

THEOLOGY AND SCIENCE: WHERE ARE WE?

by Ted Peters

Abstract. Revolutionary developments in both science and theology are moving the relation between the two far beyond the nineteenth-century "warfare" model. Both scientists and theologians are engaged in a common search for shared understanding. Eight models of interaction are outlined: scientism, scientific imperialism, ecclesiastical authoritarianism, scientific creationism, the two-language theory, hypothetical consonance, ethical overlap, and New Age spirituality. Developments in hypothetical consonance are explored in the work of various scholars, including Ian Barbour, Philip Clayton, Paul Davies, Willem Drees, Langdon Gilkey, Philip Hefner, Nancey Murphy, Wolfhart Pannenberg, Arthur Peacocke, John Polkinghorne, Robert John Russell, Thomas Torrence and Wenzel van Huyssteen.

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"A passionate new battle over religion and science," was the way the *New York Times* opened its front page article describing church leaders' misdirected stand against patents in genetics and biotechnology (Andrews 1995, 1). Note two things here. First, the interaction between science and religion is front page news. Second, the interaction is described with a military metaphor, as a battle. The battle metaphor probably reflects the image bequeathed us by A. D. White in his notorious book, *A History of*

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the Warfare of Science with Theology (White [1896] 1960). Does the image of a constant state of war, with readiness for a "passionate new battle," accurately describe the current interaction between religious thought and natural science? No, not completely.

A revolution is under way, a revolution adding complexity and nuance so that it is no longer accurate to see science and theology merely as pitched enemies. The revolution is being led by an unpredicted and astounding intellectual trend, namely, the reasking of the God-question within the orbit of scientific discussion about the natural world. The raising of theological questions within the scientific camp does not fit neatly into the warfare model.

In addition, the prerevolutionary situation from which we are now emerging ought not be described as a situation of constant war either. Rather, it is better described as a truce—that is, for decades we have worked with the assumption that a border should separate what we know about the natural world through science and what religious thinkers say about the transcendent reality, God.

Since the Enlightenment we have pretty much assumed that these two represent separate domains of human knowing. We have erected a high wall of separation between church and laboratory. Yet, now as the revolution is beginning to take hold, this is increasingly recognized as most unfortunate. It is unfortunate because we all are aware that there is but one reality. So sooner or later we will become dissatisfied with consigning our differences to separate ghettos of knowledge.

The prerevolutionary separatists and the revolutionary scientists represent only part of the picture. There is another group of quiet revolutionaries who since the 1960s have been looking for parallels, points of contact, consonance, crossovers, and confluations. Their emerging new discipline, as yet without a name, is studying developments in natural science—especially physics and the life sciences—and at the same time, engaging in serious reflection on various loci of Christian doctrine. Scientists and theologians together are engaged in this common search for shared understanding. The search is not merely for a shared discipline. They are not looking merely for rapprochement between separate fields of inquiry. Rather, scientists and theologians are aiming for increased knowledge, for an actual advance in the human understanding of reality. Until a name comes along, we will refer to this new enterprise as Theology and Natural Science.

In this article I will briefly outline eight different ways in which science and religion are currently thought to be related. I will note that the dominant view in academic circles—the truce-by-separation view—is what I label the "two-language theory," but I will go on to point out that the advancing frontier is taking us in the direction of hypothetical

consonance. Then I will turn to the central methodological issue, namely, the classic concern for the relation between faith and reason. Rather than sharply contrasting what we can know by faith and what we can know by reason, scholars such as Nancey Murphy and Wentzel van Huyssteen are maximizing the overlap. Along the way I will note the work of some of the more important scholars in the field of Theology and Natural Science: Ian Barbour, Philip Clayton, Paul Davies, Willem Drees, Langdon Gilkey, Philip Hefner, Nancey Murphy, Wolfhart Pannenberg, Arthur Peacocke, John Polkinghorne, Robert John Russell, Thomas Torrance, and Wentzel van Huyssteen. I will then conclude with my own observations regarding the merits of hypothetical consonance and the value of making a theological interpretation of nature so that we can see the natural cosmos as divine creation.

EIGHT WAYS OF RELATING SCIENCE AND THEOLOGY

Not everyone views the relation between science and religion in the same way. If we extend the metaphor of warfare, we can see that relations vary from pitched battle to an uneasy truce.

1. *Scientism*. Sometimes called “naturalism” or “scientific materialism” or “secular humanism,” scientism seeks war with total victory for one side. Scientism, like other “. . .isms,” is an ideology, in this case built upon the assumption that science provides all the knowledge that we can know. There is only one reality, the natural, and science has a monopoly on the knowledge we have about nature (Gilkey 1993). Religion, which claims to purvey knowledge about things supernatural, provides only pseudoknowledge—that is, false impressions about nonexistent fictions.

Some decades ago, British philosopher and atheist Bertrand Russell told a BBC audience that “what science cannot tell us, mankind cannot know.” At midcentury astronomer Fred Hoyle argued that the Jewish and Christian religions have become outdated because of modern science. He explained religious behavior as an escapist measure pursued by people who seek illusory security in face of the mysteries of the universe (Hoyle 1950).

More recently, physicists Stephen Hawking and Carl Sagan have teamed up to assert that the cosmos is all there is or was or ever will be, and to assert that there was no absolute beginning at the onset of the Big Bang. Why no beginning? Had there been an absolute beginning, then time would have an edge; and beyond this edge we could dimly glimpse a transcendent reality such as a creator God. But this is intolerable to scientism. So, by describing the cosmos as temporally self-contained, Sagan, in his introduction to Hawking’s *A Brief History of Time*,

could write confidently about “the absence of God” on the grounds that there is “nothing for a Creator to do” (Hawking 1988; also Sagan 1980; Crick 1994). In the warfare between science and theology, scientism demands elimination of the enemy.

2. *Scientific Imperialism.* This approach is scientism in a slightly different form. Rather than eliminating the enemy, scientific imperialism seeks to conquer the territory formally possessed by theology and claim it as its own. Whereas scientism is atheistic, scientific imperialism affirms the existence of something divine but claims that knowledge of the divine comes from scientific research rather than religious revelation. “Science has actually advanced to the point where what were formerly religious questions can be seriously tackled . . . [by] the new physics,” writes Paul Davies (Davies 1983). Physicist Frank Tipler, claiming that quantum theory combined with Big Bang cosmology and thermodynamics can provide a better explanation than Christianity for the future resurrection of the dead, declares that theology should become a branch of physics (Tipler 1994).

3. *Ecclesiastical Authoritarianism.* Some in the Roman Catholic tradition who perceive science and scientism as a threat resort to a defensive tactic that may be seen as ecclesiastical authoritarianism. Presuming a two-step route to truth in which natural reason is followed by divine revelation, they award to theological dogma authority over science on the grounds that dogma is founded on God’s revelation. In 1864 Pope Pius IX promulgated *The Syllabus of Errors*, wherein item 57 stated it to be an error to think that science and philosophy could withdraw from ecclesiastical authority. A century later, the Second Vatican Council dropped these defenses by declaring the natural sciences to be free from ecclesiastical authority, calling them instead “autonomous” disciplines (*Gaudium et Spes*: 59). Pope John Paul II, who has a serious interest in fostering dialogue between theology and the natural sciences, is negotiating a new peace between faith and reason (Russell et al. 1990).

4. *Scientific Creationism.* Sometimes called “creation science,” scientific creationism is not a Protestant version of church authoritarianism, even though it is frequently so mistaken. The grandparents of today’s scientific creationists were Fundamentalists, to be sure, and Fundamentalism appealed to biblical authority in a fashion parallel to the Roman Catholic appeal to church authority. Yet, there is a marked difference between Fundamentalist authoritarianism and contemporary creation science. Today’s creation scientists are willing to argue their case in the arena of science, not biblical authority. They assume that biblical truth and scientific truth belong to the same domain. When there is a conflict between a scientific assertion and a religious assertion, then we allegedly have a conflict in scientific theories. The creationists argue

that the book of Genesis is itself a theory that tells us how the world was physically created: God fixed the distinct kinds (species) of organisms at the point of original creation. They did not evolve. Geological and biological facts attest to biblical truth, they argue.

With regard to theological commitments, scientific creationists typically affirm (a) the creation of the world out of nothing; (b) the insufficiency of mutation and natural selection to explain the process of evolution; (c) the stability of existing species and the impossibility of one species evolving out of another; (d) separate ancestry for apes and humans; (e) catastrophism to explain certain geological formations, e.g., the flood explains why sea fossils appear on mountains; and (f) the relatively recent formation of the earth about six thousand to ten thousand years ago (Gish 1973; Timm 1989).

Establishment scientists typically try to gain quick victory over creationists by dismissing them. Stephen Jay Gould, the colorful Harvard paleontologist, says the very term *scientific creationism* is meaningless and self-contradictory (Gould 1983). Although the battle between scientific creationists and established scientists appears to be all-out war, this is not the case. The creationists, many of whom are themselves practicing scientists, see themselves as soldiers within the science army (Gilkey 1993).

5. *The Two-Language Theory.* Seen by some as the way to establish a truce with an enduring peace, the two-language theory respects the sovereign territory of both science and theology and is advocated by highly respected persons in both fields. Albert Einstein—remembered for his remark that “science without religion is lame and religion without science is blind”—distinguished between the language of fact and the language of value. “Science can only ascertain what is, but not what should be,” he once told an audience at Princeton; “religion, on the other hand, deals only with evaluations of human thought and action.” Note the use of “only” here. Each language is restricted to its respective domain.

Neoorthodox theologian Langdon Gilkey has long argued for the two-language approach. Science, he says, deals only with objective or public knowing of *proximate* origins, whereas religion and its theological articulation deal with existential or personal knowing of *ultimate* origins. Science asks How? while religion asks Why? (Gilkey 1985). What Gilkey wants, of course, is for one person to be a citizen in two lands—that is, to be able to embrace both Christian faith and scientific method without conflict. To speak both languages is to be bilingual, and bilingual intellectuals can work with one another in peace.

The modern two-language theory of the relation between science and theology ought not to be confused with the premodern concept of the

two books. In medieval times, it was thought that revelation regarding God could be read from two books, the Book of Nature and the Book of Scripture. Both science and theology could speak of things divine. Both natural revelation and special revelation pointed us in one direction: toward God. The two-language theory, in contrast, points us in two different directions: either toward God or toward the world.

A problem I have with the two-language theory is that it gains peace through separation, by establishing a demilitarized zone that prevents communication. In the event that a scientist might desire to speak about divine matters or that a theologian might desire to speak about the actual world created by God, the two would have to speak past one another on the assumption that shared understanding is impossible. Why begin with such an assumption? The method of hypothetical consonance makes just the opposite assumption, namely, that there is but one reality, and sooner or later scientists and theologians should be able to find some areas of shared understanding.

6. *Hypothetical Consonance.* The name I give to the frontier that seems to be emerging beyond the two-language policy is hypothetical consonance. The term *consonance*, coming from the work of Ernan Mc Mullin, indicates that we are looking for those areas where there is a correspondence between what can be said scientifically about the natural world and what the theologian understands to be God's creation (Mc Mullin 1981). *Consonance* in the strong sense means "accord," "harmony." Accord or harmony might be a treasure we hope to find, but we have not found it yet. Where we are now is working with consonance in a weak sense—that is, identifying common domains of question asking. The advances in physics, especially thermodynamics and quantum theory in relation to Big Bang cosmology, have in their own way raised questions about transcendent reality. The God-question can be honestly asked from within scientific reasoning. Theologians and scientists now share a common subject matter, and the idea of hypothetical consonance encourages further cooperation.

It also asks theologians to view their discipline somewhat differently. Rather than beginning from a rigid position of inviolable truth, the term *hypothetical* asks theologians to subject their own assertions to further investigation and possible confirmation or disconfirmation. An openness to learning something new on the part of theologians and scientists alike is essential if hypothetical consonance is to move us forward.

7. *Ethical Overlap.* This category refers to the recognized need on the part of theologians to speak to the questions of human meaning created by our industrial and technological society and, even more urgently, to the ethical challenges posed by the environmental crisis and the need to plan for the long-range future of the planet. The ecological

challenge arises from the crisis-crossing forces of population overgrowth, increased industrial and agricultural production that depletes nonrenewable natural resources while polluting air and soil and water, the widening split between the haves and the have-nots around the world, and the loss of a sense of responsibility for the welfare of future generations. Modern technology is largely responsible for this ecological crisis, and theologians along with secular moralists are struggling to gain ethical control over technological and economic forces that, if left to themselves, will drive us toward destruction.

An advocate of hypothetical consonance, I belong also to the ethical overlap camp, and I believe that, at root, the ecological crisis poses a spiritual issue, namely, the crying need of world civilization for an ethical vision. An ethical vision—a vision of a just and sustainable society that lives in harmony with its environment and at peace with itself—is essential for future planning and to motivate the peoples of the world to fruitful action. Ecological thinking is future thinking. Its logic takes the following form: *understanding-decision-control*. Prescinding from the scientific model, we implicitly assume that to solve the ecocrisis we need to understand the forces of destruction; then we need to make the decisions and take the actions that will put us in control of our future and establish a human economy that is in harmony with earth's natural ecology.

In order to bring theological resources to bear on the ecological challenge, most theologians have tried to mine the doctrine of Creation for its wealth of ethical resources. It is my judgment that we need more than Creation; we also need to appeal to eschatological Redemption—that is, New Creation. God's redeeming work is equally important when we begin with a creation that has somehow gone awry.

I believe the promise of eschatological renewal can provide a sense of direction, a vision of the coming just and sustainable society, and a motivating power that speaks relevantly to the understanding-decision-control formula. We need to combine Creation with New Creation. Theologians can make a genuine contribution to the public discussion if, on the basis of eschatological resources, we can project a vision of the coming new world order—that is, announce the promise Kingdom of God and work from that vision backward to our present circumstance. This vision should picture our world in terms of (a) a single, worldwide planetary society, (b) united in devotion to the will of God; (c) sustainable within the biological carrying capacity of the planet and harmonized with the principles of the ecosphere; (d) organized politically so as to preserve the just rights and voluntary contributions of all individuals; (e) organized economically so as to guarantee the basic survival needs of each person; (f) organized socially so that dignity and freedom are respected and protected in every quarter; and (g) dedicated

to advancing the quality of life in behalf of future generations (Peters 1992, chap. 12).

8. *New Age Spirituality.* Next and final in our list of parties interested in the science-religion struggle are the New Age thinkers. The key to their approach is holism—that is, their attempts to overcome such modern dualisms as the splits between science and spirit, ideas and feelings, male and female, rich and poor, humanity and nature. New Age artillery is loaded with three explosive sets of ideas: (a) discoveries in twentieth-century physics, especially quantum theory; (b) acknowledgment of the important role played by imagination in human knowing; and (c) a recognition of the ethical exigency of preserving our planet from ecological destruction.

Fritjof Capra and David Bohm, who combine Hindu mysticism with physical theory, are among the favorite New Age physicists. Bohm, for example, argues that the explicate order of things that we accept as the natural world and that is studied in laboratories is not the fundamental reality; there is under and behind it an implicate order, a realm of undivided wholeness. This wholeness, like a hologram, is fully present in each of the explicate parts. Reality, according to Bohm, is ultimately “undivided wholeness in flowing movement” (Bohm 1980, 11; also Capra 1977; Peters 1991). When we focus on either objective knowing or subjective feeling, we temporarily forget the unity that binds them. New Age spirituality seeks to cultivate awareness of this underlying and continually changing unity.

By adding evolutionary theory to physics and especially to Big Bang cosmology, New Age theorists find themselves constructing a grand story—a myth—regarding the history and future of the cosmos of which we human beings are an integral and conscious part. On the basis of this grand myth, New Age ethics tries to proffer a vision of the future that will guide and motivate action appropriate to solving the ecological problem. Science here provides the background, not only for ethical overlap, but also for a fundamental religious revelation. Physicist Brian Swimme and theologian Thomas Berry put it this way: “Our new sense of the universe is itself a type of revelatory experience. Presently we are moving beyond any religious expression so far known to the human into a meta-religious age, that seems to be a new comprehensive context for all religions. . . . The natural world itself is the primary economic reality, the primary educator, the primary governance, the primary technologist, the primary healer, the primary presence of the sacred, the primary moral value” (Swimme and Berry 1992, 255).

Now, I happen to find the ethical vision of the New Age inspiring. But I cannot in good conscience endorse its metareligious naturalism. I find it contrived and un compelling. Nearly the same ecological ethic

with an even stronger emphasis on social justice can be derived from Christian eschatology.

Returning to the more theoretical tie between science and theology, I earlier recommended hypothetical consonance as the most viable option for the near future. Hypothetical consonance takes us beyond the limits of the two-language theory without initially violating the integrity of either natural science or Christian theology. Where the leading scholars find themselves, to my interpretation, is with one foot in the two-language theory and the other stretched for a stride to go beyond.

FAITH AND REASON IN SCIENCE AND THEOLOGY

The key development among those scholars who either strive for consonance or are at least in partial sympathy with consonance is the attempt to demonstrate overlap between scientific and theological reasoning. Two insights guide the discussion. First, scientific reasoning depends in part on a faith component, on foundational yet unprovable assumptions. Second, theological reasoning should be recast so as to take on a hypothetical character that is subject to testing. What is a matter of some dispute, however, is whether or not theological assertions refer—that is, Is theology a form of realism? Do theological statements merely give expression to the faith of a religious community, or do they refer to a reality beyond themselves such as God? Theologians are asking to what extent *critical realism* in the philosophy of science should be incorporated into theological methodology.

Langdon Gilkey has long argued the point that science, every bit as much as theology, rests upon faith. Science must appeal to some foundational assumptions regarding the nature of reality and our apprehension of it, assumptions which themselves cannot be proved within the scope of scientific reasoning. In its own disguised fashion, science is religious, mythical. “The activity of knowing,” he writes, “points beyond itself to a ground of ultimacy which its own forms of discourse cannot usefully thematize, and for which religious symbolization is alone adequate” (Gilkey 1970, 41). Scientific reasoning depends upon the deeply held conviction—the passion of the scientist—that the world is rational and knowable and that truth is worth pursuing. “This is not ‘faith’ in the strictly religious and certainly not in the Christian sense,” he observes, “But it is a *commitment* in the sense that it is a personal act of acceptance and affirmation of an ultimate in one’s life” (Gilkey 1970, 50).

On the scientific side, Paul Davies acknowledges the faith dimension to science in terms of assumptions regarding rationality. Presumed here is a gnostic-style connection between the rational structure of the universe and the corresponding spark of rationality in the human mind.

That human reasoning is generally reliable constitutes his "optimistic view" (Davies 1992, 24, 232). Yet, he acknowledges that the pursuit of scientific knowledge will not eliminate all mystery, because every chain of reasoning will eventually hit its limit and force on us the metascientific question of transcendence. "Sooner or later we all have to accept something as given," he writes, "whether it is God, or logic, or a set of laws, or some other foundation of existence. Thus 'ultimate' questions will always lie beyond the scope of empirical science" (Davies 1992, 15).

Thus theologians and scientists—or at least philosophers of science—agree that basic assumptions are finally a form of faith. Then arises a second, related issue: does theology, like science, seek to explain? If so, then theology cannot restrict itself to individual or even communal subjectivity or to authoritarian methods of justification that isolate it from common human reasoning. This is what Philip Clayton argues: "Theology cannot avoid an appeal to broader canons of rational argumentation and explanatory adequacy" (Clayton 1989, 13). Clayton proceeds to argue for intersubjective criticizability and to view theology as engaged in transcommunal explanation.

If theology seeks to explain, does it also refer? This is the question of critical realism to which we now turn.

CRITICAL REALISM AND THEOLOGICAL REFERENCE

Wentzel van Huyssteen, professor in the first chair in the United States designated for Theology and Natural Science, at Princeton, believes that theological statements about God refer to God. He advocates "critical-theological realism" and a method for justifying theories in systematic theology that parallels what we find in natural science. Justification occurs through progressive illumination offered by a theological theory, not as traditionally done by appeal to ecclesiastical or some other indisputable authority. Van Huyssteen recognizes the relativistic and contextual and metaphorical dimensions of human speech that flood all discourse, theological and scientific alike. Progress toward truth requires constructive thought, the building up of metaphors and models so as to emit growing insight. And, most significantly, theological assertions refer. They refer to God, They are realistic. "Theology," he writes, "given both the ultimate religious commitment of the theologian and the metaphoric nature of our religious language, is scientifically committed to a realist point of view. . . . Our theological theories do indeed refer to a Reality beyond and greater than ours" (van Huyssteen 1989, 162–63).

On the one hand, critical realism should be contrasted with nonliteralist methods such as positivism and instrumentalism, because it recognizes that theories represent the real world. On the other hand, critical

realism should be contrasted also with "naive realism," which invokes the correspondence theory of truth to presume a literal correspondence between one's mental picture and the object to which this picture refers. Critical realism, in contrast, is nonliteral while still referential. The indirectness comes from the conscious use of metaphors, models, and theories. Ian Barbour notes that "models and theories are abstract symbol systems, which inadequately and selectively represent particular aspects of the world for specific purposes. This view preserves the scientist's realistic intent while recognizing that models and theories are imaginative human constructs. Models, on this reading, are to be taken seriously but not literally" (Barbour 1990, 43; 1974, 38; see McFague 1982, 133-34). Urging the adoption of critical realism by theologians, Arthur Peacocke maintains that "critical realism in theology would maintain that theological concepts and models should be regarded as partial and inadequate, but necessary and, indeed, the only ways of referring to the reality that is named as 'God' and to God's relation with humanity" (Peacocke 1993, 14).

Not all theological voices chime in with harmony here. Nancey C. Murphy recommends that theologians avoid critical realism on the grounds that it remains modern just when we need to move toward postmodern reasoning. Critical realism remains caught in three restrictive elements of the modern mind: (a) epistemological foundationalism which attempts to provide an indubitable ground for believing; (b) representational thinking with its correspondence theory of truth; and (c) excessive individualism and inadequate attention to the community. The postmodern elements she lifts up for the theological agenda are (a) a nonfoundationalist epistemological holism and (b) meaning as use in language philosophy (Murphy 1987, 1-10; 1990). What counts for Murphy is the progressive nature of a research program; and this is a sufficient criterion for evaluating theological research regardless of its referentiality.

THEOLOGICAL ASSERTIONS AS HYPOTHESES: WOLFHART PANNENBERG

Would the tasks of explanation and reference make theology itself scientific? Yes, answers Munich systematic theologian Wolfhart Pannenberg. Describing theology as the science of God, he contends that each theological assertion has the logical structure of a hypothesis. This makes it subject to verification against the relevant state of affairs it seeks to explain. But how can we confirm or disconfirm an assertion about God? A theologian cannot follow a method of direct verification because the existence of its object, God, is itself in dispute and because

God—defined by Pannenberg as the all-determining reality—is not a reproducible finite entity. An indirect method of verification is available, however. Building in part on Karl Popper's procedures for critical verification and falsification, Pannenberg submits that we can test assertions by their implications. Assertions about a divine life and divine actions can be tested by their implications for understanding the whole of finite reality, a wholeness that is implicitly anticipated in the ordinary experience of meaning.

The anticipation of wholeness of meaning within common human experience is the key that makes Pannenberg's method work. We anticipate a wholeness of meaning that is not yet fully present, a wholeness that we hypothesize will come in the future as the gift of an eschatological act of the one God. The *direct confirmation* of this hypothesis is dependent upon the actual coming of that eschatological wholeness. In the meantime, while we await the eschatological fulfillment, our faith in the future takes the form of a hypothesis that can gain *indirect confirmation* by the increased intelligibility it offers to our understanding of our experience of finite reality. If in fact God is the all-determining reality, then everything else we study, including the natural world, must eventually be shown to be determined by this reality. The very raising of the hypothesis of God as the all-determining One can be evaluated positively if it increases the intelligibility of the natural world we study through scientific disciplines. It is this task of increasing the intelligibility of the natural world by considering it in relation to God that leads Pannenberg to engage in dialogue with scientists and to construct a theology of nature.

"SCIENCE AND RELIGION" VERSUS "SCIENCE AND THEOLOGY":
THOMAS F. TORRANCE

Pannenberg believes theology can be scientific if it makes hypotheses and seeks to confirm them. In complementary contrast, Thomas Forsyth Torrance, who taught Christian Dogmatics at the University of Edinburgh from 1952 to 1979, argues that it is the objectivity of theology that makes it scientific.

The first and salient legacy of the Torrance approach is a key distinction: "Science and Religion" versus "Science and Theology." These two are not the same. Religion has to do with human consciousness and human behavior. Theology has to do with God. "Whenever religion is substituted in the place of God, the fact that in religion we are concerned with the behavior of religious people, sooner or later means the substitution of humanity in the place of religion. . ." (Torrance 1969, iv-v). Torrance clearly prefers to take up the distinctively theological task, defining theol-

ogy as a science. He describes theology (or a philosophy of theology) as a "meta-science of our direct cognitive relation with God. Science and meta-science are required not because God is a problem but because we are. . . . It is because our relations with God have become problematic that we must have a scientific theology" (Torrance 1969, v). One can see clearly here the influence of Karl Barth in getting beyond religious consciousness as the object of theology and allowing our consciousness to be shaped by the true object of theology, God. "Scientific theology is active engagement in that cognitive relation to God in obedience to the demands of His reality and self-giving" (Torrance 1969, v).

Torrance stresses that authentic inquiry, both scientific inquiry and theological inquiry, attend to what is, to what is actual, to what is real; and this means that we should guard against superimposing upon reality an a priori or idealistic scheme. To this end we allow our inquiry to be guided by its object, by the reality of the object under study. The transition from the Newtonian worldview to the Einstein revolution could take place only when science was authentic, only when it let nature tell us what nature is like.

In stressing this point, Torrance elegantly moves natural theology from its previous position of prolegomena into positive theology proper. This move parallels Einstein's treatment of geometry. The Euclidian geometry inherited with Newtonian physics provided a context for inquiry that presupposed absolute mathematical space and time with bodies in motion. For Einstein, this constituted an idealized pre-supposition detached from nature as he was studying it. Einstein's revolution in the theory of relativity consisted of placing geometry into the material content of physics. Rather than treating geometry as an idealized framework, Einstein brought it into the midst of physics where it became a natural science indissolubly united to physics.

Torrance wants to learn from Einstein's example. Torrance puts natural theology where Einstein had put geometry. "So it is with natural theology: brought within the embrace of positive theology and developed as a complex of rational structures arising in our actual knowledge of God it becomes 'natural' in a new way, natural to its proper object, God in self-revealing interaction with us in space and time. Natural theology then constitutes the epistemological geometry, as it were, within the fabric of revealed theology" (Torrance 1985, 39). By making this post-Barthian move, Torrance denies natural theology any independent status while making it serve as an instrument of unfolding and expressing the knowledge content of Christian theology.

Authentic theology, then, attends to its object, God. It listens to what the Word of God tells us. This form of objectivity—listening to the object of inquiry—makes science scientific and theology scientific.

Theology is the unique science devoted to knowledge of God, differing from other sciences by the uniqueness of its object [God] which can be apprehended only on its own terms and from within the actual situation it has created in our existence in making itself known. . . . Yet as a science theology is only a human endeavor in quest of the truth, in which we seek to apprehend God as far as we may, to understand what we apprehend, and to speak clearly and carefully about what we understand. It takes place only within the environment of the special sciences and only within the bounds of human learning and reasoning where critical judgment and rigorous testing are required, but where in faithfulness to its ultimate term of reference beyond itself to God it cannot attempt to justify itself on the grounds occupied by the other sciences or within their frames of interpretation. (Torrance 1969, 281-82)

Torrance recognizes the finite and perspectival limits of human knowing as it operates in theology and the other sciences; and it is just this perspectival limit that mandates that authentic inquiry attend to its object and learn from its object.

Departing from Barth, who argues that theology can be methodologically isolated from other disciplines, Torrance maintains that theology should engage the natural sciences in conversation. Torrance affirms *creatio ex nihilo*, noting that the divine transcendence implied here renders the created world contingent. The contingency of the world requires that we study the world directly to unlock its secrets. No idealistic shortcuts or revelations about God can substitute for empirical research. This conclusion functions as a sort of theological blessing upon the scientific enterprise.

Torrance wants the theologian to broaden the scope of attention, to get beyond anthropology to include nature around and in us. Theology has been suffering from tunnel vision, he complains, the tunnel vision wherein we have limited theology to the relationship between God and the human race. Theology cannot be restricted to the relationship of God to humanity. "Theology has to do with the unlimited reality of God in his relations with the universe of all time and space" (Torrance 1985, 67). Hence, the sciences broaden our knowledge of God's creation and provide an understanding of the arena within which Incarnation and Resurrection take place.

This enlargement of the scope of theology to include all space and time provides the framework for specifying just how God can be an object of inquiry and how knowledge of God can be objective. Torrance is a trinitarian theologian, and the finite objectivity of God incarnate grounds the objectivity of theology.

The framework of objective meaning that concerns the theologian here is bound up with the Incarnation of the Son of God to be one with us in our physical human existence within the world of space and time in such a way that through his vicarious life and passion he might redeem human being and creatively reground it in the very life of God.

Therefore the framework of meaning also is bound up with the Resurrection of Jesus Christ in body, or the physical reality of his human existence among us, for it is in the Resurrection that God's incarnate and redeeming purpose for us is brought to its triumphant fulfillment.

One of the difficulties any Barthian theologian confronts when engaging in dialogue with the natural sciences is the apparent self-referentiality of the theological circle. The existence of the object of theological inquiry, God, is just what is in dispute in the modern world. To presuppose its truth and then contend that this assumption produces knowledge seems to beg the question. Torrance is aware of the difficulty. He defends his method with a *tu quoque* argument, noting that all theories are circular, striving to establish themselves through coherence because they cannot be derived or justified on any grounds other than what they themselves constitute. In this regard, theology is no worse off than any other discipline.

SCIENCE AND SYSTEMATIC THEOLOGY: ARTHUR PEACOCKE

Arthur Peacocke is a biochemist turned theologian, former Dean of Clare College at Cambridge, retired from directing the Ian Ramsey Center at Oxford, and Warden Emeritus of the Society of Ordained Scientists. "Theology needs to be consonant and coherent with, though far from being derived from, scientific perspectives on the world," he asserts (Peacocke 1993, x). The task for theology is clear: to rethink religious conceptualizations in light of the perspective on the world afforded by the sciences.

This rethinking leads to questions about God. God is mysterious, affirms Peacocke. Natural theology paints a picture of an ineffable and transcendent God beyond human comprehension. The special revelation of God experienced in the person of Jesus Christ only enhances the mystery of the divine. Yet mystery is by no means confined to theology. Twentieth-century science is characterized by a new appreciation of the mystery of existence. Quantum physics, with such features as indeterminacy and vacuum fluctuations, has increased our knowledge and at the same time humbled our hubris in assuming causal explanations to be right around the corner. The foundation of physical reality is more elusive than once thought. "So the mystery-of-existence question becomes even more pressing in the light of the cosmic panorama disclosed by the natural sciences" (Peacocke 1993, 101). Also mysterious is human personhood, arising as it does from the biological sphere to attain consciousness and then become itself a top-down cause. Peacocke believes that "this recognition of an ultimate ineffability in the nature of the divine parallels that of our ultimate inability to say what even things and persons are in themselves" (Peacocke 1993, 102).

BOTTOM-UP SYSTEMATICS: JOHN POLKINGHORNE

Peacocke is a hybrid—that is, he is trained in both science and theology. Another hybrid is mathematician-physicist turned theologian John Polkinghorne, now president of Queens' College, Cambridge. Polkinghorne pursues systematic theology with what he calls a “bottom-up” method. The *bottoms* with which he begins are scientific data regarding the natural world, historical data regarding the biography of Jesus, the Church's threefold encounter with the economic Trinity, and such. The *up* with which Polkinghorne concludes is a high degree of confidence regarding the fundamental commitments of the Christian faith, commitments that are completely compatible with the truths pursued in the field of science. “Although faith goes beyond what is logically demonstrable,” he writes, “yet it is capable of rational motivation. Christians do not have to close their minds, nor are they faced with the dilemma of having to choose between ancient faith and modern knowledge. They can hold both together” (Polkinghorne 1994, 193).

Polkinghorne is committed to consonance—that is, theological reflection on Creation must be consonant with what science says about the Big Bang and evolution. But consonance by no means requires that theological assertions be reducible to scientific assertions. The scientific worldview is itself subject to interrogation and expansion, and this process is pursued through metaphysics.

For example, Polkinghorne distinguishes his position from the deism that Stephen Hawking and some other physicists oppose in their explanations of the Big Bang, with its possible edge of time at the beginning. Such deistic suppositions limit Creation to a single act at the beginning; from then on, God is presumed to let nature take its evolutionary course. But Polkinghorne is a theist who believes in an active God, so he combines *creatio ex nihilo* with *creatio continua* to emphasize God's continuing involvement in nature. Polkinghorne's active God is omnipotent but by no means a tyrant. God's power has been withheld to make room for freedom within nature. God still acts in nature without obviating this freedom. “One is trying to steer a path between the unrelaxing grip of a Cosmic Tyrant and the impotence or indifference of a Deistic Spectator” (Polkinghorne 1994, 80).

Polkinghorne rightly defines his position sharply against such colleagues in the field as Arthur Peacocke and Ian Barbour. The strength of Peacocke and Barbour is, perhaps, that they wrestle actively with the actual scientific ideas, seeking their integration with theological ideas. The strength of Polkinghorne is his confidence that the Christian faith, when subjected to the same rational scrutiny that science imposes upon its data and theories, exhibits an honest pursuit of truth accompanied by a confidence in its rational motivation.

PHYSICAL COSMOLOGY AND DIVINE ACTION:
ROBERT JOHN RUSSELL

On the American side of the Atlantic we find Robert John Russell, a hybrid physicist and systematic theologian directing the program he founded in 1981: The Center for Theology and the Natural Sciences at the Graduate Theological Union in Berkeley. Methodologically, Russell belongs to the consonance school, but in his own way he emphasizes a dialectic between consonance and dissonance. Science and theology can at points take different trajectories, and dissonance must be acknowledged. Like Polkinghorne, Russell is clear that scientific prognostications regarding the future of the cosmos do not square with Christian eschatology. A projected heat death due to entropy does not square with the promise of Resurrection and New Creation. Here is dissonance that needs to be acknowledged. Inspired by the work of his former student Nancey Murphy, who employs the philosophy of Imre Lakatos for theological purposes, Russell seeks to embed the consonance-dissonance dialectic into a theological method that sees itself as a progressive research program.

In careful conversation with physical cosmologists and with such physicist-theologians as Ian Barbour and Willem Drees, Russell has pressed for consonance on understandings of the origin of the universe found in Big Bang cosmology and the Christian concept of Creation. The orienting question is this: Is the Christian doctrine of *creatio ex nihilo* consonant with the Big Bang? Many answers have been given, all unsatisfying to Russell. The two-language answer is no, because this school believes in principle that no scientific picture of the universe's origin has any conceptual relevance for theology. This approach precludes looking for consonance at the outset. An alternative answer, a semiliteralist answer, would be, yes, they are consonant because the scientific discovery of a beginning to the universe corroborates the Christian view that the creation had a beginning boundary, before which there was nothing. Two circumstances make this answer unsatisfying as well. First, current conversations regarding quantum theory make it premature to pronounce a scientific consensus that the universe—at least the original singularity—had an absolute beginning. Second, the force of the *creatio ex nihilo* idea is that the world is ontologically dependent upon God, and this could be the case even if there were no beginning boundary.

Russell feels the need to find his own answer. Following the Lakatos-Murphy distinction between the inner-core commitment and the outer belt of auxiliary hypotheses in a research program, he posits the following as core: *creatio ex nihilo* means ontological dependence. Then he adumbrates three auxiliary hypotheses: (a) ontological dependence entails finitude; (b) finitude includes temporal finitude; and (c) temporal

finitude entails past finitude—that is, going backwards in finite time must take us to a beginning, a $t = 0$ point. This assertion fits with what we know from Big Bang cosmology, in which the data of astrophysics, the theory of general relativity, and other factors point us to an initial singularity, $t = 0$. That this singularity may have a quantum life of its own, does not stop Russell from tendering a modest conclusion: the empirical origination described by $t = 0$ in Big Bang cosmology tends to confirm what is entailed in this theory's core, namely, *creatio ex nihilo* means ontological dependence. This observation is not a proof, but it is a partial confirmation.

THE CREATED CO-CREATOR: PHILIP HEFNER

Like Russell, Philip Hefner picks up on the Lakatos-Murphy methodology with its core-auxiliary distinction. He puts God in the hard core, "that to which all terrestrial and cosmic data are related." He adds seven auxiliary hypotheses that I will not enumerate here. He believes that the test of theology is its credibility, that it is subject "in principle" to falsification by experience, but finally measured by its fruitfulness. "What is at stake in the falsification of theological theories is not whether they can prove the existence of God," he writes, "but rather whether, with the help of auxiliary hypotheses, they lead to interpretations of the world and of our experience in the world that are empirically credible and fruitful—that is, productive of new insights and research" (Hefner 1993, 201). Hefner also puts great emphasis on the moral fruitfulness of theological theories.

Hefner teaches systematic theology at the Lutheran School of Theology at Chicago, edits the journal *Zygon*, and co-directs the Chicago Center for Religion and Science. His work in the field has been devoted less to physical cosmology and more to rapprochement between theology and the life sciences, especially evolutionary theory. He has sought to develop an anthropology and even a Christology in what he calls a biocultural evolutionary scheme. His is a grand vision, and at the focal center of this vision is the concept of the human being as the *created co-creator*. A basic element, embedded within the core rather than located in an outer auxiliary hypothesis, the concept of the created co-creator is Hefner's central contribution to the enterprise of theology and natural science. He writes, "Human beings are God's created co-creators whose purpose is to be the agency, acting in freedom, to birth the future that is most wholesome for the nature that has birthed us—the nature that is not only our own genetic heritage, but also the entire human community and the evolutionary and ecological reality in which and to which we belong. Exercising this agency is said to be God's will for humans" (Hefner 1993, 264).

CONCLUSION: SEEING COSMOS AS CREATION

We in the Christian tradition are used to speaking glibly of the natural world as God's creation. On what basis do we do this? It is not immediately obvious from observing the natural realm that it is the product of a divine hand or the object of divine care. Since the Enlightenment we in the modern scientific world have been assuming that no footprints of the divine can be discerned in the sands of the natural world. Western science assumes that if we study natural processes with the intention of learning the laws by which nature operates, what we will end up with is just a handful of natural laws. If we study natural processes with the intention of wondering about the magnificent mysteries that surround us, we will end up where we started, namely, with an imagination full of spectacular puzzles. If we study nature for its beauty, we will see beauty. If we study nature to see violence, we will see nature as did Tennyson, blood "red in tooth and claw." Nature, we have been assuming for a century or so now, does not seem to take the initiative to disclose its ultimate foundation or even its existential meaning. What natural revelation reveals is simply nature, not God. If we want to know more, we have to ask more questions. And we have to go beyond our natural relationship with nature to find the answers.

Christian theologians, seeing the limits to natural revelation in a modern world replete with naturalism, find they need to go to the historical events of the death and Resurrection of Jesus Christ, the events that stand at the heart and center of God's special revelation. Good Friday and Easter are not the first events to reveal that God is the world's Creator, of course. But these events do confirm what had already been suspected in ancient Israel, namely, that the creation of the world was the necessary first act in God's continuing drama of salvation. The world in which we live is not merely a conglomeration of natural laws or puzzles; it is not merely the realm of beauty or violence. The cosmos exists because it plays a part in the divine scenario of Redemption. It is on the basis of what we know about the God who raised Jesus from the dead that Saint Paul can perceive how creation has been "subjected to futility," that it "has been groaning in travail," and that God has furthermore "subjected it in hope" because it "will be set free from its bondage to decay and obtain the glorious liberty of the children of God" (Rom. 8 : 18-25).

Special experiences of God reveal special knowledge. We need to know—or at least need to hypothesize—that there is a God with divine intentions before we can see clearly that the world around and in us is in fact a Creation. It is primarily on the strength of Israel's experience with the liberating God of the Exodus that the Old Testament writers

could depict the world as God's creative handiwork. It is on the strength of our experience with the incarnate Lord that Christians in today's world can say that "God so loved the world . . ." (John 3:16). The New Testament promise of an eschatological New Creation tells us something essential about the present Creation. Theologically, it is God's promised Kingdom that determines Creation, and Creation is the promise of the Kingdom. Whether we interpret nature through the symbol of the Exodus, the Incarnation, the Kingdom, or some other, similar religious symbol, we find that we are dependent upon some form of revelation of God's purposes if we are to put nature into proper theological perspective—that is, if we are to think of nature as a Creation.

So, curiously enough, we might consider the possibility of a reversal in natural theology. Traditionally the aim of natural theology has been to ask what our study of nature can contribute to our knowledge of God. But might it work in reverse? Might we ask what our knowledge of God can contribute to our knowledge of nature? To know that God is the Creator is to know that the world in which we live and move and have our being is Creation.

We may not have to choose between the two methods, of course. We could begin with nature and then ask about God; or we could begin with what we think we know about God and then ask how this influences what we think about nature. Or, we could do both. Both should be on the agenda of those working in the field of theology and natural science.

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