The immediate impact of Einstein's theory on a Newtonian philosophy of nature is seen especially with regard to the notion of forces. The general theory of relativity contradicts the Euclidian geometry that formed the

[62] Ibid. 206.

[63] Albert Einstein, "The Foundation of the General Theory of Relativity," in *Principle of Relativity: A Collection of Original Memoirs on the Special and General Theory of Relativity*, ed. Albert Einstein et al., trans. W. Perrett and G. B. Jeffery (New York: Dover, 1952) 117.

[64] See Wicken, "Theology and Science" 51.

[65] Herman Minkowski, "Space and Time," in *Principle of Relativity* 75–91, at 75.

[66] Einstein and Infeld, *Evolution of Physics* 206.

[67] Ibid. 207.

foundation for Newton's calculations and, as Einstein remarked, "diverges widely from that of Newton with respect to its basic principle."[68] The principle Einstein referred to was the concept of force, which had allowed Newton to make general statements about the conformity of the physical universe. Newton's forces were only conceivable in relation to space and time as a whole. In addition, space and time themselves remained unaffected by these forces. Einstein, on the other hand, rejected both the autonomous character of space and time and the idea of instantaneously acting forces. As physicist Michio Kaku summarizes, "'Force' is now revealed to be an illusion, a by-product of geometry."[69] In its place appears the concept of the field.

Properly speaking, the concept of forces has not disappeared. As renowned physicist and philosopher Max Jammer remarked in his study of dynamics, "It has been transferred, so to say, only to a different plane. It lies now in the functional relation between the space-time structure and the mass-energy distribution, or, in other words, in Einstein's field equations."[70] Field theory indeed proposed that all natural phenomena are constituted by forces as an irreducible constituent of nature.[71] However, these forces were eventually understood as acting upon one another without the mechanical properties Newton sought to ascribe to them. Einstein saw fields as properties of the symmetry that unified space and time. The idea of symmetry, in general, points to the presence of balance and proportion.[72] The explicit use of this concept in modern physics is often taken to mean invariance (the absence of any observable change with respect to a transformation).[73] The significance of symmetry is rooted in the fact that it can be demonstrated within the rules of a formal system, particularly mathematics, and thereby provide a unified description of the fundamental laws of nature.[74] Einstein's emphasis on the symmetry of space and time helped subsume Newton's theory of forces into a larger theory that sought "to explain the origin of matter itself, *to construct matter out of*

[68] Einstein, *Out of My Later Years* 57. See also Einstein, "Foundation of the General Theory of Relativity" 160–62.

[69] Kaku, *Einstein's Cosmos* 98.

[70] Jammer, *Concepts of Force* 261.

[71] On the development of field theory see Jammer, *Concepts of Force* 200–264; Mary B. Hesse, *Forces and Fields: The Concept of Action at a Distance in the History of Physics* (New York: Philosophical Library, 1962).

[72] Hermann Weyl, *Symmetry* (Princeton, N.J.: Princeton University, 1952) 3.

[73] See Wolfgang Ludwig and Claus Falter, *Symmetries in Physics: Group Theory Applied to Physical Problems* (New York: Springer, 1988); Joe Rosen, *Symmetry in Science: An Introduction to the General Theory* (New York: Springer, 1995); Katherine Brading and Elena Castellani, *Symmetries in Physics: Philosophical Reflections* (New York: Cambridge University, 2003.

[74] See Brading and Castellani, *Symmetries in Physics* 12.

geometry."[75] Where Newton had struggled to relate forces to space and time, on the one hand, and to matter, on the other, Einstein made matter an integral part of existence in the space-time continuum.

A further impact of Einstein's trajectory is felt at the concept of motion. Simply put, Newton's laws define motion as a concept of acceleration occurring within the coordinates of absolute space and time (themselves unaffected by the motion of bodies). In this theory, Einstein commented, "Newton's space must be thought of as 'at rest,' or at least as 'unaccelerated,' in order that one can consider the acceleration . . . as being a magnitude with any meaning. Much the same holds with time."[76] For Einstein, however, extension and duration depend on the mass and velocity of bodies. On a cosmological scale, space-time itself could be considered subject to motion, an aspect that abandoned the static coordinate system of Newton and led to the idea of curved space-time and a finite, yet unbounded cosmos[77]—in other words, the idea of the expanding universe, which has become the standard cosmological model for post-Newtonian physics.

Einstein's ontological trajectory has deep implications for a theology that is steeped in Newton's philosophy of nature. Newton's distinction between space and time was necessary for him to distinguish between the eternity and ubiquity of God. By implication, Einstein's symmetry of space and time implies that God's eternal duration is not diffused equally throughout all parts of space. Einstein's scientific papers lack any explicit theological references. Nonetheless, the implications of the theory of relativity for the existence of God have been widely discussed throughout the 20th century.[78] Einstein did not intend to question the existence of a divine being. However, much less attention has been paid to the question how this God is actually present in Einstein's physical universe.

In general, Einstein's trajectory forbids the postulate of God as a personal being. He was convinced that the anthropomorphic conception of God presented the main source of conflicts between science and religion.[79] In its place is found what Einstein called a "cosmic religious feeling." He described this perspective succinctly as a form of pantheism. "This firm belief, a belief bound up with deep feeling, in a superior mind that reveals itself in the world of experience, represents my conception of God.

[75] Kaku, *Einstein's Cosmos* 174, emphasis original.

[76] Albert Einstein, *Relativity: The Special and the General Theory* (New York: Random House, 1961) 155.

[77] Einstein, *Considerations on the Universe as a Whole* 276–78.

[78] See Max Jammer, *Einstein and Religion: Physics and Theology* (Princeton, N.J.: Princeton University, 1999) 65–151.

[79] Einstein, *Ideas and Opinions* 47–48.

In common parlance this may be described as 'pantheistic.'"[80] The chief theological postulate of Einstein's pantheism is the presence of God in the cosmos: "The divine reveals itself in the physical world."[81] This meant in the first place that, like Newton, Einstein did not attribute any material attributes to God. Moreover, unlike Newton, whose God is present in the absolute realm of space and time, Einstein's intimate connection of space-time and matter effectively places God outside the realm of physical reality. Contrary to the Judeo-Christian concept of God, Einstein's pantheistic deity is present in the cosmos in a "superpersonal" manner.[82] Although the theological development of the idea of divine personhood has also emphasized the analogical and often apophatic manner of understanding the divine "person," Einstein's "superpersonal" deity stands in particular contrast to the trinitarian doctrine of God. The pantheistic notion of God leaves no room for the absolute opposition of relation that characterizes the divine persons. In the second place, and as a result of the former, Einstein's pantheism portrays God as a rational being, who, although not present as person in the natural world, can nonetheless be comprehended in the laws of nature. In fact, he suggested that "every one who is seriously involved in the pursuit of science becomes convinced that a spirit is manifest in the laws of the Universe—a spirit vastly superior to that of man."[83] Here, the term "spirit" has three primary functions. First, Einstein's "spirit" (*Geist*) is the rationality of the cosmic order that lay at the basis of his cosmic religious feeling. Second, this "spirit" expresses a radically unitarian concept of the presence of God in the physical universe. Finally, the "spirit" manifest in the laws of nature is a radically immanent entity that imbues the physical universe with meaning and order. The immanentist, unitarian, impersonal, and pantheistic qualities of Einstein's universe stand in stark contrast to the transcendent, trinitarian, and personal structures of classical theism.

THE NOTION OF "SPIRIT" IN NEWTON'S AND EINSTEIN'S COSMOLOGY

Newton's philosophy of nature suggests three major constituents for Pneumatology: (1) absolute space and time as the universal framework

[80] Ibid. 38, 262.

[81] Ze'ev Rosenkranz, ed., *Albert through the Looking-Glass: The Personal Papers of Albert Einstein* (Jerusalem: Jewish National and University Library, 1998) 80.

[82] See Einstein, *Ideas and Opinions* 45. See also Paul Tillich, "The Idea of a Personal God," *Union Review* 2 (1940) 8–10.

[83] Helen Dukas and Banesh Hoffmann, ed., *Albert Einstein: The Human Side* (Princeton, N.J.: Princeton University, 1979) 33.

for the function of the divine Spirit, (2) Newton's notion of "spirit" itself as a vital principle operating in the natural world, and (3) the concept of "force" as a nonmaterial medium for the origin of all physical activity.

Space and time are the fundamental components of a Newtonian account of God. More precisely, the existence of God cannot be described without referring to these components, even though the extension of space and the duration of time are exhausted in the presence of God. Since Newton stated in the *Principia* that both space and time exist without reference to anything external, the divine essence also cannot be external to them, while at the same time Newton had to safeguard that God was not subject to the limitations of the physical universe. "The supreme God is an eternal, infinite, and absolute perfect being; but a being, however perfect, without dominion is not the Lord God."[84] In order to be lord of time and space, Newton considered that God had to be "one and the same God always and everywhere."[85] This meant that God "is omnipresent not only *virtually* but also *substantially*; for action requires substance."[86] In an earlier text, Newton makes this connection more explicit.

> Space is eternal in duration and immutable in nature, and this because it is the emanent effect of an eternal and immutable being. If ever space had not existed, God at that time would have been nowhere; and hence he either created space later (in which he was not himself), or else, which is not less repugnant to reason, he created his own ubiquity.[87]

Newton apparently considered God substantially present in the natural world because space and time are emanative effects of God's existence. As J. E. McGuire has shown, Newton's proposal is not simply following the emanationist accounts of some of his contemporaries but expresses more importantly that "God's eternal existence is coeval with the existence of infinite space and time."[88] Newton's basic scientific postulate was that time and space are ubiquitous. His theological reasoning suggests that wherever there is duration and extension, there is God. Hence, God exists everywhere and at all times "in the same absolute spatio-temporal framework."[89] However, scientifically, space and time are related to each other only as absolute coordinates of a universal frame of reference (i.e., in their ubiquity) and not directly through their extension and duration. This meant, by inference, that Newton's reasoning intended to explain *that* God exists but failed to give an account of *how* God is present in the natural world. Space and time accounted for the existence but not the

[84] Newton, *Principia* 940–41. [85] Ibid. 941.
[86] Ibid., emphasis original.
[87] Newton, "De gravitatione" 137. See also McGuire, "Existence, Actuality, and Necessity" 9–19.
[88] McGuire, "Existence, Actuality, and Necessity" 15–16.
[89] Ibid. 38.

activity of all things. Since Newton's natural philosophy pivots on the assumption that nature is conformable and life is cohesive, he set out to find a universal principle of activity in the physical universe that accounted for both the natural and the divine.

The challenge of positing God in Newton's universe consisted primarily in reconciling God's presence with the activity of matter. Newton's insistence that God was present not only virtually but substantially was based on the premise of the continuing activity of God in nature since "active power [virtus] cannot subsist without substance."[90] However, this meant that even though "all things are contained and move" in God, "he does not act on them nor they on him. . . . It follows that all of him is like himself: he is . . . all force . . . of acting, but in a way not at all human, in a way not at all corporeal, in a way utterly unknown to us."[91]

With this discussion of God, the reader has arrived at the end of the *Principia*. In his attempt to relate his theological considerations to the scientific endeavors of his work, Newton leaves the reader with a surprising reference to a "spirit" pervading the natural world. The work ends with the statement that this approach to the idea of spirit in the physical universe is yet undefined, as "there is not a sufficient number of experiments to determine and demonstrate accurately the laws governing the actions of this spirit."[92] The chief task in this endeavor is the explanation of this "spirit" as substantially situated in a spatiotemporal framework without being corporeally present in the natural world. In his alchemical writings Newton pursued with particular fervor the idea of a "subtle spirit" that operated in the natural world.[93] Indebted to the mechanical universe of his student years, Newton's imagination with regard to the idea of spirit surfaced particularly in the concept of a new vital ether.

Newton's initial views of the ether were indebted to Descartes's postulate of the ancient concept of an imperceptible medium capable of transmitting activity and endowed with mechanical properties.[94] In his

[90] Newton, *Principia* 941; literal translation by I. Bernard Cohen.
[91] Ibid. 941–42. [92] Ibid. 944.
[93] See, e.g., Betty Jo Teeter Dobbs, *The Foundations of Newton's Alchemy or "The Hunting of the Green Lyon"* (New York: Cambridge University, 1975); Richard S. Westfall, "The Role of Alchemy in Newton's Career," in *Reason, Experiment, and Mysticism in the Scientific Revolution*, ed. M. L. Righini Bonelli and William R. Shea (New York: Science History, 1975) 189–232; Bonelli and Shea, "The Influence of Alchemy on Newton," in *Science, Pseudo-Science, and Society*, ed. Marsha P. Hanen et al. (Waterloo, Ont.: Wilfrid Laurier University, 1979) 145–69.
[94] Isaac Newton, *De Aere et Aethere*, in *Unpublished Scientific Papers* 214–28; Newton, "Newton's Letter's to Boyle, Feb. 28, 1678/9, and to Oldenburg, Jan. 25, 1675/6," in *Isaac Newton's Papers & Letters on Natural Philosophy*, ed. I. Bernard Cohen (Cambridge, Mass.: Harvard University, 1958) 249–54.

alchemical writings, Newton eventually proposed a quasimechanical, material ether and distinguished between its active (vegetative) and passive (mechanical) functions.[95] In his treatise, "Of Natures obvious laws & processes in vegetation," Newton describes the fusion of both aspects.

> This is the subtle spirit which searches the most hidden recesses of all grosser matter, which enters their smallest pores and divides them more subtly than any other material power whatever. . . . This is nature's universal agent, her secret fire, the only ferment and principle of all vegetation. . . . And thus perhaps a great part if not all the moles of sensible matter is nothing but aether . . . not wholly distinct . . . nor wholly joined and compacted together.[96]

As Dobbs has shown, Newton considered a radically transcendent God the ultimate cause of all natural phenomena and therefore wrestled with the existence of an intermediary agent between God and the world.[97] The ether provided such an intermediary, since it was both uniform and universal, yet it continually resisted precise definition. Dobbs argues convincingly that the Stoic concept of *pneuma* massively influenced the ideas and tone of Newton's cosmological idea of this ether.[98] The world is formed and shaped by a cosmic *pneuma* or ether. More exactly, Newton proposed the existence of an internal ether dwelling within bodies and of a dense, external ether on the outside.[99] At the same time, the ether exhibited both active and passive functions that led Newton to believe that "the aether is but a vehicle to some more active spirit. The bodies may be concreted of both together; they may imbibe aether as well as air in generation, and in that aether the spirit is entangled."[100]

Newton's choice of the term "spirit" reveals the difficulties in defining the properties of the etherial medium. The logical problem of the ether consisted of the question what primary cause could be assigned to the movement of the ether itself. Experimentally, no such "spirit" could be verified. Furthermore, Newton's distinction of internal and external effects of the ether proved untenable, and Newton eventually abandoned the idea

[95] See L. Rosenfeld, "Newton's Views on Aether and Gravitation," *Archive for History of Exact Sciences* 6 (1969) 29–37; Betty Jo Teeter Dobbs, "Newton's Rejection of the Mechanical Aether: Empirical Difficulties and Guiding Assumptions," in *Scrutinizing Science: Empirical Studies of Scientific Change*, ed. Arthur Donovan et al. (Baltimore: Johns Hopkins University, 1988) 69–83.

[96] Isaac Newton, "Of Natures obvious laws & processes in vegetation," in *Janus Faces of Genius* 100–101; Dibner Collection MSS 1031B, in ibid. 256–70.

[97] Dobbs, *Janus Faces of Genius* 36–37.

[98] Ibid. 27–29.

[99] Isaac Newton, Letter to Robert Boyle, in *Isaac Newton's Papers & Letters* 250.

[100] Newton, "Of Natures obvious laws & processes in vegetation," f. 4r; in *Janus Faces of Genius* 101–2.

of the material ether in favor of the notion of forces.[101] At this point, little research exists on the intersection of Newton's alchemical writings with his larger scientific work.[102] In essence, the abandonment of the concept of the ether compelled Newton to move the alchemical notion of "spirit" together with the scientific notion of "force."

For Newton's opponents, the result of wedding the alchemical idea of "spirit" with the scientific notion of "forces" bordered on the occult.[103] Despite the unresolved questions of the origin of Newton's forces, he maintained that all forces could be quantified by natural phenomena. This ontological status given to forces effectively established the roots of modern science; at the same time, the spiritual status attributed to such forces provided a uniform framework for modern Protestant and Catholic theology. The impact of Netwon's ideas can be observed in the thought of such influential thinkers as Karl Barth, Karl Rahner, Wolfhart Pannenberg, and Jürgen Moltmann.[104] The main tension in this application consisted of the fact that the spiritual connotations of forces could not be translated into a pure mechanical philosophy of nature.[105] As a result, Newton and his successors continued to struggle with the unresolved possibilities of a universal spiritual agent, which, as Dobbs highlights, "Newton apparently conceived as quasi-material inhabitants of the grey area between the complete incorporeality of God and the full solidity of body."[106] Although God is seen as the ultimate cause of all things, the idea of a universally present, vital spirit offered the opportunity to show a more immediate cause for natural phenomena while maintaining the transcendence of God. In this way, Newton sought to avoid the dangers of atheism, deism, and pantheism. The struggle was whether this intermediate spirit was itself a divine or a created agent. Dobbs points out that Newton "called it a 'spirit,' as he had called God a 'spirit' . . . , but seventeenth-century 'spirits' were notoriously ambiguous, existing in a broad gray area between solid matter and Deity."[107] Whereas Newton hesitated to draw the theological implications of his own view, the influence of his thought on the theological schools of the 18th and 19th centuries is well attested.[108]

[101] See Westfall, *Force in Newton's Physics* 373–77.

[102] The exception is Dobbs, *Janus Faces of Genius* 89–249; Dobbs, *Foundations of Newton's Alchemy* 194–232.

[103] See Dobbs, *Foundations of Newton's Alchemy* 211; Westfall, *Force in Newton's Physics* 386–91.

[104] See Vondey, "The Holy Spirit and Time" 396–405.

[105] See Westfall, *Force in Newton's Physic*s 391.

[106] Dobbs, "Newton's Rejection of the Mechanical Aether" 80.

[107] Dobbs, *Janus Faces of Genius* 95.

[108] See Jammer, *Concepts of Force* 116–57; William H. Austin, "Isaac Newton on Science and Religion," *Journal of the History of Ideas* 31 (1970) 521–42; Arthur Quinn, "On Reading Newton Apocalyptically," in *Millenarianism and Messianism*

A closer look at the pneumatological framework of Newtonian physics reveals that at the heart of the Newtonian philosophy of nature stands the possibility of a direct, divine activity in creation, that is, at the least, a causal relationship between God's existence and the activity of the cosmos through a vital spirit. From a scientific perspective, "Newton concluded that only spirit could penetrate to the centers of bodies without causing retardation."[109] In this pneumatological framework, the divine Spirit is responsible for the conformity and coherence of life, even if it is not possible to determine this Spirit as the ultimate cause of all things. In summary, Newtonian Pneumatology consists of at least the following elements:

(1) spirit is a necessary component for a philosophy of nature.
(2) spirit is an intermediate agent of the transcendent God in creation.
(3) spirit is a universal principle present in all natural phenomena.
(4) spirit is an internal medium of infinite duration (time) and extension (space).
(5) spirit is a cohesive and conforming force in nature.

In contrast, Einstein is critical of Newton's postulate of absolute time and space, the mechanical basis for his thought, and the universal applicability of his concepts of force and motion in a universal reference frame. At the second centenary of Newton's death, Einstein remarked that "Newton's basic principles were so satisfying from a logical standpoint that the impulses to fresh departures could only come from the pressure of the facts of experience."[110] The experimental objections to which Einstein referred form the very heart of Newton's philosophy of nature: the postulate of absolute time and space and the idea of direct, instantaneously acting forces.[111] The theory of relativity replaces the autonomous coordinates of space and time with the symmetry of space-time and the concept of forces with the theory of the field. Behind these more apparent transformations, however, lies a more subtle change in the understanding of the relation between the space-time continuum and physical matter. Einstein elucidates this change within the scientific concept of space:

> Space remained until the most recent time simply the passive container of all events, without taking part in physical occurrences. Thought only began to take a new turn with the wave-theory of light and the theory of the electromagnetic field

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in English Literature and Thought, 1650–1800, ed. Richard H. Popkin (Leiden: Brill, 1988) 176–92; Walter Stangl, "Mutual Interaction: Newton's Science and Theology," in *Perspectives on Science and Christian Faith* 43 (1991) 82–91; James E. Force and Richard H. Popkin, eds., *Newton and Religion: Context, Nature, and Influence* (Dordrecht: Kluwer Academic, 1999).

[109] Dobbs, *Janus Faces of Genius* 211.

[110] Einstein, "Isaac Newton" 204. [111] Ibid. 201–2.

of Faraday and Maxwell. It became clear that there existed in free space states which propagated themselves in waves, as well as localized fields which were able to exert forces. . . . Since it would have seemed utterly absurd to the physicist of the nineteenth century to attribute physical functions or states to space itself, they invented a medium pervading the whole of space, on the model of ponderable matter—the ether.[112]

Einstein was critical of the "reinvention" of Newton's ether theory, which propagated the ether as the center of all forces acting universally across space. For Einstein, the idea of the ether showed the weakness of the theory of absolute space and time in Newton's system, a "shadowy conception" of "something" that relates matter to absolute space.[113] This interpenetration of matter and ether had formed the basis for Newton's alchemical perspective on the existence of a vital spirit in the cosmic order. Einstein's universe had no room for this mechanistic association.

Explaining the advancement of physics, Einstein criticized the mechanistic view of the cosmos for attempting to reduce all natural phenomena to forces acting between particles, which had formed the substance of Newton's ether theory.[114] Although Einstein did not abandon the notion of the ether completely, for him it served "only to express some physical property of space" and "no longer stands for a medium built up of particles."[115] Instead, Einstein's special theory of relativity stripped the ether of its fundamental mechanical quality, immobility, and in so doing made the ether unnecessary.[116]

Einstein was not engaged in alchemy, and the notion of a vital "spirit" is foreign to both his vocabulary and conceptual thinking. A direct comparison with the pneumatological framework of Newtonian physics is therefore not possible. However, Newton's central perceptions of a "spirit" as an etherial medium, framed by the absolute coordinates of space and time, and engaged in the natural world through forces, appears with similar vocabulary also in Einstein's work, albeit with radically different conclusions. These coordinates allow for a further evaluation of the notion of spirit in Einstein's work.

As Einstein remarked, "the special theory of relativity forbids us to assume the ether to consist of particles observable through time, but the hypothesis of ether in itself is not in conflict with the special theory of

[112] Einstein, *Ideas and Opinions* 280. See also Albert Einstein, "Ether and Relativity," in *Sidelights on Relativity*, trans. G. B. Jeffery et al. (New York: Dutton, 1923) 5.

[113] Einstein, "Isaac Newton" 204–5.

[114] Einstein and Infeld, *The Evolution of Physics* 151.

[115] Ibid. 153.

[116] Albert Einstein, "Zur Electrodynamik bewegter Körper," in *The Collected Papers of Albert Einstein*, vol. 2, *The Swiss Years: Writings, 1900–1909* (Princeton, N.J.: Princeton University, 1989) 277; Einstein, "Äther und Relativitätstheorie" 312.

relativity."[117] However, the ether theory had effectively merged the three dimensions of space into a single continuum. Einstein's introduction of the relativity of simultaneity now merged space and time and yielded a four-dimensional space that includes the dimension of time: "The ether in the general theory of relativity is a medium which is itself devoid of *all* mechanical and kinematical qualities, but helps to determine mechanical (and electromagnetic) events."[118] Put differently, the "ether not only *conditions* the behavior of inert masses, but *is also conditioned* in its state by them."[119] The theoretical framework to formulate this idea of the immaterial, nonmechanical ether was provided by the field concept.

From a pneumatological perspective, the replacement of the ether with the field removes the basis for the continuing use of Newton's notion of "spirit." The ether theory had provided Newton with a physical reality for a universal agent in nature, which his alchemical work could interpret as a vital spirit. Einstein, on the other hand, was weary of the existence of an all-penetrating ether: "One could never get a clear picture of the interior forces governing the ether, nor of the forces acting between the ether and . . . matter."[120] The field concept explains the forces of nature in contrast to Newton's theory on the basis of the functional symmetry of the space-time continuum and its inherent mass-energy distribution. As a result, Einstein admits, "Many physicists maintain . . . that in face of these facts not only the differential law but the law of causality itself—hitherto the ultimate basic postulate of all natural science—fails."[121]

The theological implications of Einstein's revision of Newtonian physics are not immediately apparent. His scientific writings provide neither explicit theological observations nor references to an intermediary agent as in Newton's alchemical research. Einstein's revision of the ether theory further complicates the matter. In its dialogue with science, Pneumatology—which is at large more akin to the synthetic method—has tended to begin with particular theories and concepts rather than by appropriation of an overarching scientific cosmology. In this context, the field theory has offered the most widely acknowledged basis for a pneumatological appreciation of Einstein's scientific work. The most prominent approach is that of Wolfhart Pannenberg, who sees the significance of the field in its independence from a material medium, such as the ether, and in its connection to the concepts of space and time.[122] Pneumatology, he suggests, can speak of

[117] Einstein, "Ether and Relativity" 15.
[118] Ibid. 19, emphasis original.
[119] Ibid. 18, emphasis original.
[120] Einstein, *Out of My Later Years* 75.
[121] Einstein, "Isaac Newton" 207.
[122] The concept is developed in Wolfhart Pannenberg, *Systematic Theology*, vol. 2, trans. Geoffrey W. Bromiley (Grand Rapids, Mich.: Eerdmans, 1994) 76–135; Pannenberg, *Toward a Theology of Nature: Essays on Science and Faith*, ed. Ted Peters

the divine Spirit as field both metaphorically and conceptually. However, Pannenberg's major historical support for this theological appropriation of the field theory is the supposed origin of the field concept in the ancient Stoic notion of *pneuma*—the same concept that served as a basis for the abandoned proposition of Newton's ether.

Pannenberg's use of the field concept has been widely criticized. In response to his critics, he points repeatedly to the Neoplatonic idea of the universal *pneuma* and the existence of an undivided whole of space and time.[123] Yet, both aspects gather support primarily from Newtonian physics, not from Einstein's theory of relativity. There is no historical evidence that the Stoic concept of *pneuma* directly influenced Einstein.[124] Whereas alchemy provided a bridge for Stoic ideas in Newton's work, there is no such bridge in Einstein's scientific endeavor. Furthermore, such an influence is highly improbable in light of the remaining incongruence of the concepts of force and field, in general, as well as Einstein's rejection of Newton's ether.

In addition, Pannenberg understands space and time "as an infinite and undivided whole,"[125] a thoroughly Newtonian idea, and speaks with a strikingly similar tone of "God's immensity and eternity," "the undivided space of God's omnipresence" and "the presence of his eternity."[126] Einstein, on the other hand, collapses the dual entities of space and time into one symmetrical continuum, invariant to a particular reference frame, and with various forms of representing that invariance. As a result, within the infinite universe there remains the possibility of a variety of types of fields and the possibility that "a part of space may very well be imagined without an electromagnetic field."[127] Furthermore, the separation of field and matter, which forms the basis for Pannenberg's field-Pneumatology, cannot be found in Einstein or the currently accepted quantum field theory.[128] While Pannenberg distinguishes the field scientifically from Newton's quasimaterial ether, he fails to distinguish the ideas conceptually. From a pneumatological perspective, Newton's spirit-filled ether and Pannenberg's Spirit-as-field are virtually indistinguishable.

A closer look at the pneumatological framework of the Einsteinian universe reveals that Einstein's cosmology provides no relative counterpart to Newton's proposal of a direct divine agent or a causal relationship

(Louisville: Westminster John Knox, 1993) 37–41; Pannenberg, "God as Spirit—and Natural Science," *Zygon* 36 (2001) 783–94.

[123] See Wolfhart Pannenberg, "Response to John Polkinghorne," *Zygon* 36 (2001) 799–800; Pannenberg, "God as Spirit" 788–91.

[124] See Jammer, *Concepts of Force* 30–52.

[125] Pannenberg, "God as Spirit" 790.

[126] Ibid. 791.

[127] Einstein, "Ether and Relativity" 21.

[128] Ibid. 22.

of God and the physical universe. At his own admission, Einstein's religiosity "consists in a humble admiration of the infinitely superior spirit that reveals itself in the little that we ... can comprehend of reality."[129] Einstein's cosmology endorsed neither an atheistic concept of reality nor the pneumatological perspective of Christian theism. The "spirit" he admired was the rational order of the universe.

The rationality and intelligibility of the cosmos converted Einstein "into a believing rationalist."[130] The cosmic, religious feeling is caused not only by the order of the universe *per se* but by the possibility to understand that order. For Einstein, "the eternal mystery of the world is its comprehensibility."[131] There exists, therefore, a relational continuity between the cosmic order and human reason.[132] Although the "ordered regularity" of the cosmos left no room for a divine being "as an independent cause of natural events,"[133] a pneumatological approach to Einstein's cosmos is in its most fundamental sense a "striving after the rational unification" of natural phenomena "moved by profound reverence for the rationality made manifest in existence."[134] In this sense, Einstein understood the scientific task as informed by a "religious attitude" even if his cosmic religion was not intended to lead to a definite notion of God or to a theology.

Much like Newton, Einstein sees the conformity and coherency of life from a spirit-filled perspective. However, the concept of "spirit" in Einstein's work differs radically from that of Newton. At the basis of a Pneumatology in Einstein's universe stand at least the following elements:

(1) spirit is a necessary component in the scientific endeavor.
(2) spirit is the rational order of the universe.
(3) spirit is a universal principle present in all natural phenomena.
(4) spirit is the symmetry of the space-time continuum.
(5) spirit has no physical, material reality.

Similar to Newton's universe, Einstein's is fully endowed with the basis for a pneumatological framework, albeit not in the form of a subjectivized, substantial, quasimaterial, mediating presence of a transcendent God. In contrast to Newton's conception, for Einstein "spirit" is the ordering principle of all existence and not the vital principle of all activity. As a result, the focus of Pneumatology falls on "spirit" as a term of divine essence rather than a divine person. As such, the Spirit is comprehensible but not directly

[129] Dukas and Hoffmann, *Albert Einstein* 66.
[130] Ibid. 67.
[131] Einstein, *Out of My Later Years* 61.
[132] See Morrison, *Science, Theology, and the Transcendental Horizon* 345.
[133] Einstein, *Ideas and Opinions* 48.
[134] Ibid. 49.

observable. Anthropomorphic and personal conceptions of God and God's Spirit are largely incompatible with Einstein's perspective. The fact that this contrast has not been sufficiently explored by contemporary theology is one of the reasons for the lack of distinction given to the differences between Pneumatology in a Newtonian and in an Einsteinian universe.

PNEUMATOLOGY AFTER EINSTEIN

A scientific theology after Einstein does not have to adopt his religious beliefs. It is, however, indebted to the challenges and opportunities left by Einstein's scientific program and its postulate of a superpersonal, nonetherial, and nonsubstantial spirit. The chief task of a scientific Pneumatology after Einstein will be the adoption of a general cosmological framework.

Five major opportunities stand out in this task for a contemporary Pneumatology in light of the scientific paradigm shift described in this article, namely, the understanding of the Spirit in terms of (1) order, (2) rationality, (3) relationality, (4) symmetry, and (5) movement. An integration of these aspects into the traditional doctrinal landscape encounters particular challenges with regard to the transcendence of the divine nature, the trinitarian character of God, and the personhood of the Holy Spirit.

(1) *Order*. Pneumatology after Einstein demands an incorporation of God's Spirit in the cosmic order.[135] The notion of "order" as such represents a methodological approach to the wholeness and structure of the cosmos. At the heart of this notion in the sciences stands the problem of the organization of interrelated phenomena in the physical universe. Ludwig von Bertalanffy has argued successfully for the centrality of this problem in the various branches of science and proposed the existence of general system laws.[136] Einstein's quest for a unified field theory was in essence a search for a general systems theory. The development of system theories since Bertalanffy bears witness to the importance of this concept in philosophy and science. In theology, however, the systems view plays only a minor role, resulting from the predominance of an organic worldview in the biblical Scriptures, a general identification of the systems view with the mechanistic view of Newtonian physics, and the severed connection between theology and mathematics.

Another obstacle is the fact that at the heart of scientific systems theory stands the idea of the *causal* connectedness of all natural phenomena,

[135] See, e.g., Colin E. Gunton, "The Spirit Moved over the Face of the Waters: The Holy Spirit and Created Order," *International Journal of Systematic Theology* 4 (2002) 190–204.

[136] See Ludwig von Bertalanffy, "An Outline of General Systems Theory," *British Journal for the Philosophy of Science* 1 (1950) 134–65, at 138.

which stands in sharp contrast to the widespread tendency of postmodern theology to desert the idea of causality.[137] The so-called "cosmological argument" of modern theology betrays the continuing influence of the Newtonian worldview with its postulate of God as the first cause that is then placed as absolutely transcendent above the created order. In its place, contemporary Pneumatology faces the task of describing the function of the Spirit *within* the created order and, if the concept of causality is maintained, *within* the causal relationship of the cosmos. On the other side of the spectrum stand the extremes of the deistic worldview that understands the cosmos as a closed system with no recourse to the divine, and of open theism that portrays the world as a self-organized, open system on which even God places no constraints. Contemporary Pneumatology can escape these extremes by following Bertalanffy's suggestion that the general principles of systems theory go beyond the realm of physics.[138] Attempts to integrate theology and systems theory thus far have paid little attention to the impact of Pneumatology on an understanding of the created order.[139] Methodologically, this task demands a transformation of Pneumatology into an interdisciplinary, transtheological discipline. This may include the transformation of the concept of "system" itself into a pneumatologically defined approach to the whole of life. Conceptually, it calls for an understanding of the Spirit's role in terms of order, organization, and harmony as well as disorder, chaos, and discontinuity. These aspects can be found not only in the cosmic realm but also on the epistemological, institutional, and ecclesiological level.[140] Last but not least, these aspects should open up opportunities for a truly "systematic" understanding of the role of the Spirit in the order and processions of the divine persons, in the trinitarian life of God, and in the world.[141]

(2) *Rationality*. The notion of reason has traditionally been attributed to God and the human being and not to creation in general. Western theology

[137] See Albert Einstein, introduction to Rudolf Kayser, *Spinoza: Portrait of a Spiritual Hero* (New York: Philosophical Library, 1946) xi.

[138] Bertalanffy, "An Outline of General Systems Theory" 142. See also John Polkinghorne, "Christianity and Science," in *The Oxford Handbook of Religion and Science*, ed. Philip Clayton and Zachary Simpson (New York: Oxford University, 2006) 57–70, at 67.

[139] See, e.g., Niels Henrik Gregersen, "The Idea of Creation and the Theory of Autopoietic Processes," *Zygon* 33 (1998) 333–67; Arthur Fabel, "The Dynamics of the Self-Organizing Universe," *Cross Currents* 37.2–3 (1987) 168–77; James E. Huchingson, "The World as God's Body: A System's View," *Journal of the American Academy of Religion* 48 (1980) 336–44.

[140] See, e.g., "Spirit, Order, and Organization: Concluding Report on the Faith and Order Study," *Study Encounter* 6.3 (1970) 142–55.

[141] See, e.g., David Coffey, "The Theandric Nature of Christ," *Theological Studies* 60 (1999) 405–31.

has linked the idea of rationality or intellect (*nous*) with the divine Logos rather than the Spirit.[142] The link of the former with the Incarnation has further enhanced the distinction between spirit and flesh, on the one hand, and between spirit and matter, on the other hand. The implications of this dualism are particularly apparent in the attempt to ascertain the role of the Spirit at the creation. Its repercussions are also felt on the ecclesiological level, for example, in distinguishing the institutional church from the charismatic or Spirit-filled church or in the pentecostal dualism of an intellectual baptism and a Spirit baptism. Pneumatology after Einstein faces the opportunity to confront these dualistic tendencies and to involve in this process questions of human reason, imagination, and comprehensibility that have rarely been the focus of pneumatological discussion. The goal of this endeavor is not simply to equate the divine Spirit with a cosmic rationality but to discover the role of the Spirit in the origin, availability, and distribution of reason in the physical universe.

Einstein's insistence on the rationality of the cosmos stands in contrast to the mechanistic worldview of Newtonian physics. While modern scientists embraced the deterministic and reductionistic methods of Newtonian science and thereby "quickly distanced themselves from modes of explanations that invoked purpose, or *telos*,"[143] the idea of the cosmos as a rational system is decidedly goal-oriented. From a rational systems perspective, the Spirit in the physical universe can be seen as a purposeful and coordinating agent. In this sense, rationality may refer to both the selection of goals and to their implementation. A systems theology must be able to integrate this teleological perspective of the physical universe into a set of alternatives that attribute to God's Spirit both the rationality to assess and the freedom to choose alternative activities.[144] Rationality is therefore an essential aspect of integrating the miraculous into a theology of nature.

In addition, the idea of a rational universe also emphasizes its formalized structure. Since "a structure is formalized to the extent that the rules governing behavior are precisely and explicitly formulated,"[145] the activity of the Spirit may be seen as an impartation of the divine freedom to govern the created order (see 2 Cor 3:17). Attention must be paid at this point not to turn the rational perspective into a mechanistic model that views the

[142] See, e.g., Karl Barth, *Church Dogmatics*, vol. 3/2, *The Doctrine of Creation: The Creature*, ed. G. W. Bromiley and T. F. Torrance (Edinburgh: T. & T. Clark, 1969) 355–57.

[143] Kirk Wegter-McNelly, "Fundamental Physics and Religion," in *Oxford Handbook of Religion and Science* 156–71, at 160.

[144] See Jürgen Moltmann, *The Trinity and the Kingdom: The Doctrine of God* (San Francisco: Harper & Row, 1981) 55.

[145] W. Richard Scott, *Organizations: Rational, Natural, and Open Systems* (Englewood Cliffs, N.J.: Prentice-Hall, 1981) 59.

economic order as primarily performative in favor of the whole system and attributes no significance to the participation of the individual.[146] Instead, while formalization makes physical phenomena more predictable, this predictability applies to both the standardized and the hostile behavior of all participants. Thus we can speak of what Torrance has called the "epistemological relevance of the Spirit"[147] in a twofold sense: as an agent of rationality, the Spirit is present in both the act of order and disorder. Knowledge of the physical universe necessitates the discernment of both the Spirit's presence and activity as well as the Spirit's absence and withdrawal.

(3) *Relationality*. A major difference between Newton's and Einstein's concepts of the universe is the aspect of relationship. In his autobiographical notes, Einstein remarks on this aspect almost apologetically, "Newton, forgive me.... The concepts that you created are even today still guiding our thinking in physics, although we now know that they will have to be replaced ... if we aim at a profounder understanding of relationships."[148] The task of Pneumatology after Einstein is to ascertain how the divine Spirit is involved in the relations of all constituents of creation, both on the cosmic and the particular level. An important venue in this regard is the role attributed to relations themselves rather than to the classical theistic idea of being or the scientific approach to physical objects.[149] Pneumatology is confronted, in particular, with the challenges of divine personhood and the tendency to revert to purely metaphorical language.

Relationality speaks of the Spirit as person. An understanding of the property of the Spirit as person in terms of the rationality of the universe can be complemented by the personal presence of God's Spirit in the world and in the creature. Whereas Pneumatology from a Newtonian perspective has not neglected this aspect, it placed little emphasis on the relational character of the physical world. As John Polkinghorne reminds us, "Newtonian physics had pictured physical processes as involving the collisions of individual atoms moving in the container of absolute space and ... absolute time. Einstein's ... relativistic physics put an end to that separable picture" by tying "together space, time, and matter in a single package deal of mutual influence."[150] Pneumatology after Einstein has yet to take this relational character of creation into account. Since a trinitarian

[146] See ibid. 60–61.

[147] Thomas F. Torrance, *God and Rationality* (New York: Oxford University, 1971) 165–92.

[148] Albert Einstein, *Autobiographical Notes: A Centennial Edition*, trans. and ed. Paul Arthur Schilpp (Chicago: Open Court, 1979) 31.

[149] See Jansen, *Relationality and the Concept of God*; for the root of the idea in Einstein see Max Jammer, *Einstein and Religion* 236–40.

[150] Polkinghorne, "Christianity and Science" 64.

theology of the Holy Spirit emerges from the relations of the divine persons, more effort can be paid to how a relational universe exists in relation to the triune God. This includes particularly the understanding of God as creator, the notion of divine freedom, plurality and unity in God, the idea of transcendence, and the community of the divine persons. In addition, an interpretation of Spirit in a relational way tells us not only about God *in se* and God *quoad nos* but also about the *opera Dei ad extra* as they relate God to creation and, through creation, God to himself. A fruitful starting point in this regard are studies of an eco-theological nature, which have been shown to be of great significance for the further development of Pneumatology, and the notion of the *kenosis* of the Spirit in creation.[151]

(4) *Symmetry*. Although, at first glance, both Newton and Einstein embrace a homogeneous image of the universe, in the Newtonian system, "spirit" is essentially infinite and corporeal, both qualities of space, whereas little is said about the temporal dimension of that spirit. Infinite space—not time—is the sensory of God.[152] Put differently, the presence of the Spirit in all parts of the cosmos has no direct bearing on the presence of the Spirit in and throughout history. The theory of relativity, on the other hand, as Torrance reminds us, "involved a radical change in outlook upon the universe, for it meant a rejection of dualism, and a way of thinking of the universe in its inherent unity of form and being."[153] This unity is described primarily in terms of the symmetry of the natural world and with no recourse to a concept of the supernatural. Instead, the symmetry of the universe emerges on the basis of the rational order of the cosmos and from the relationality of all natural phenomena in the space-time continuum. The answer to the question, "What can have symmetry?" is "Anything can."[154] In theology, however, the idea of symmetry has rarely been employed.

Theologically, the concept of symmetry can be employed not only as a synonym for commensurability but also in the context of illuminating the regularity and unity of the created order.[155] We may distinguish between attributing the principles of symmetry to physical phenomena and deriving

[151] See, e.g., Sigurd Bergmann, *Creation Set Free: The Spirit as Liberator of Nature* (Grand Rapids, Mich.: Eerdmans, 2005); D. Lyle Dabney, *Die Kenosis des Geistes: Kontinuität zwischen Schöpfung und Erlösung in Werk des Heiligen Geistes*, Neukirchener Beiträge zur systematischen Theologie 18 (Neukirchen-Vlyun: Neukirchener, 1997).

[152] See, e.g., Newton, *Opticks,* Query 31. See Dobbs, *The Janus Faces of Genius* 209 n. 119.

[153] Torrance, "Newton, Einstein, and Scientific Theology" 242.

[154] Joe Rosen, *Symmetry Discovered: Concepts and Applications in Nature and Science* (New York: Cambridge University, 1975) 5.

[155] See Brading and Castellani, *Symmetries in Physics* 1–3.

particular consequences from these properties.[156] While physics can serve as a resource for the development of principles, theology has yet to interpret its consequences. This need is particularly evident in a theology of creation that has frequently been developed on the basis of a merely implicit use of symmetry and continuity. Among the other numerous examples of symmetry in nature, the symmetry of space-time holds particular implications for a unified, cosmological argument. Pneumatology is in a unique position to make the status of symmetry in contemporary cosmology more explicit in terms of the biblical witness of the ubiquity of the divine Spirit.

A place of reference for this kind of theology may be Pierre Curie's principle that a physical phenomenon is created by the absence rather than the presence of symmetry (a so-called "symmetry breaking").[157] From a scientific perspective, dissymmetry does not necessarily imply the absence of symmetry but, according to Curie, refers to a lower form of symmetry.[158] From a theological perspective, however, the general validity of Curie's principle has come under critique. A theology of creation, in particular, should question the implied primacy of symmetry over dissymmetry that is dominant in the scientific perspective. In fact, Genesis 1 to 3 speaks of natural phenomena as resulting from a primary state of dissymmetry that change through several stages of higher levels of symmetry and are eventually subjected again to dissymmetry. The involvement of God's Spirit in this scenario (see Gen 1:3; 2:7; 3:17–19) could be described as both symmetry-forming and symmetry-breaking. Conversely, symmetry breaking can be seen as a corruption of the original order of creation, which likewise is expressed in the biblical texts in pneumatological terms (see Rom 8:21–23).

A second way to overcome the shortcomings of Curie's principle is to go beyond the principle of causality that forms the basis of his proposal. Causality as the root for the so-called "cosmological argument" is pneumatologically barren. The notion of causality has traditionally attributed to the Spirit only a passive role in the trinitarian relations, largely due to the concept of the divine processions, and has yielded little success in the understanding of the Spirit as person.[159] Moltmann

[156] Ibid. 3.

[157] See Pierre Curie, "Sur la symétrie dans les phénomènes physiques: Symétrie d'un champ électrique et d'un champ magnétique," *Journal de Physique* III.3 (1894) 393–417; Brading and Castellani, *Symmetries in Physics* 10–11.

[158] See Elena Castellani, "On the Meaning of Symmetry Breaking, "in *Symmetries in Physics* 324.

[159] See, e.g., the integration of the Scholastic teaching of causality in Heribert Mühlen, *Der Heilige Geist als Person: In der Trinität, bei der Inkarnation und im Gnadenbund: Ich – Du – Wir,* 5th rev. ed. (Münster: Aschendorff, 1988) 26–44.

has criticized the Western processional model as a basis for pneumatological questions, since it understands the Spirit as a purely receptive vehicle of the act of the Father and the Son.[160] Causality, in principle, has two major shortcomings: it is one-directional and cannot attribute the same cause to two different effects. The operation of the Spirit, on the other hand, can be seen as symmetric in the sense that the Spirit both comes from and returns to the Father through the Son (see Eph 2:18). An integration of creation in this symmetry event is one of the foremost tasks of Pneumatology.

A step beyond the limitations of causality may be seen in the Pneumatology of Heribert Mühlen. Here one finds the notion of symmetry in the proposal that the Holy Spirit is in the Father and the Son by virtue of his relation to both, the we-act of the Father and the Son.[161] The Spirit is constituted as person in the Spirit's symmetric relation to the other two divine persons. This principle was later extended in Mühlen's argument of the symmetry of the Spirit's presence in Christ and in Christians.[162] From the perspective of causality, Mühlen initially described the Father and the Son as the two necessary partial causes for the procession of the Holy Spirit.[163] However, he later rephrased his argument in kenotic terms. Although the idea of the Spirit as the symmetry between the Father and the Son, and between Christ and Christians, is preserved, Mühlen framed his Pneumatology no longer in terms of causality but in the context of the divine self-surrender.[164] With this reframing he sought to overcome the limitations of a causal interpretation of existence (*esse extra suam causam*) in order to portray the Spirit as God going beyond himself, the kenosis of God to creation.[165] Lyle Dabney has more recently interpreted the kenosis of the Spirit as the "continuity" between creation and redemption.[166] He criticized Moltmann for his understanding of *kenosis* that finds in the Spirit merely the object of the act of the Father[167]—a criticism that also applies to Mühlen's proposal. Dabney attempts to develop from a *pneumatologia crucis* a continuity of the history of God in creation that

[160] Jürgen Moltmann, "Antwort auf die Kritik an 'Der Gekreuzigte Gott,'" in *Diskussion über Jürgen Moltmanns Buch "Der Gekreuzigte Gott,"* ed. Michael Welker (Munich: Christian Kaiser, 1979) 184–87.

[161] Ibid. 157–58, 164.

[162] Heribert Mühlen, *Una Mystica Persona: Die Kirche als das Mysterium der heilsgeschichtlichen Identität des Heiligen Geistes in Christus und den Christen: Eine Person in vielen Personen* (Paderborn: Ferdinand Schöningh, 1964).

[163] See Vondey, *Heribert Mühlen* 71.

[164] Heribert Mühlen, "Die epochale Notwendigkeit eines pneumatologischen Ansatzes der Gotteslehre," *Wort und Wahrheit* 18 (1973) 275–87.

[165] Ibid. 279.

[166] Dabney, *Die Kenosis des Geistes* 165–237.

[167] Ibid. 78.

understands the Spirit as the presence of God with the Son in the absence of the Father.[168] The implications of this proposal for a scientific Pneumatology have yet to be explored.

(5) *Movement*. Modern theology has paid little attention to the concept of movement. It has remained indebted to a Newtonian idea of a transcendent God who exists independently from and, as such, external to the movement of creation: God is mover but not moved. The concepts of transcendence and immanence are derived from the image of a static universe. Einstein's notions of the rationality, relationality, and symmetry of the cosmic order contradict this understanding insofar as these constituents exist not as external to the movement of the universe but as part of it. The order *of* the cosmos is at the same time the order *in* the cosmos. The concepts of change, process, movement, and organization emerge from the supposed relational order and symmetry of the cosmos and have become fundamental concepts in today's physical cosmology. Yet, a pneumatological approach to the Spirit as movement of and in the cosmos has not been proposed.[169]

In a pneumatological image of the cosmos, the Spirit can be seen as both mover and moved, subject and object of creation. What needs to be maintained, however, is the essence of God's unity that distinguishes between the movement of God as Spirit in the world (created movement) and the Spirit as movement in God's self (uncreated movement). As Sigurd Bergmann observes, "The doctrine of the Holy Spirit posits the self-movement of the Holy Spirit as a characteristic of uncreated movement in contradistinction to movement within created nature and its creatures."[170] While this movement "can be defined only on the basis of the Spirit itself" and is "independent of time and space," a relational understanding of the Spirit in the physical universe demands also that the Spirit subjects God's self to be the object of the world's movement.[171] This pneumatological concept of movement faces the task of correlating the traditional terms of movement in the sense of procession, mission, and transformation with contemporary ideas, such as liberation, process, and becoming, or the Pentecostal notion of Spirit baptism. A particular outcome of this endeavor might be a deeper understanding of the order and relation of the immanent and economic Trinity, that is, a refinement of the concept of *kenosis*.

Newtonian physics forces theology to attribute to the movement of God in creation a particular place and time, or else to locate God completely

[168] See ibid. 226–37.

[169] A starting point is the work of Gregory of Nazianzus. See Bergman, *Creation Set Free* 115–33, 204–26.

[170] Ibid. 119.

[171] *Pace* ibid. 120.

outside the cosmic system. The relativity of space-time, on the other hand, abandons this juxtaposition in favor of a dynamic integration of the Spirit in the cosmos. Moreover, symmetry perceived as a kenotic event leaves room for the integration of both the presence *and* the absence of God's Spirit, understood as either a forming or a breaking of symmetry, but nonetheless as a kenotic event.

Kenosis is fundamentally a rational movement of God that seeks to restore the symmetry of creation in relation to God. In this sense, the Newtonian worldview allows for only an "outward" *kenosis* of God into creation, whereas the "inward" movement of God occurs apart from space and time and is in this sense *not* a kenotic event.[172] The *kenosis* of the Spirit is therefore understood as a movement away from God into that which is other than God and which is defined by the constraints of space and time. This form of movement attributes the existence of creation to God's act of self-giving, without which nothing external to God would exist. Creation is essentially a symmetry forming event. However, in this form of movement, God remains essentially unaffected by the kenotic act, since there is no substantial relation between God and that which benefits from the *kenosis*. God's self-giving is in the true sense an operation (*energeia*) of God's self into God's image, establishing a symmetry of God and creation. What is missing is a cooperation (*synergeia*) of God's movement and the movement of creation in the act of *kenosis*.

From a synergetic perspective, the *kenosis* of the Spirit can be seen as a movement of God away from God that always seeks to return to God. In the act of giving, the Spirit does not abandon God but moves from God into creation in order to create and sustain that creation and eventually to return creation to union with God. From the perspective of creation, therefore, *kenosis* can be a pouring out of the Spirit as well as a withdrawal of the Spirit. An example of the former is the incarnation; an example of the latter is the crucifixion. The future task of Pneumatology after Einstein will be to describe and interpret the consequences the kenotic acts hold for God and the physical universe.

These observations suggest that the *kenosis* of the Holy Spirit forms a bridge between contemporary Pneumatology and the recent paradigm shift in the sciences. The chief difficulty in developing a theology of God's Spirit as order, rationality, relationality, symmetry, and movement is its integration into the traditional, theistic concepts of the transcendence of the divine nature, the trinitarian character of God, and the personhood of the Holy Spirit. Pneumatology in Einstein's universe is confronted with unitarian, pantheistic, and impersonal tendencies, since "spirit" is understood primarily in terms of essence and not person. The most immediate

[172] See ibid. 290.

challenge to this understanding is posed by the creedal formulation of the divine persons in terms of "articles," in general, and of the Holy Spirit as the "third article," in particular. Pneumatology is likely faced with a rethinking of the consummation of the divine essence, the order of the divine persons, and the procession and mission of the Holy Spirit. The contemporary task is to understand the Spirit in the physical universe, rather than the metaphysical; in time, rather than the eschaton; in space and matter, rather than the supernatural; in movement, rather than in presence. In many ways, Pneumatology after Einstein stands at a point of transition.