

METAPHOR AND THINKING IN SCIENCE AND RELIGION

by Mary Gerhart and Allan Melvin Russell

Abstract. Excerpts from Chapters 1 and 3 of *New Maps for Old: Explorations in Science and Religion* (Gerhart and Russell 2001) explore the ramifications of metaphoric process for changes in thinking, especially those changes that lead to a new understanding of our world. Examples are provided from science, from religion, and from science and religion together. In excerpts from Chapter 8, a double analogy—theology is to science as science is to mathematics—is proposed for better understanding the contemporary relationship between science and religion. A conservation of epistemological sufficiency is disclosed as one moves from mathematics to empirical science to theology—a move from one discipline to another that involves a sacrifice of one aspect of thought to gain another.

Keywords: field of meanings; Carl Hempel; higher viewpoint; metaphoric process; stereoscopic view; tectonic reformation; theology; *weltanschauung*; world of meanings.

THE ROLE OF METAPHORIC PROCESS IN THE DEVELOPMENT OF COGNITIVE COMPLEXITY¹

We understand metaphors to comprise linguistic objects linked in surprising and superficially inappropriate ways. We understand cognition to be the dynamic activity of a mind traversing conceptual fields of meanings in a search for understanding. Because metaphors link different parts of fields

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of meanings, they have the ability to distort or reshape these fields increasing the complexity of the interactive conceptual elements contained. We call this distortion “metaphoric process” and suggest that it plays an important role in the development of understandings of complex states of affairs.

METAPHORS, ANALOGIES, AND COGNITION. Metaphor is everywhere! One of our colleagues noticed a sign over the baggage area in the Athens airport; it contained the word ΜΕΤΑΦΟΡ—equivalent to “transfer,” as in “baggage transfer.” The occasion serves to remind us that metaphor is a much more common word in Greek than it is in English—at least until recently. Once restricted to the fields of language, rhetoric, and poetry, *metaphor* has now become so popular that it is in danger of losing its distinctiveness.

Definitions of simile, analogy, and metaphor are not mutually exclusive (if they ever were); they refer rather generally to the substitution of some thing (usually some word) in the place of another. Some authors use simile, analogy, and metaphor interchangeably. Some uses of metaphor are so broad that any act of representation can be referred to as metaphorical. There is an increasing danger that the term will soon become meaningless as in the tag line, “. . . speaking metaphorically, of course”—an expression intended to imply that what has been said is, in some unarticulated sense, *untrue*, just when one means that what has been said is, in some (other) unarticulated sense, more true than otherwise.

Turning to theories of metaphor, one becomes quickly aware that, in the words of Paul de Man (1978, 13), “metaphors, tropes, and figural language in general have been a perennial problem and, at times, a recognized source of embarrassment for philosophical discourse and, by extension, for all discursive uses of language including historiography and literary analysis.” The failure of efforts to develop a generally accepted theory of metaphor arises, we believe, because theories of metaphor usually address a kind of text (called metaphorical) rather than a kind of cognitive *process* (called metaphoric) for which the texts give evidence. Without a model of cognition and explicit attention to the cognitive effects of metaphor, the things one sees in metaphorical language are but the shadows of thought.

What, then, does it take to distort a field of meanings? What is a field of meanings—the thing to be distorted? How does the distortion of a field of meanings change our understandings and affect the ways we think? These are the questions we need to examine. First we take up the idea of a field of meanings.

FIELDS AND WORLDS OF MEANING, COGNITION, KNOWING VS UNDERSTANDING. Many scholars, including Mary Hesse, Nelson Goodman, and Paul Ricoeur, address the problem of understanding the

metaphoric process in terms of an implied model of thought. For Hesse there is a “network of meanings” (1988, 1); Goodman speaks in terms of “worldmaking” (1978, 1); Ricoeur refers to a “shift in the logical distance” (1978, 147). In each case, although a model of cognitive structure or function is implied, no description of a model is given.

Our model of a world of meanings is constructed as a network of nodes (concepts) interconnected with branches (relations). We understand a science (e.g., physics and theology—insofar as the latter is a science) as being the business of relating every object of inquiry (here, experiences of nature) to everything else (concepts already related). We assume that we are able to understand experiences only if, to some extent, they can be related to previously understood experience. The test of the effectiveness of our understandings lies in our ability to analyze the relations that hold with respect to experience. Metaphoric process *changes* relations within a field of meanings, a disruptive cognitive act that goes beyond analogic process.

FOUNDATIONS FOR METAPHORIC PROCESS. Metaphoric process and its concomitant cognitive disruption is justified by the efficacy of the result. In *Metaphoric Process: The Creation of Scientific and Religious Understanding* (Gerhart and Russell 1984) we called the driving force behind metaphoric process an “ontological flash” (p. 114), an insight that a particular act of cognitive distortion made the world more understandable. From time to time we glimpse a possible cognitive rearrangement of our world of meanings, or one of its fields of meanings, a rearrangement that might render our view of our world more comprehensible, more comprehensive.

Some years ago one of us was rummaging around in the dark attic of a house on a stormy night. He had been told that he would find a certain chair in the attic and he had been groping along for some time. His hands encountered a variety of objects he was more or less able to identify: an old bridge lamp, a cedar chest, some old clothes on a hanger. Suddenly, there was a flash of lightning, and for a split second the entire attic was full of light. Then it was dark again. From that instant on he knew where all the objects in the attic were. He was able to go, with confidence, right to the chair. This kind of insight is related to the so-called *aha!* experience or “*aha!* reaction” in psychology as described, for example, by Martin Gardner in his book *aha! Insight* (1978).

In order to characterize more complex and deliberate experiences of this kind, we borrow the formal term “higher viewpoint” from Bernard Lonergan. Lonergan used the term “higher viewpoint” to designate a “complex *shift* in the whole structure of insights, definitions, postulates, deductions and applications” (1957, 13). Rather than a “shift” in structure, we speak of a “torque” or twist in the world of meanings such that some meanings which were formerly distant become close, and some previously close are now displaced to a distance. Lonergan saw higher viewpoints as resulting

from further questions which emerge within established fields of meanings—“when inverse expectations are allowed full generality, when they are not restricted to bringing one back to one’s starting point” (p. 15). For us, the initiation of a higher viewpoint is as apt to be aesthetic or ethical as it is to be formal—a higher viewpoint results from our dissatisfaction with, or attempt to change, the “shape” of our world of meanings.

Our use of “higher viewpoint” is more epistemologically general than Lonergan’s. We focus on the new cognitive perspective that can arise as the result of what Arthur Koestler (1964) called “a combinatorial act.” More specifically, Koestler described the effects of combining ideas that were formerly “strangers to each other.” Our conception of metaphorical process requires the equation of two concepts, or conceptions, formerly thought to be different from each other. Our paradigmatic example, drawn from human perception, is binocular vision—the constructive combination of two, two-dimensional images into one three-dimensional image, along with the greater insight and understanding thereby produced. An important point here is that the two elements are *necessarily different*: each two-dimensional view contributes different information that, when combined, results in a single three-dimensional view (see Figure 1).

Compromise—a process that would require either or both images to be changed—plays no role in the transformation that leads to the three-dimensional view, i.e., the higher viewpoint. Metaphoric process is one means of achieving such a rearrangement. There need not be any prior “similarity” in the parts of the cognitive world of meanings brought together by the metaphoric process. Indeed, the distortion created by the metaphoric act may eliminate similarities that formerly existed. If, however, the world of experience is subsequently better understood (more intelligible), metaphoric process is successful (see Figures 2 and 3). If there is no improvement in our understanding, metaphoric process fails. In the meantime there is the tension required to “hold” these two parts together. Once it is clear that the world is, indeed, better understood, the tension begins to subside, the world of meanings assumes its new topography, and the meta-

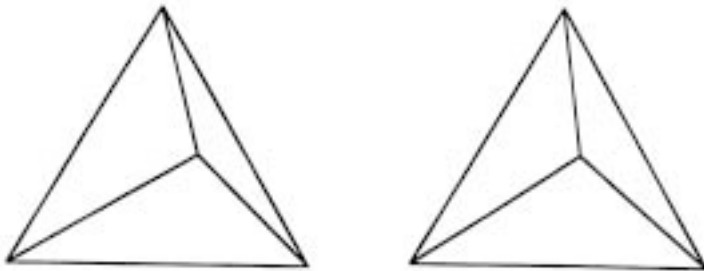


Fig. 1. A stereo pair illustrating a four-concept field of meanings as a three-dimensional surface (irregular tetrahedron). This figure is for stereo viewing.

phor begins to die (although religious metaphors may not atrophy in this way [as discussed later on]).

The test of any model is to be found in the extent to which it elucidates the state of affairs under consideration. However, there is more to it than greater complexity because metaphoric process is productive of understanding precisely because it sets the stage for further simplicity—for the discovery of a higher viewpoint. We offer examples:

FORMAL EXAMPLES OF METAPHORIC PROCESS FROM GEOMETRY AND PHILOSOPHY.

*The tetrahedron in two and three dimensions:
[Left-eye view + right-eye view = three-dimensional view
(higher viewpoint).]*

We will model a field of meanings as a *spatial* structure with a knowledge of its geometry or topography representing, in some sense, our understanding of the field. If we specify two concepts with one relation, we have a linear diatomic structure. When our field contains three concepts, we have a planar triangular structure. An increase to four concepts with six relations yields a structure that in general requires three dimensions. If all the relational branches were the same length, we would have a tetrahedron.

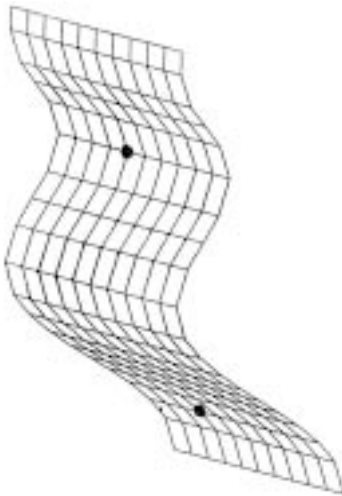


Fig. 2. A two-dimensional network in three-dimensional space as a model of a field of meanings (sometimes called a “net” or a “rug”). Two concepts are marked on the net.



Fig. 3. A field of meanings (the net of Fig. 2) distorted by metaphoric process that requires the two marked concepts to be related more closely. The field of meanings and hence the relations between other concepts are also changed in the process.

Now a two-dimensional view of a regular tetrahedron shows the four concepts not equally spaced. Only when displayed in three dimensions is the structure accurately presented. Recall from Figure 1 that it took two different viewpoints (a left view and a right view) to achieve a stereoscopic three-dimensional representation. Moreover, it was not the sum of the two views that achieved the three-dimensional presentation but a synthesis or fusion of the two views. A stereoscopic view is an analogue of the higher viewpoint described above. Neither individual need relinquish her/his point of view. One does not have to ask which view is correct—both are.

We saw that three equidistant concepts could be represented by an equilateral triangle in a plane; four equidistant concepts required three dimensions to display a tetrahedron. Five equidistant concepts, however, cannot, in general, be represented spatially because they require four orthogonal spatial dimensions. This problem illustrates the representational limits of conceptual maps or networks of concepts and relations. The inability to represent the high dimensionality of a field of meanings in conventional configuration space may account at least in part for the lack of success of extensive efforts to develop conceptual maps in physics and may also explain why many religious thinkers prefer creative syntheses over systematic theologies. Despite these limitations, we believe the idea of a topographical field of meanings is of great utility in describing the way change takes place in ways of thinking.

Phosphorus (φωσφορία) and *Hesperus* (εσπερος) to the Greeks.
[Morning Star = Evening Star.]

We draw our philosophical example from Gottlob Frege's famous paper "Über Sinn und Bedeutung." Frege said that "the reference of 'evening star' would be the same as that of 'morning star,' but not the sense" (1966, 57). He said, in other words, that the morning star *is* the evening star. In terms of our theory of metaphoric process, to insist on this relation is to create a metaphoric change in a world of meanings. Prior to this metaphoric act (whenever it first occurred) we had from time to time a phenomenon—a bright star seen near the eastern horizon just before dawn. We also had from time to time another phenomenon—a bright star seen near the western horizon just after sunset. These disparate observations (presentations) are given, in the metaphoric assertion, a single reference—the planet Venus. Frege used this example to distinguish between the sense (*Sinn*) of a word and its meaning (*Bedeutung*) or reference—the thing to which the word "points." We refer to Venus (the planet) in two different ways (senses) phenomenologically distinct. The metaphoric achievement is to "realize" that the distinct phenomena (distinct texts) mean or "point to" the same thing. To observe two manifestations is to encounter two phenomena. If these phenomena are separately understood and one subsequently realizes that these two phenomena are manifestations of the same thing, one has encountered a cognitive metaphor. Lest the morning star/

evening star example seem a purely scientific issue unrelated to religious concerns, consider the possible effect of the metaphoric transformation on two tribes: one tribe worships the morning star and the other tribe worships the evening star. The metaphoric process *equates* what were formerly two *different* gods—a potentially explosive theological change. Indeed, such a change can be seen in the Hebrew Bible with the metaphor, Yahweh = El, made in response to Moses' question, "What shall I say when they ask me your name?"

Following are examples of cognitive disruption brought on by metaphoric process, first from natural science, and second from theology.

EXAMPLES FROM PHYSICS AND ASTRONOMY. The examples in natural science are drawn from physics and astronomy—surely there are many others in geology, biology, and chemistry as well and can be added by those knowledgeable in these fields.

The Copernican Revolution.
[*The Sun (not the Earth) = the Center.*]

Nicolaus Copernicus wrote one of the most important books in history, *De Revolutionibus Orbium Coelestium* (1543). In it he claimed that the sun rather than the earth was the center of the universe (solar system). To the best of our knowledge the claim was made on the basis of no definitive observational evidence whatsoever. The "facts"—i.e., the observations that had been made of the motions of the sun and the planets in the heavens—were as completely accounted for by Ptolemaic theory as they were by Copernican (see Figure 4). We understand the Copernican assertion as

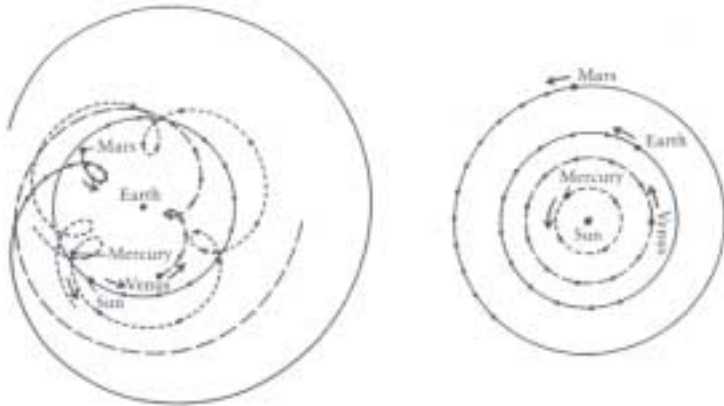


Fig. 4. Two views of the inner solar system. The same motions as seen from Earth are accounted for by both the Earth-centered theory and the Sun-centered theory. The view on the left represents the Ptolemaic theory and the right the Copernican theory of how the motions of the Sun and planets can be accounted for.

deriving from a metaphoric act based on his understanding of the relations among the heavenly bodies (actually not an entirely new understanding since it had been held by Aristarchus about 1,800 years earlier). The negative reaction reached its climax in 1633 with the Italian church's house arrest of Galileo Galilei (who *did* have observational evidence to support his teaching the Copernican system).⁴

With Galileo, the issues were no longer matters of opinion, for when he turned his telescope on Venus he saw the phases of that planet. Now in the Ptolemaic system everything (sun, moon, Venus and the other planets) circled the earth. However, observations had always shown Venus to be near the sun (as the morning star in the east or the evening star in the west). If Venus were going around the earth—somewhat in step with the more distant sun—the sun shining on the planet would always put it in a crescent phase. But that was not what the telescope revealed to Galileo. Venus had a gibbous phase (it was more than half illuminated) when near the sun which meant that it was then further from earth than the sun was! (It was also smaller and dimmer in the gibbous phase than in its crescent phase). A sun-circling Venus could account for all of these observations. No earth-circling model could account for what the telescope revealed.

No longer was the Copernican claim merely a matter of expressed simplicity or calculational convenience. One of the greatest metaphoric acts in history had forever changed the way people on Earth would be able to think of themselves.

Notice that the negative reaction to this act was intensified by the distortion of *other relations* that occurred as a necessary result of the metaphoric process effected by Copernicus. These cognitive effects could be suppressed so long as the Copernican scheme was seen as merely a calculational convenience (as it surely was) but could not be avoided when the Copernican System was taught as science. The daily rotation of the earth requires an observer (at European latitudes) to be moving with a speed of about 1000 km/hr—some thirty times the speed of a running horse (very likely the fastest thing experienced at the time) or about twice the speed of a jet airplane today. Moreover, the revolution of the earth around the sun in a year's time requires the planet to move at a speed of about 100,000 km/hr—a speed so great as to be unimaginable *as an experience*.

Reviewing a linguistic expression of the Copernican metaphor, we notice that the statement can be reduced to "The location of the sun (not of the earth) is the center of the solar system." This is not a simile, nor is it an analogy. Furthermore, there is nothing unknown or ambiguous about the meaning of either "the sun" or "center of the solar system." To insist that one of these concepts *is* the other, despite the general understanding that they were different concepts, conforms to our formula for the linguistic expression of metaphoric process. The new understanding of the sun as the center of the solar system changed a host of relations in the relevant

cognitive fields profoundly distorting the topography of the sixteenth-century world of meanings. Testimony to the outrageousness of the act is amply given in history's description of the reaction to it. And although the idea had Greek origins, the Copernican revolution remains the paradigmatic example of metaphoric process—cognitive disruption with a move to a higher viewpoint—in the history of Western science.

The Newtonian Synthesis:
[*The Laws of Heaven = the Laws of Earth.*]

Although Copernicus' metaphor changed the way we see ourselves as related to the rest of the universe, the metaphoric process that caused Isaac Newton to equate the mechanics of the heavens with the mechanics of earthly objects had perhaps an even more profound effect on our lives. The mechanics of the "heavens" had been developed by Johannes Kepler. His laws of planetary motion expressed, in quantitative terms, the relations between the planets (the "wandering" heavenly bodies of the Greeks) and the sun. The mechanics of the "world" (the surface of the earth) was put together by Galileo, who could, for example, calculate the rate of fall of an object as it moved from some height toward the ground. Newton (in the famous falling-apple allegory) realized that Galileo's laws of falling objects applied to the moon as well as to terrestrial objects, and, with that metaphoric act, caused the laws of earth to become the laws of heaven—quite a reversal. The laws of mechanics followed, and the resulting ability to analyze mechanisms thoroughly and to predict mechanical behavior reliably can be understood as having reshaped one world of meanings to create a new world of meanings that lasted for over two hundred years. The Newtonian synthesis combined the Galilean laws of terrestrial motion and Kepler's laws of planetary motion using a new form of mathematical analysis—the calculus—to create analytical mechanics, arguably the most powerful scientific system in history up to the twentieth century.

EXAMPLES OF METAPHORIC PROCESS FROM RELIGION AND THEOLOGY.

John's Epistle:
[*God = love.*]

It is said that religious metaphors retain their tension long after other kinds of metaphors have lost theirs (see, for example, Soskice 1985, 158; Hesse 1988, 18). Can our model of metaphoric cognition account for this claim?

Some of the most startling and perennially productive religious metaphors include the assertion in John's Epistle that "God is love" (1 John 4:8) and the statement made by Jesus when the disciples were vying with one another over primacy of place that "the least among you all, that is the one who is great" (Luke 9:48). With respect to the first (*God = love*), the equation of God and love involves equating one of the field of attributes

associated with God, namely, omnipotence, omniscience, and impassibility with the field of meanings associated with love, here understood as all that human relationality at its best includes (including vulnerability as well). With respect to the second (*the least = the greatest*), the equation is uncommonly paradoxical. Neither of these radical claims helps us to understand the everyday world where there are mass murders and where competing for the top spot appears to be the way to succeed. Instead, these metaphors challenge us to imagine a possible world to be reexamined and reaffirmed in the light of human experience. We understand and even believe religious metaphors *in spite of* their inability to explain the problems of evil, of suffering, and of meaning in the world.

“In the midst of life we are in death” (Christian burial service):
[*Life = death.*]

Among the major religions we find different images for the idea of life-after-death: resurrection, karma, the afterlife. In relation to a world of meanings, the concept introduces a fundamental twist or torque in the ordinary perception of reality. For example, in Corinthians 15:23, Paul writes of all persons as “dying in Adam and being brought to life in Christ” as though Adam had not been the biblical ancestor through whom life had been given. In a related sense, Al-Hallaj, who in Herbert Mason’s Islamic narrative *The Death of al-Hallaj* (1979) is accused of blasphemy and will be executed, says, “We do not think about the end. There is none.” Al-Hallaj describes the everyday understanding of reality as a distortion “leaving us floating blind spots we forget when our vision is clarified in His” (pp. 72–73)!

Moses:
[*Yahweh (God of the Exodus) = El (God of the Fathers).*]

In the Old Testament, the Mosaic declaration in the Book of Exodus that the God Yahweh is the God of the Fathers (El) results in a radical distortion of pre-Exodus meanings. The theory of metaphoric process provides here a basis for interpreting the transformation of the religion of Israel from polytheism to monotheism. By equating the God of the Exodus with the God of the Fathers in the metaphoric pronouncement Yahweh = El, Moses invokes the new concept *Yahweh*, now God of all the tribes of Israel.

We understand this process as a sublimation of the Goddess in the cognitive field of meanings that has been restructured by the metaphoric process in which Yahweh = El. See chapter 4 in Gerhart and Russell 2001.

We have seen the world-creating effects of metaphoric process as it distorts, reshapes, and complicates our world of meanings. By contrast, the Grand Unification Theories of physics—should they succeed—would make the physical world extraordinarily simple in physical terms. The metaphoric processes embedded in that theory will surely die quickly because

the theory will explain so much—will have such theoretical efficacy. The efficacy that kills the metaphors of science does not prevail with respect to many metaphors of religion precisely because of our inability to see the world as religion says it is. We fail to understand, and so the metaphor lives on. Questions in science are limited—rigidly circumscribed; questions in religion are *limit questions*—questions about limits. If someday the root metaphors of religion die, it will be a sign that the eschaton is here.

SUMMARY: THINKING ON A FIELD OF MEANINGS. To plan a trip by car from one city to another, a member of the American Automobile Association can order a custom-made map that will display the trip in a straight progression of roads, in effect reducing the map of the planned journey to a narrow linear strip. To abstract a trip or a proposition in this way is, in our model, to know but *not to understand*. The same is true for a hiker who must follow a blazed trail to get through a forest. That hiker knows how to get to the other side only by starting and ending at designated places each time. By contrast, a forester who understands the forest can go through in many ways starting from any point. The forester understands the forest and will not be lost when away from the trail. Analogously in our model, to understand is to know the shape of the cognitive field of meanings, to know one's way over and around the surface in a general sense. And, as we have seen, when the shape of the surface of the field of meanings changes, the change will be apparent to one who understands, even when it might go unnoticed by a person who is able only to follow a narrow path from start to finish.

We take thinking to be the activity of traversing relations—of going from one concept to a related one in a purposeful way. Cognitive activity can lead us along a path marked by conceptual points until we reach a conceptual point not yet experienced. At this point according to our model, an “analogic act” expands meanings within fields without distorting the fields.

The “metaphoric act” also involves the recognition of similarities, but these similarities are created by a “disruptive cognitive act” which *forces* an uncalled-for analogy within or between the fields of meaning—a distortion of one or both of these fields—in order to achieve the required analogy. When this distortion is productive, it creates new understandings and meanings.

In a text, the effect of metaphoric process, as well as analogic process, depends on the knowledge state of the reader. For a reader who knows only one of the two metaphoric elements, the text functions as an analogy, since the unknown element is free to move within the field. Such freedom removes the possibility of tension or distortion of the field of meanings of the reader—the litmus test of metaphoric process. The possibility of an

utterance being metaphoric for one person and analogic for another, depending on each person's state of knowledge, shows the ability of our theory to explain misunderstandings about metaphor as well as misunderstandings in general.

In the middle of the twentieth century Einstein is reported to have remarked that everything had changed except our thinking. We would say that our fields of meanings were substantially enlarged but that the shape and form of these fields had not changed.

Since 1950 our knowledge of the universe has been reshaped by metaphoric process, reshaped in a way not unlike the way our understanding of the universe was reshaped by Copernicus when the sun rather than the earth became the center of the universe. Because of Copernicus our point of view moved off the earth and into space—the higher viewpoint of the time. In the second half of the 20th century, our *Weltanschauung* was once again reshaped—so much so that the very concept of a center of the universe lost its meaning. Whether or not we can achieve a higher viewpoint appropriate for this new universe in the twenty-first century remains to be seen.

METAPHORIC PROCESS AS THE TECTONIC REFORMATION OF WORLDS OF MEANING IN THEOLOGY AND NATURAL SCIENCE²

In a multidisciplinary world of meanings, associative contexts depend on topography. Occasionally, a cognitively disruptive experience will create new relationships among conceptual elements in that world of meanings. If these newly related elements were formerly distant, the new world will exhibit a new topography which in turn can give rise to new understandings in theology and/or natural science.

DYNAMICS: COGNITIVE DISRUPTION. We now turn our attention to the ways in which fields of meanings change both in natural science and in theology. Much attention has been given to the question of changes in natural science during this century in part because there has been so much change. At first the question was asked as a question about scientific method. Only later did questions turn toward issues of systems of belief in science. Credit for this turn goes to Thomas Kuhn with his 1950 essay on scientific revolutions and to Gerald Holton for his work on thematic origins (1973; 1978). Holton examined the notebooks and private writings of scientists in order to expose and explore what he calls S_1 —the private and individual professional thinking of scientists such as Albert Einstein and Robert Millikan.

This shift from formal objective methodology in science to informal day-to-day working of individual scientists has allowed the doing of science to be understood as more of a human activity and encourages com-

parison with the thinking activities of theologians, which have always been understood to have a private and personal dimension even while the conclusions themselves might be of vital concern to large numbers of other believers. In our bidisciplinary explorations, we have learned that the ways in which change is brought about in theology and natural science are more alike than different. This conclusion has two consequences: (1) when the relationship between theology and natural science is taken as an object of study, times of major change in understandings within each field need to be taken at least as seriously as times of relative stability in understanding, and (2) the focus of our own study needs to be the phenomenon of change and only incidentally the beliefs or their rationalizations at any historical moment.

We are now ready to ask in what ways a field of meanings can be changed. At least three possibilities come to mind:

1. *New Knowledge—Adding to a Field of Meanings—A Cumulative Process.* First, we can imagine an increase in the number of concepts that make up a field. The additions might come at the edges of a field or as a filling in of an already established region. In either case we take a change of this kind to correspond to a basic learning process that results in an increase in what is known.

2. *New Understandings—Templates and Molds—Analogic Process.* In *Metaphoric Process*, we compared processes of coming to know (knowledge-in-process) in science and religion. We found that in either field there were two distinct kinds of operations which we called analogical on the one hand and metaphoric on the other. We said that when a conception is not well known, it is not rigidly contained in a field—its relations with other concepts in a field are underdetermined, loose, or at least elastic. When we attempt to understand such a concept, we often say that it can be understood as being like some other well established concept in the field. In making the comparison we are asserting a kind of cognitive proportion between the known and unknown concepts and, since the new one is free to move, little if any cognitive tension is caused by the comparison. This process is analogical and the newly learned conceptual element takes on the shape of the known concept without strain.

3. *New Topography—Tectonic Change—Metaphoric Process.* Consider now the case of two concepts both firmly or rigidly embedded in a field of meanings. Here both concepts are known. Here each has well established relations with other “nearby” concepts, and the shape of this part of the field is understood. What happens, we ask, when we suddenly realize that one of those concepts is the same as the other? Bringing the two concepts together cognitively involves considerable intellectual stress and results in a distortion of the field, a distortion we understand as metaphoric strain.

Large cognitive forces come into play here because of the rigidity of the conceptual relations in the field of meanings.

The effect of the metaphoric process is to achieve new understanding without the addition of any new concepts to a field. The newly shaped field constitutes a better construction of what we already know.

EXAMPLES OF COGNITIVE DISRUPTION. Following are examples of cognitive disruption brought on by metaphoric process, first from natural science, second from theology, and finally from theology and natural science combined.

In Natural Science. The following examples of cognitively disruptive assertions are drawn from physics and astronomy.

Heat is motion. (Thompson/Joule)

No longer is heat understood as a fluid substance. It is understood as the random motion of particulate matter.

Electromagnetism is not mechanical.

As Freeman Dyson (1992, 103) points out, the great James Clerk Maxwell, who created the theory of electromagnetic radiation—light as electricity and magnetism combined—could not see that his theory was independent of the mechanics of Newton. This example of cognitive disruption is particularly interesting because it represents cognitive fission rather than fusion. Most of the cases of metaphoric process we know involve the realization that X is the same as Y. In this case we have the realization that X and Y are independent.

Galilean relativity holds for electromagnetism as well as mechanics. (Einstein)

Einstein insisted that, for all observers, the laws of physics are independent of the state of motion. In applying this Galilean principle to electromagnetism Einstein was required to say that the speed of light was the same for all observers. This statement of an absolute yielded the special theory of relativity.

Light is particulate as well as undulatory. (Einstein)

Einstein was awarded the Nobel Prize for his theory of photoelectricity—the release of electric charge when light strikes a metal surface. The then-prevailing view of light as electromagnetic waves was insufficient to account for the experimental observations.

Energy is particulate. (Planck/Bohr/Einstein)

The idea that energy comes in chunks is one of the most remarkable conceptions of the past century. It gave rise to the quantum theory that is a universal denial of continuity. At the microscopic level everything is discrete and all knowledge fundamentally statistical.

Mass is undulatory as well as particulate. (deBroglie)

What wonderful symmetry! Not long after Einstein showed that light could behave as particles, deBroglie asserted that particles could behave as light. Demonstration came in the form of the diffraction of electrons. Ironically, it was diffraction of light that banished Newton's original corpuscular theory of light. The field of meanings in this area of human thought must look like a pretzel!

In Theology.

God is human as well as divine. (Luke)

In the Christian New Testament the concept of God becoming a human being in Jesus Christ results in a distortion of previously discrete fields of meanings for "God" and "human." Indeed, the crowds' avowal of the charge that Jesus had claimed to be the Son of God is so politically unsettling that it results in a death sentence (Luke 22:66–71).

An individual's ultimate concern is that person's god. (Tillich)

Paul Tillich used to claim that he needed only a fifteen-minute conversation with someone in order to be able to identify that person's God. Here disbelief results from relegating god and human interests to the same field of meanings.

God is relational rather than omni-anything
(e.g., all-knowing, all-powerful, all-present and eternal).

Distancing the concept "God" from classical metaphysical fields of meanings enables us to correlate the concept "God" with contemporary metaphysical understandings of relations and processes. Such distancing began with the "turn to the subject" in early twentieth-century theology and was developed further by process theologians Charles Hartshorne, John Cobb, Marjorie Suchocki.

The "natural" state of existence for human beings
is to be "graced." (Rahner)

By calling the "natural" a "remainder concept," Karl Rahner called into question the notion of the *merely* "natural," especially in the sense of its being only a basis for the "supernatural." Rahner argued that, rather than designating an actual state of affairs, the "natural" is best understood as a hypothetical designation of what would have been the human condition—had it not already been blessed from the beginning.

Christ is sophia and logos.

The christology of traditional Christianity was drawn from the logos tradition. New appreciation of the sophia tradition in biblical exegesis and theology means that the logos concept no longer need dominate: It becomes possible to reconstruct the concept "Christ" in feminine as well as masculine terms.

Before moving on to examples of changes in the field of theological meanings suggested by new understanding in physics, we should remember that it is no mere coincidence that painting, music, and dance all have undergone tectonic reformation. Throughout history the arts have been most reliable indicators of the state of the world of meanings of their time.

Rather than display a list of changes in religious thinking influenced by natural science over the years, we choose to focus on two quite recent conceptions that remain incompletely developed and unresolved. We choose such cases to stimulate not merely discussion of historical *faits accomplis* but also inventive speculation—to encourage a more imaginative approach to the creation of theological understanding. Here are two proposals.

First, conceptual structures in science in relation to understandings in theology:

Evil as entropic degradation. (Robert John Russell)

In his “Entropy and Evil” (1984) Robert John Russell explores the possibility of a “substantive relationship between entropy and evil.” Does the probable inevitability of evil, degradation, and death play the same role in human being that entropy plays in the second law of thermodynamics? The second law of thermodynamics is a statement to the effect that when any natural process takes place, one can find a corresponding increase in the entropy of the universe, an increase in the uselessness of everything—especially energy. Thus gravitational energy degrades into radiant energy which in turn degrades into low temperature heat energy in the form of random molecular motion. In like manner the highest aspirations of human beings, as in the story of the tower of Babel, decay into jealousy, war and garbled communication. The best that can be done is to improve the situation in a limited region, and that can be achieved only at the inevitable cost of making things worse everywhere else.

If this ingenious analogy is to avoid concluding in one of the gloomiest conceptions of human being we can imagine, we must study it—as Russell does—with care. It is no wonder that we have difficulty living our lives on the basis of an understanding of the field of meanings that contains these great principles. Of particular importance is the related concept of information—shown by Claude Shannon to be a form of negative entropy. Information enables us to manage complicated scenarios with a degree of efficiency and thereby to minimize the excoriating effects of the increase in entropy. We should all be especially concerned that the sun is shining its light away at enormous cost in entropy-increase, and we are doing little to take advantage of this process for the benefit of human beings. Our lack of willingness to develop space with the same confidence we developed the western United States may yet turn out to be the scandal of the century, and seal the early demise of the human species.

Here is a second application of conceptual structures in science to understandings in theology:

*Time [as understood in Einstein's theory of relativity]
and the second coming of Christ. (Gerhart/Russell)*

In *Metaphoric Process* (1984, 182) we quote, from the Christian testament, a familiar eschatological passage attributed to the Christ: "I tell you solemnly, before this generation passes away all these things will have taken place. . . . But as for the day or hour, nobody knows it, neither the angels of heaven, nor the Son; no one but the Father. Be on your guard, stay awake, because you will never know when the time will come."

In a mechanical understanding of the world, if a particular event is going to happen, the probability of its occurrence tomorrow increases as each day goes by. If the alarm clock is going to ring, each minute you wait makes it more likely the alarm will go off in the next minute. If you wait a long time, however, say 2,000 years, and the event has not occurred, you may reasonably conclude that the system that would have caused the event is inoperative—the clock is broken. However, our understanding of nuclear physics now belies this conclusion. A radioactive atom has some probability of disintegrating in the next moment, and that probability does not change with time. As we observed earlier, microscopic processes are fundamentally statistical. We can reasonably think that the second coming is as likely today as it has ever been.

Let's speculate further. Is there a natural science understanding of time that would make the time of the second coming significant in human experience? We think perhaps there is, and we look to the special theory of relativity. There we learn that an individual's time is personal, in the sense that it depends on the individual's history—in particular Einstein's theory demonstrates that your time depends on your state of motion. If you traveled fast enough you might possibly live the 200,000 years it would take to cross the galaxy.

Consider, then, in the light of that conceptual situation in physics, the following understanding of the time of the Second Coming: Perhaps that time is the same time for all human beings. Perhaps that time coincides with the time of the death of each of us. Perhaps the promises made in Jerusalem are all to be fulfilled at one moment that is common to us all. The conceptual structure of Einstein's world does not say it is so, but it does say that such a conception is not impossible.

NEW UNDERSTANDINGS. Understandings of God may differ for different human beings because human beings are different from one another. Theology tries to account for differences and similarities in understandings of God and of human beings. Let us recall two ancient puzzles. One is the story of the blind person trying to understand reports of what is being felt by six other blind persons, each of whom is describing a different part of an elephant. The other is a puzzle, attributed to Heraclitus, which states that we cannot step in the same river twice. How do these puzzles

apply to both science and theology? The elephant story illustrates the difficulty of trying to understand God from reports of various persons, including theologians. The river story illustrates the change undergone by people and theologians as God changes and all descriptions of God change.

Early attempts to grapple with heterogeneous theological questions and answers in the late Middle Ages provide good examples of the expectation that abstract understandings can in some sense be discrete and repeated, an expectation borne out in the “*Sic et non*” style of thought. To questions like “Is the Son God? Is the son human? Is the Spirit the same as the Son?” formal answers were given: “Yes, yes, no,” together with the arguments for the sense in which these were the correct answers. It is apparent to us today that these logical exclusions were mind-boggling to early and medieval thinkers. Tertullian, for example, took the position that one ought to believe religious doctrine precisely *because* it is absurd! (Here we might recall Bohr’s “Is it crazy enough?”) But since then human beings have become better at thinking in this way. With Hegel, for example, it became possible to think these contradictions and to eliminate the law of the excluded middle as an impediment to thought. But the big danger today is not only in the kind of rationality that is being called into question. The danger is even more present in thinking that it is best (or adequate) to think through any major issue only privately. For if we do not attempt to understand cooperatively, that understanding is less likely to be able to reach the goal of reasonableness to all who also ask a question about what is described.

The theological question asked by many Jews after the Holocaust—how could God have allowed these atrocities to happen—for example, is a question not only within Judaism. It is a question to be taken seriously by any contemporary person who attempts to find the concept of God meaningful. An answer any better than completely inadequate is likely to begin with the paradigm shift cited in the example of cognitive disruption above: namely, that *God is relational rather than omni-anything (e.g., knowing, powerful, present) and eternal*. With the distancing from classical metaphysical fields of meanings, the concept “God” is drawn closer to the ways in which human beings differ and change.

This insight about the changing character of theology is borne out by the question of what will happen in the ever-increasing recognition of plurality—both within and between major religions. David Tracy reminds us that, until recently, the question of the relationship of Christianity to other religions typically has been taken up last—often in an appendix in systematic theology (see Tracy 1990). But with the shift in populations, there has come a shift in theological focus, especially in liberation and feminist theologies, away from human beings as non-believers. Theological reflection done exclusively within a community of believers has expanded to include interreligious dialogue as well. If that dialogue is to be authentic, those

who participate put at risk their presuppositions about other religions. They also experience a sense of the ambiguity of all propositions concerning their own religion because of changes in lived experience and its expressions.

Novelty is forced on natural science by empirical observation: theories become inadequate to do the job of accounting for experience. So we are forced to reconstruct theories in a wild but intelligible effort to explain experience. As we argue in the following chapter, verification in theology proceeds by affirmation rather than by empirical observation. When people change, what can be affirmed changes. When people are no longer willing to say “yes, I can believe in that,” their failure of faith has less to do with natural science than with their own experiences in the world. The need to understand both these experiences and those of natural science makes it possible and necessary to do new theology today. What we have done is to provide a conceptual tool to support the expectation of and existence of novelty in theological as well as in scientific traditions. There is something new under the sun. All is not more of the same. Not all was given at the beginning.

MATHEMATICS, EMPIRICAL SCIENCE, AND THEOLOGY³

Just as empirical science draws on the forms and proofs found in pure mathematics for its means of describing the behavior of the natural world, so does theology borrow what scientific understandings it finds productive in the theological understandings of the role of God in the universe.

In this chapter we focus on the process relations that obtain between pure mathematics and natural science on the one hand, and natural science and theology on the other.

It has long been understood that developments in the natural sciences have implications for philosophy and theology. Just what these implications are is far from obvious. The empirical sciences have control of human rationality in the sense that they are, today, the arbiters of what constitutes the reasonable.

We argue that the natural sciences influence theology not so much by causing necessary changes in doctrine, but by reforming the world of meanings within which human beings explore the limits of human understanding. This process is analogous to the enlarging of the realm of the analytical that occurs in the interaction between pure mathematics and the natural sciences. The structure of our argument is an analogy in the classical form

$$A:B::B:C$$

which we read as “A is to B as B is to C.” A-is-to-B is the relationship between theology and the natural sciences. That relationship is understood as analogous to the B-is-to-C relationship that obtains between the natural sciences and mathematics:

Theology : Science :: Science : Mathematics

We argue as well for what might be called a conservation of epistemological sufficiency, in which a move from one discipline to another involves a sacrifice of one aspect of thought in order to gain another.

We intend to clarify the distinction between the synthetic epistemology of empirical science on the one hand and the noetic or intellect-focused epistemology of theology on the other, by borrowing and extending the argument of one of Carl Hempel's papers on mathematics and the natural sciences. Although these three realms of human thought—mathematics, science, and religion—have the practices of human reflective thought in common, they differ one from another in the nature of their subjects and objectives.

We begin the analogy by examining mathematics from the formalist perspective and ask how mathematics and the natural sciences are related.

THE RELATIONSHIP OF NATURAL SCIENCE TO MATHEMATICS (B IS TO C). In 1945 Hempel published an article entitled "Geometry and Empirical Science" (1945a). In December of the same year he published, in the same journal, a paper entitled "On the Nature of Mathematical Truth" (1945b). Widely reprinted, these papers demonstrated the distinction between the analytical epistemology of mathematics on the one hand and the synthetic epistemology of empirical science on the other.

Hempel begins "Geometry and Empirical Science" with a memorable sentence: "The most distinctive characteristic which differentiates mathematics from the various branches of empirical science, and which accounts for its fame as the queen of the sciences, is no doubt the peculiar certainty and necessity of its results."

It is the certainty of mathematical results—which Hempel characterizes as "peculiar"—that we wish to emphasize. "On the Nature of Mathematical Truth" begins with the sentence, "It is the basic principle of scientific enquiry that no proposition and no theory is to be accepted without adequate grounds. In empirical science, which includes both the natural and the social sciences, the grounds for the acceptance of a theory consist in the agreement of the predictions based on the theory with empirical evidence obtained either by experiment or by systematic observation."

While the certain truth of a mathematical statement is grounded on principles of validation—on the deductive relationship between that statement and an axiom previously established as a cornerstone of the particular mathematical system under consideration, the merely probable truth of a scientific statement is grounded on principles of verification—on the agreement between the scientific statement and empirical evidence derived from experiment and observation.

Thus formal mathematics achieves its certainty at the cost of sterility—a worldly meaninglessness—while natural science achieves a required

worldly relevance by giving up certainty. Hempel expresses this situation by quoting Albert Einstein to the effect that "As far as the laws of mathematics refer to reality, they are not certain, and as far as they are certain, they do not refer to reality" (1945a, 17).

So much for formal epistemological comparisons. What about the functional relations between mathematics and empirical science? What implications are there for physics, say, when a new mathematical structure is discovered? Most likely, depending on the branch of mathematics involved, there are no implications at all. The physicist sees new mathematics as a region in which to prospect just as Einstein did when he needed an analytic geometric structure for his general theory of relativity. He found and made use of Riemann's geometry, a development in fundamental mathematics made fifty years earlier.

A more general statement might be that new mathematics expands the realm of computable or otherwise analyzable relations and that some of these relations may, at some time, turn out to be of value to physics. As you can see, there is a certain parasitic quality here, especially from the point of view of mathematics.

Having described the B-is-to-C relationship between natural science and mathematics, we now turn to the A-is-to-B half of our analogy and construct the parallel relationship we see between theology and natural science.

RELATION OF THEOLOGY TO NATURAL SCIENCE (A IS TO B). For the purposes of this chapter we define theology as philosophical reflection upon explicitly or implicitly religious experience and language. Experience here refers to consciousness of a subject in relation to images, actions, events, texts, and language.⁵

The dominant referent for theology would seem to be human experience, as reported in texts and in living traditions, both past and present. By human experience we do not mean, as one does in the natural sciences, the reports of observations or measurements: we mean instead the lived experiences of human-being. Such experiences are notoriously absent from the data of the natural sciences.

It is a parallel between the lack of "worldliness" in mathematics and the lack of the experience of human-being in the natural sciences that stimulates the analogy we argue for here. Just as the mind must give up the certainty of mathematics if it is to address the world of natural science, so must the mind give up an aspect of the natural sciences if it is to address the world with the empathy for human-being that is required by theology. What is it that the mind must leave behind in order to include the experience of human-being?

We think that the theological mind must forego that truth, both probable and predictive, that is established through empirical verification. Theological propositions are not constructed as falsifiable assertions. The

mathematical certainty that empirical science gives up when it addresses quantitative measurements of the world—measurements that are necessarily imprecise—corresponds, in our analogy, to theology’s abandoning the requirement of quantitative verification through measurement, incorporating, instead, verification by assent. Since theology is based on lived experience, and since consciousness of self has no equivalent in science but is the ground of the lived experience of human-being, it is fitting and necessary that such a shift in the source of verification be made.

Evolution (mutation and natural selection) changes the human species over time. The development of an individual human being, however, is determined by interaction between genetic constitution on the one hand and environment on the other. Individual human beings change as well through reflective thought. And when the last human being to verify a theological proposition dies, the theological truth of that proposition dies. The natural sciences also change, but not in this way. The laws of physics, according to the theory of relativity, are time and space invariant. Which is not to say that the laws never change—they change as our understandings of the world change. But the laws, as we understand them at any given time, apply and, we must assume, have always and will always apply to all worlds and all peoples—whether or not any of these people understand any of these laws. In making its turn toward the human and away from measures of the world, theology turns away also from this time and space independence of scientific understandings. Theology is not apologetic for doing so, just as the natural sciences do not apologize for their lack of certainty.

What then can be said of the dynamic relations, the knowledge-in-process, that obtains between the natural sciences and theology? E. L. Mascall said that “present day science leaves a good deal more elbow-room than the science of yesterday left for theological speculation” (1965, 29). But there is a good deal more going on here than a mere increase in elbow-room. We find change—often a dramatic change—in what is accepted as reasonable and believable. Such change is the fruit of research in the natural sciences. Here is a fundamental challenge to reconstruct the possible. Analogous to the expansion of the realm of the computable and analyzable achieved by mathematics and seen as hunting ground by the natural sciences, the natural sciences offer a reconstructed world of meanings—a world of meanings possible to be shared by theological reflection. This process of cognitive reconstruction we have argued is best understood as metaphoric process.

If it is the case, then, that in order to be able to make intelligible claims about God and freedom and immortality (Kant’s triad) theology must give up both mathematical certitude and empirical atemporality, how does this process play itself out? For example, is it reasonable to expect that there should be a direct and immediate relationship between natural science and Christian theology?

NATURAL SCIENCE AND DOCTRINE IN THEOLOGY. Of all the differentiated tasks in the field of theology, that of doctrine is the most visible. The task of doctrine is to make those minimal statements that express an historical consensus in a tradition. Doctrines (in science as well as in theology) originate as formal historical answers to questions. Perhaps inevitably, doctrine comes to be invoked apart from the questions in which it originates. As it becomes familiar and communicable, doctrine may seem to be a timeless truth from which all ambiguity and ground for conversation and argument have been removed. Today we expect clarification and correction to be necessary to the growth and development of doctrine. Although some expect such clarification and correction of theology to come from the sciences, as a matter of historical record, the most important twentieth-century revisions of doctrine—for example, the doctrine of God/ess—have not come directly as a result of empirical discoveries in either natural or social science.

Moreover, doctrine is only one genre in, for example, Christian theology. In theology, historical answers to questions (before and after such answers are formulated as doctrine) are expressed in a variety of genres, such as poetry, fiction, biography and autobiography, dialogues, creeds, and oaths. Doctrine and apocalyptic, for example, are two major genres in early Christianity and, according to David Tracy, both are better understood as playing corrective rather than constitutive roles in interpreting New Testament texts. In his view, apocalyptic emphasizes the sense of present inadequacy before the event not yet realized whereas doctrine relaxes (though it does not eliminate) the tension between the everyday present and the extraordinary Christic event (1981, 267). The plurality of genres in Christian theology cautions us against literalizing doctrine with too direct a relationship to natural science. Dostoevsky was fond of saying that one could have as radical a doctrine of sin as one wanted so long as one had an equally radical doctrine of grace. The problem remains: how to model the process of theological change in relation to changes in the natural sciences.

Factors such as those described above complicate any hope we might have of moving directly from natural science to doctrine. There is a sense in which the central doctrines of Christianity are parallel to major theories in the natural sciences; both scientific theories and religious doctrines tend to persist in the face of contrary evidence. Belief in the face of contrary evidence in the natural sciences, though common, is often thought to be pathological. In theology, on the contrary, such belief, understood as faith, is a normal part of religious understanding. Indeed, the theological virtues of faith, hope and love are often premised on the *absence* as well as the presence of confirming evidence: faith is in that which is seen, but through a glass darkly, hope is for that which is anticipated but has not been realized, and love is most remarkably love in its ability to persist somehow during times when love is not returned. If it is the case that direct and

immediate consequence cannot be established between theory and empirical data on the one hand, nor between theological doctrine and lived experience on the other, then we should not expect there to be a direct and immediate relationship between Christian theology and the natural sciences.

But what other than a direct and immediate relationship between natural science and Christian theology might be possible? In *Metaphoric Process* (1984) we describe and distinguish between analogical and metaphoric processes—both of which are indirect and mediated. Most developments in scientific and religious understanding have been analogical—they are a mapping of a knowledge structure (a known) from one field of meanings onto another (an unknown). By contrast, metaphoric process—the equation of two knowns—results in a distortion of a field of meanings, an epistemological change that gives rise to new understandings. Physics' description of an electron as both a particle and a wave or theology's description of God as both human and divine⁶ come to mind as examples of metaphoric process.

How might contemporary developments in the natural sciences impact Christian theology? Genetic determinism in the field of biology might be related by analogy to the doctrine of judgment. The implied challenge to theology made by microbiological determinism is not in kind different from the question with which theology has always had to contend: namely, to what degree are we not responsible for our actions? If we should think that theology lacks criteria for blame, for example, a knowledge of inherited behavioral characteristics might provide a template for such criteria. However, it is not immediately clear that such a construction as a replacement for the concepts of divine grace and forgiveness which come into play in the traditional world of meanings here would constitute an improvement.

We think that the contemporary understandings of physics and cosmology are more likely to have relevance for contemporary theology through the changes these new understandings make in what we can believe rather than as challenges to or restrictions on any doctrine—say, that of the divine creation of the world. While it seems to us that the doctrine of judgment might be understood as a live theological issue today, the doctrine of the divine creation of the world is not in that category. Once beyond the question of who created the world and why—questions that today are of little concern to theology and never were of concern to natural science—we are left with the “how” questions that continue to be important to physics but not to contemporary/postmodern theology. We are reminded of the stunning impact of the Copernican metaphoric pronouncement that the sun and not the earth is the center of everything—an impact that has completely disappeared in the modern world. Indeed we are at pains, in trying to understand the treatment of Galileo Galilei, to know what the

theological fuss was all about. Such, we think, is the case with any facts that clarify the details of creation.⁷

What science creates from the point of view of theology is a cognitive environment. The development of theology within that environment occurs by invention and selection and not by instruction. In other words, we can find no direct and determinate relationship between scientific discoveries and theological development: We think it more likely that theological development is a creative and somewhat stochastic, or conjectural process, a process that results in speculations, *some* of which prove productive.

NOTES

1. This section is excerpted from Chapter 1 of Gerhart and Russell 2001.
2. This section is excerpted from Chapter 3 of Gerhart and Russell 2001.
3. This section is excerpted from Chapter 8 of Gerhart and Russell 2001.
4. See Gingerich 1998 for an account of Galileo's role in precipitating the dispute.
5. From this perspective, theology is neither "inside" nor "outside" explicitly religious traditions. Indeed, the margins of what is inside (i.e., explicitly religious) or outside (i.e., implicitly religious or secular) shift within the texts of many traditions.
6. One of the perennial religious metaphors results from classical theology's insistence that God is human. According to our model of metaphoric process, this claim is metaphoric in the sense that the field of meanings associated with being human (mortal, being born, being self-conscious, being reflective, worshiping an Other) is claimed to be equivalent to the field of meanings traditionally associated with being divine (immortal, having no origin in time, being omniscient, being omnipotent, being self-sufficient, and formally having only internal relations). As the fruit of this metaphor, God/ess is no longer necessarily understood as omniscient, unchanging, and all powerful but can be understood as eminently related to all, as becoming and being, as providing the space for human freedom to be realized.
7. Popular accounts of the relation between religion and science typically sensationalize the search for such details. See, for example, Sheler and Schrof 1992 and the entry in "Letters to the Editor" commenting on Sheler and Schrof in *U.S. News and World Report* 112 (January 13, 1992). For a balanced theological account of the "silent, secret attraction" that the classical "proofs" for the existence of God (two of which address the issue of divine creation) continue to exercise in contemporary thought and as well of the "challenge to thought" they provide, see Küng 1980, 529–36.

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