Dialogue on Theological Models

CONSTRUCTING AND TESTING THEOLOGICAL MODELS

by David E. Klemm and William H. Klink

Abstract. In order for theology to have a cognitive dimension, it is necessary to have procedures for testing and critically evaluating theological models. We make use of certain features of scientific models to show how science has been able to move beyond the poles of foundationalism, represented by logical positivism, and antifoundationalism or relativism, represented by the sociologists of knowledge. These ideas are generalized to show that constructing and testing theological models similarly offers a means by which theology can move beyond confessionalism and postmodernism. Our starting point is Paul Tillich's concept of God as the ground of being and the different levels of consciousness and thinking that accompany his understanding of theology. The ontological argument of Anselm is shown to play a key role, not as a proof for the existence of God but as a means for testing theological models. An example of a theological model, drawn from the domain of philosophy of science, is presented to show how theological models are constructed and tested.

Keywords: depth; model; nesting of paradigms; structure; theological model.

Theology is often perceived as a marginalized discipline in contemporary intellectual life. It is unusual for scholars in fields outside of theology to cite the writings of theologians in their own academic work. Nor do theologians seem to have much impact on public debates in general. It was not

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always so. A generation ago serious theological thinkers such as Paul Tillich, Reinhold Niebuhr, Martin Buber, and many others, played significant roles in the contemporary disputes and discussions about the meaning and impact on society of politics, the arts, literature, science, and technology. Since that time dramatic changes have occurred in the social order. A whole new complex and interconnected social-cultural situation confronts theology—yet theologians seem to be rendered mute in face of it. The silence of the theologians has consequences. Thinkers who do try to understand and to interpret what is happening in our world today do not look to theology to assist them in the task of making sense of our cultural and social lives. Consequently these thinkers are unable to articulate the depth of meaning in current movements; they neither acknowledge nor respond to the presence of transcendence in their worldly lives.

In this essay we ask why public intellectual discourse has lost its capacity to disclose theological meanings in the various domains of culture and locate the problem in theology itself. Also, we present a method for thinking theologically in order to invigorate new theological reflection, finding a catalyst for the theological method we propose in the practice of constructing and testing models that is widely accepted in the scientific community. We begin with some reflections on the internal reasons for theology's languishing. Our basic claim is that theology, in its two most prevalent forms, is not able to contribute to human knowledge by making cognitive claims that are possible to test. By backing off the challenge of making testable knowledge claims, theology assigns itself to the sphere of expressing opinions and cannot respond to the human desire to know.

Consider first the form of churchly or confessional theology, in which theologians restrict themselves to expressing the beliefs or opinions inherited from their particular confessional communities. Such confessional theology typically begins with the symbols, narratives, creeds, or dogmas of a particular church tradition. These starting points have the self-evident and unquestionable status of axioms, and theologians have the task of revising and applying these axiomatic principles to new situations of discourse and action. Confessional theologians rarely, if ever, make cognitive claims that can be tested outside the system of discourse of their own communities of belief.[1] They reject the idea and practice of a general theological hermeneutic of cultural expressions or religious forms, preferring to hold faithful to the inherited traditions, practices, and beliefs of their own particular communities.

Consider on the other side the radical, secular theologies of our time, which exist in stark contrast to the confessional theologies and perhaps prosper as an alternative to them. These theologies begin with autonomous interpretations of cultural processes in order to disclose their theological dimensions of meaning. Employing the most current modes of reflection on the interconnectedness of symbolic forms and disseminated

images, radical theologies seek to disrupt or deconstruct prevalent theological ideas or beliefs. Radical theologians embrace postmodernist discourses and often locate the theological in the gaps, negativities, and margins of texts and other cultural processes. God is conceived of in these theologies as "wholly other," systematically escaping the nets of thought and baffling attempts at analysis. Radical theologies merge on their margins with negative theologies and mystical invocations of the self-removing name of God.[2]

The result of these two influential trends is the marginalization of theology, which takes place within a larger intellectual context marked by widespread critique of the fundamental concepts, theories, and methods of research. Almost every discipline today is torn by debates about what constitutes knowledge and whether knowledge is possible. Nearly every discipline includes prominent voices who propose (as true statements) that truth claims cannot be made in that discipline, that what passes for knowledge is really a social construction, that research methodology is really a disguised will to power, or that scholarly discourse is merely refined persuasion.

However, in spite of these dissident voices and the debates in which they engage, science persists as a dominant intellectual force in our age. Science continues to make knowledge claims that both rise above all forms of modern fundamentalism on one hand and belie the skepticism reflected in the radical, dissident voices on the other hand. There are indeed grave doubts, often expressed by scientists and philosophers of science, about the effects of technology on the environment and culture, a technology grounded in the scientific understanding of nature uncovered in the twentieth century. However, such concerns bear on the application of science to transform the world; they do not pertain to the question of whether scientific knowledge is possible. Indeed, these legitimate concerns about the relationship between science and technology in our time presuppose the possibility of scientific knowledge. Consequently, in spite of the revisionist mood in academics today, a feeling persists that what science has to say represents at least some approximation of true knowledge.

Lest it be thought that science is impervious to revisions in its own fundamental concepts, theories, and methods, we assert that science itself has undergone drastic changes in its self-understanding. Consider the progression from the beginning of the twentieth century to the present, a progression that includes the logical positivists, Karl Popper, Thomas Kuhn, Paul Feyerabend, and the sociologists of knowledge. In this progression different views of the cognitive dimension of science have been articulated, from an absolutist position (or, alternatively, a foundationalist position) represented by the logical positivists and Popper, to a relativist (or antifoundationalist) position presented by Feyerabend and the sociologists of knowledge. As a consequence of the debates about scientific knowledge and method, a much more sophisticated view of science and its knowledge

claims has emerged, which we discuss in detail in the next section. Returning to our discussion of the state of theology, we claim that it is now possible to see a clear path between confessional theologies and radical theologies by comprehending the nature and method of constructing and testing models in science. Given the intellectual context just described, we ask the following questions: Can theology become part of current intellectual life through our taking seriously the necessity of having a cognitive dimension? Can theology find an analogous path between its two poles of confessional and radical-secular thinking?

We claim that theology can and should assume an important place in the current scholarly debates. However, the price of admission is the capacity both to make testable knowledge claims and to justify the possibility of so doing. Moreover, we argue in this paper that it is possible to make cognitive claims in theology by making use of important elements that have arisen within contemporary philosophy of science. In particular, we claim that theology can meet the demand to make cognitive claims, and not merely confessional or deconstructive claims, by adapting to its own set of problems the theories, concepts, and methods of constructing and testing models that we find in the sciences. The task for theology is to construct and test theological models. In this paper we propose a different way to think about constructing and testing theological models. We conceive of it as an effort to show a way beyond the opposition between confessional theology and radical secular theology.

In our work on constructing and testing theological models, we begin with the first principle of Tillich's theology, namely, that God is "being-itself," the "ground of being" that gives the structure and the power of being to everything that is.[3] To take Tillich's theology as a starting point for our reflection means that we do not follow recent trends in theological thinking that still grapple with the idea of God as supreme being.[4] Some theistic thinkers, such as Richard Swinburne, do construct theological models of a supreme being who has such attributes as omniscience, omnipotence, and omnibenevolence. For such thinkers the primary theological question is whether the theistic affirmation of the existence of a supreme being is more reasonable than the atheistic negation of the same view. In terms that we elaborate further on, theistic thinking remains at the level of objective or reflective consciousness. Tillich's theology, by contrast, unfolds at a deeper level altogether—namely, the level of reflexive consciousness.

Because Tillich conceives of God as being-itself, hence as the ground of being and nonbeing, his theological standpoint is beyond the opposition between theism and atheism. According to Tillich, critical reflection on the existence of God divides into two equally valid arguments: (1) that God exists as supreme being, and (2) that God does not exist as supreme being. By critically reflecting on these opposing forms of reflecting, which is what we mean by "reflexive consciousness," Tillich grasps the ultimate

ground of both the existence and nonexistence of God. Tillich names this ultimate ground the "God above the God of theism" or "being-itself" as the ground of both being and nonbeing. In our view, Tillich was correct to say that the debate between atheism and theism is at best penultimate and at worst irrelevant. God as being-itself is ontologically deeper than any being—even the supreme being; God conceived of as being-itself is the ultimate principle for thinking the being or nonbeing of anything whatsoever—including the supreme being. The problem with Tillich's theology is that his formulation of the idea of God seems so general and abstract as to deny the possibility of any cognitive dimension beyond the correlation of symbols and concepts. However, we take Tillich's theology as a starting point and push it into the debate about knowledge claims by asking whether it is possible to construct and test theological models to show the appearance of God as being-itself within specific domains. Some domains of inquiry, we hold, manifest the being of God and call for theological interpretation. We propose a means of constructing and testing theological models that discloses a theological dimension of meaning and invokes an interpretive response.

Our Tillichian starting point means that we do not take theology to be the elaboration of a set of ultimately intestable, fundamental beliefs about God, held in faith by some particular community, perhaps as divinely revealed or perhaps as traditional grounds of faith. We reject this approach to theology, because in its case theological knowledge claims become impossible. Theology becomes unjustifiable opinion, albeit sincerely held within confessing communities. Likewise, our starting point denies the negation of proper, discursive theological interpretation as proposed by radical, secular theologies. In their case, knowledge claims also become impossible. Theology reduces to cultural critique, although passionately advanced by people intent on freedom from tyranny. Thus, we deny both the absolutist (confessional) and relativist (radical secular) positions in theology; our goal is to move beyond this unfortunate *aporia*. In section 1 we show that there are similar absolutist and relativist positions in the philosophy of science. We claim that one of the outcomes of the debates between these two positions is that in science it has proven possible to mediate between these two poles and find a way of doing science that is both open to the future and grounded in the past. We intend to generalize our way of understanding scientific method to theological thinking, which means grappling with the question of how theological models can be shown to be wrong or inadequate.

The fact that we start our analysis with scientific modeling is to some extent arbitrary. As recently as the late nineteenth century, it was commonplace to hold that the Newtonian view of the universe was literally true. Included in this deterministic view of the world was a belief that the Newtonian equations of motion were a literal reflection of nature; the

universe was fundamentally mechanical, and the structure of this mechanism was expressed in the Newtonian equations. The construction of models, as we develop it here, played only a minor role in this view of scientific methodology. Moreover, the advent of quantum theory presented scientists with a quandary: if the quantum paradigm was true, then what had previously been thought true (namely, the Newtonian deterministic paradigm) must be false. From this quandary there evolved a more sophisticated view of scientific knowledge by both scientists and philosophers of science. The activity of constructing and testing models could conceivably have arisen first in theology, to be extended to science subsequently; but it did not. We claim that although modeling first achieved consistency and clarity in science, its application to theological thought could be just as significant for theology as it has been in science.

The essay is organized as follows. In section 1, we discuss our understanding of the scientific method, grounding it in the notion of constructing and testing scientific models and showing how this procedure leads to scientific theories and paradigms. Here we abstract key elements of scientific methodology, which uses *domain*, *structure*, *anomaly*, and *paradigm* as key terms. In section 2 we introduce different forms of thinking, leading to the idea of reflexive thinking. In section 3, we discuss the procedures for constructing and testing theological models. In section 4, to show how these ideas are applied, we present a theological model drawn from the domain of the philosophy of science.

1. Models and Scientific Knowledge

It is generally acknowledged that we live—for better or worse—in an age dominated by science. Science has had a profound effect on virtually all aspects of culture, including philosophy and religion. Accompanying this dominance of science has been an ongoing debate about the nature of scientific knowledge and what the essential elements of the scientific method are. Such a debate would not have made much sense to many nineteenth-century physicists, who believed that the Newtonian worldview constituted a true view of the universe—that the universe was indeed mechanical and deterministic at every level, and the only issue was to uncover the mechanical structure of new phenomena being investigated.

In this the mechanical-deterministic worldview, scientific knowledge is the correspondence between equations, such as $F=ma$, and empirical data. Scientific knowledge centers first on the equations, which are claimed to be true by virtue of correspondence with empirical phenomena, and second on the phenomena, which are known in their causal structure by reference to the equations. In this mechanical paradigm, the equations are taken as literal representations of the underlying structure of nature. The mechanical view was considered to be true in the sense that all phenomena in principle could be accounted for by it. Even when phenomena not

envisaged by Newton, such as electrical and magnetic phenomena, were under investigation, the ways of thinking about these phenomena, the models created to help understand their behavior, were all mechanical in nature. The reigning belief was that reality at all levels is mechanical, that everything in the universe is governed by some sort of mechanical structure. James Clerk Maxwell's thinking about electric and magnetic fields was deeply influenced by mechanical models, and it was only later that physicists such as Henrik Lorentz and Albert Einstein realized that Maxwell's equations could be understood independently of any mechanical model.

It was therefore a great shock when new phenomena—particularly atomic phenomena, for which it proved impossible to construct mechanical models—were investigated. New models, which had built into them elements of randomness, successfully described phenomena such as radioactivity, in which nuclei spontaneously split apart into smaller pieces, with no seeming prior cause. The new theory that arose from these models, the quantum theory, was a theory about probabilities and, hence, the antithesis of a mechanical, deterministic theory. It is now accepted that the quantum view of the universe is the correct view and that the Newtonian mechanical view does not adequately describe the behavior of systems of atoms, nuclei, and quarks. Nonetheless, even with the advent of quantum theory, it remains true that Newtonian equations quite successfully describe most macroscopic systems, such as baseballs and planets. This fact does not disturb the authority of quantum theory, however, because when quantum theory is applied to such systems, the probabilities become virtual certainties and agree with the predictions of Newtonian theory.

But what does the challenge of quantum theory to Newtonian theory do to our conception of the truth? Is the Newtonian view false and the quantum one true? And if so, what guarantee is there that in the light of new phenomena the quantum view—now held to be true—will itself not be superseded by a new theory, which would then be considered true? Scientists and philosophers of science reflecting on these issues have come up with a number of different answers. On one hand is the absolutist or foundationalist position, which holds that scientific theories such as Newtonian theories are either true or false. Moreover, this foundationalist position holds that it is possible to say of a given theory, with sufficient investigation, whether it is true or false. Perhaps the best example of this view is the so-called "received view" of the logical positivists.[5]

On the other hand, starting already with Pierre Duhem in the nineteenth century but seen most recently in such post-Kuhnian thinkers as Feyerabend (1975) and the social constructivists, is the relativist position.[6] This position denies that there is any correspondence between the theories created by scientists and the real world. The power of science as seen through technological innovation is not denied. However, the theories that purport to say something about the real world, such as quantum theory or the

theory of relativity, are not held to be true in any correspondence sense of the term.

We deny both the foundationalist and relativist positions. Contrary to both of them, we argue here for an understanding of what science is that mediates between these positions. Specifically, we claim that science is the activity of constructing and testing models of particular domains of reality. We claim further that the way modeling is understood and done in science suggests a way of understanding not only the cognitive dimension of science but also of other disciplines, including theology. In this section we lay out our view of the structure of scientific knowledge, introducing terms and ideas that are used in later sections that deal with theology and theological knowledge.

By the *domain* of a scientific discipline we mean that part of nature investigated by the discipline. Thus, physics nowadays investigates atoms and nuclei, the domain of the very small, as well as solar systems, galaxies, and the universe as a whole, the domain of the very large. Chemistry deals with molecules, and biology deals with living organisms. The boundaries of disciplinary domains are not rigid and fixed but can be quite movable, as evidenced by such disciplines as biophysics or geochemistry. Moreover, larger domains are broken into smaller subdomains in order to keep research programs tractable. Any scientist carrying out research is forced into working in some manageable subdomain, even though the domain may change as the research progresses. The main point here is that every discipline has domains broken into subdomains, whose boundaries are acknowledged, even if just temporarily.

One of the goals of a discipline is to find methods, strategies, and techniques for uncovering the *structure* of a given domain. Every domain is made up of a set of elements that are essential to it and make that domain be what it is. As we use the term, a structure is what gives unity to the essential elements that constitute a determinate domain. Structure is not an empirical concept, if by empirical one means the quality of being directly presented to and acknowledged by the senses. Structure is more properly conceived of as transempirical, in the sense that one must grasp the structure with the intellect; thus, structure goes beyond the empirical. If we think of the empirical level of givenness as the surface of the domain under analysis, the structure underlies the surface as the condition of its possibility. A grasp of the structure of some domain begins with what appears to the senses and comprehends an inner dimension of order or design that makes the empirically given domain what it is. Structure names the arrangement of or order among elements that are proper to some domain.

Usually the first step toward uncovering the structure of a domain is to find relations between observables in the domain under investigation. Such relations are sometimes called empirical laws, as in "Kepler's laws." In his study of the motion of the planets, Johannes Kepler found a relation be-

tween the period of a planet, the time it takes for the planet to go around the sun, and the distance of the planet from the sun. Kepler expressed this law mathematically as $P=kD^{3/2}$; that is, the period, P, equals a constant, k, times the distance, D, to the three-halves power. However, the term *law* is used in other ways in science, as in "Newton's laws." Often the relationship between observables can be expressed only statistically, in which case one says that the observables are correlated. For example, the Heisenberg uncertainty relations are statistical correlations between the positions and velocities of quantum systems. In order to keep the terminology as precise as possible, we use the term *correlations* to refer to any empirical relationship between observables in a domain, including statistical relationships. What is important in this definition is that a correlation does not explain why certain observables are related, just that they are.

Explaining why is the function of *models*. Scientists create models to investigate the structure of a domain. They are supposed to explain why some part of nature behaves as it does. The fact that models are constructed is important, for it means that the modeler knows the elements of the model from the inside. The modeler can therefore change and control the composition or arrangement of elements in a workable manner. Models should explain why observables are correlated the way they are, as well as make predictions for new experiments. More generally, models enable one to "see" why something behaves the way it does. For example, the Newtonian model explains Kepler's planetary "laws." This model is mathematical in nature in that it connects the observable location (or position) of the planet with mass and force in a differential equation with time as an independent parameter. By introducing gravitational force into this model, Newton was able to explain the relationship between distance and period that had been discovered by Kepler.

Clearly, creating theoretical models requires scientific imagination. In an important sense, constructing models in science is akin to writing poetry or composing music in its use of hunches, intuition, prejudices, and play. Max Black (1962, 219–43), Mary Hesse (1966, 7–56), Paul Ricoeur (1977, 239–56), and others have pointed out the similarity between constructing models and inventing metaphors. Viewed as a creation of language, models, like metaphors, are phenomena of "semantic innovation" (Ricoeur 1977, 298). Models participate in the metaphorical capacity of provoking the mind to think something new by seeing a resemblance previously unnoticed and unthought.

Often the creation of extended meaning arises on the basis of analogical reasoning; at other times the grounds of metaphorical insight are more nebulous. The point is that creating models is an art. Moreover, like works of art, models can be created from any material known to the modeler. Scientific models are by no means restricted to mathematical models. As such, modeling is culturally rooted and historically conditioned. It is always located in a specific community that asks questions in a certain way.

Among a multiplicity of models seeking to explain some phenomena under investigation, some models are more successful than others. In time, one model may come to make correct predictions over a wider and wider range of phenomena. If that model enables one to understand why objects under investigation behave the way they do over a broader and broader range, the model may take on the character of a *theory*. Theories are simply broadened models, which are extended over a wider and wider range. As such there is no difference between a theory and a model except scope. This view of the relationship between model and theory is in contrast to some disciplines, such as mathematics or psychology, in which the term *model* is used as a concrete instantiation of a more abstract theory. In such disciplines, there are important differences between the two terms; but as these terms are commonly used in physics there is no difference in kind between models and theories. We adopt the latter terminology here.

In the early development of quantum mechanics there were a number of competing models, all attempting to explain the puzzling behavior of atoms. Already in 1913, Niels Bohr created a solar-system model of the hydrogen atom in which he envisaged the atom as a planet (electron) going around the sun (nucleus). Thus, his model made use of known elements from Newtonian celestial mechanics. But Bohr manipulated this model by quantizing the orbits (that is, allowing only certain types of orbits) of the electron around the proton. With this model he was able to predict the pattern of radiation emitted by the hydrogen atom, and he won the Nobel prize for his work. When the Bohr model was extended, however, to more complicated atoms such as helium, with two electrons moving around a nucleus, the model made incorrect predictions. In the middle 1920s, two new models were created in an effort to move beyond the shortcomings of the Bohr model: the Schrödinger wave model and the Heisenberg matrix model. These models incorporated the correct features of the Bohr model yet were able successfully to deal with atoms more complicated than the hydrogen atom. They became the basis of what is today known as nonrelativistic quantum theory, an enormously successful theory that forms the basis for almost all of the devices that have so penetrated our society, ranging from transistors and lasers to nuclear reactors and nuclear magnetic resonance devices.

The point we are making is that at each stage of evolution and development of a model, it must be testable; that is, it must be capable of making predictions that can (perhaps only in principle) show the model to be wrong. Here Popper's use of the term *falsification* is helpful: for a model to be a scientific model, it must make predictions that in principle can be shown to be wrong. Through a process of falsification and verification it is possible to adjudicate between competing models and discard inferior models in favor of superior models. Yet, if a model makes predictions that are not borne out by experiments, the model is not necessarily discarded. Duhem

(1954; 1969), Kuhn (1970), Imre Lakatos (1968), and other philosophers of science have discussed strategies that can be used to save the model or at least modify it so as to bring it into line with known experimental data. But if a model must be continually modified as a result of new experimental data, there comes a point at which the explanatory power of the model becomes questionable. How and when that happens, and the degree to which a model can be saved by cultural bias or political power, is a subject of much debate and probably depends to a large extent on whether alternative models are available.

Even models that have become successful theories are continuously being probed and explored to ascertain possible limitations of the theory. This point is particularly apparent in Newtonian theory, which is now clearly limited in its range of validity by other more encompassing theories. Thus, the theory of relativity created by Einstein in 1905 is a theory describing systems moving over a wide range of velocities, even velocities close to the speed of light. Newtonian theory correctly explains the behavior of systems only when those systems are moving at much less than the speed of light. In contrast, the special theory of relativity correctly describes even those systems moving close to the speed of light. Moreover, it agrees with Newtonian theory for systems moving at much less than the speed of light. Similarly, quantum theory deals with systems having arbitrary angular momentum. Whenever Newtonian theory attempts to deal with systems whose angular momentum is comparable to a constant called the Planck constant, it makes incorrect predictions. For systems with large angular momentum (such as the earth around the sun) the predictions of Newtonian and quantum theory agree. Thus, as Newtonian theory was applied to larger and larger domains of nature, its limitations were discovered. As a result, it became necessary to construct new models that would both explain the behavior of systems in the new domains and provide the same explanations as Newtonian theory in those domains where Newtonian theory was known to be valid.

When a theory has become so successful that it is used with confidence as a means of understanding and explaining varied and diverse phenomena, the theory may become a *paradigm*. All phenomena are then seen in its light. After the enormous success of Newtonian theory, all phenomena, particularly poorly understood phenomena, were approached as though they were manifestations of the mechanical universe. The paradigm of a mechanical universe became the source of many models for investigating new phenomena. In the nineteenth century, electric and magnetic phenomena were treated as mechanical, and Maxwell developed his equations for electric and magnetic fields on the basis of mechanical models.

The term *paradigm* was introduced by Kuhn and has been used by him and others in a variety of ways (Kuhn 1970, 174–91). We take the term to mean an overarching conceptual framework. Paradigms are suggested by

successful theories but then take on a life of their own and provide the framework for extending or modifying theories into entirely new domains. The theory of relativity supersedes Newtonian theory for objects whose velocities are close to the speed of light. But the theory of relativity is an example of a theory that fits into the Newtonian paradigm of a mechanical universe. The equations of the special theory of relativity are deterministic differential equations describing the orbits of objects, just as the Newtonian equations are deterministic differential equations. In contrast, quantum theory has generated a new paradigm, which sees the universe not as mechanical but as random. The equations of quantum theory are equations about probabilities, not about orbits of particles.

To summarize this discussion of key terms in scientific methodology, there is a progression starting with a multiplicity of models created to explain phenomena in a limited domain. A successful model is one that can explain phenomena in ever-broadening domains, in which case it is called a theory. These models or theories generally operate under some paradigm, or, if the theory is very successful, it suggests a new paradigm. What about phenomena that should but cannot be explained by a reigning paradigm? We follow Kuhn and use the term *anomaly* to describe such phenomena.

It is, of course, not initially clear whether newly discovered anomalous phenomena will fit into a reigning paradigm. At first new models are created to explain puzzling phenomena, and these new models come from the reigning paradigm. After repeated unsuccessful attempts to create models out of the reigning paradigm, however, scientists construct models having features that do not come from the reigning paradigm. This was particularly the case in the early twentieth century, when the behavior of atoms was under intense scrutiny. Many attempts were made to construct mechanical models of atoms; they all ultimately failed. Quantum models of the atom arose out of this failure. Because of the success of these new models, they became quantum theories. The success of quantum theories led in turn to the quantum paradigm. *Paradigm shifts* thus occur when anomalies cannot be taken into account by an existing paradigm.

In the ensuing debate about paradigm shifts, Kuhn, Feyerabend, and others have emphasized the degree to which differing paradigms are incommensurable.[7] They emphasize the degree to which experimental results, relevant questions, research practices, and the like, make it impossible for communities holding different paradigms to adjudicate their differences. If it were truly the case that differing paradigms were incommensurable, however, scientific knowledge would be impossible, because the very ability to recognize relations of "incommensurability" between competing paradigms relies on some more basic recognition of commensurability between the paradigms. If paradigms were truly incommensurable, it would not be possible to measure progress in science and the social constructivists would be correct in their assessment of science.

We contend that Kuhn and Feyerabend are mistaken in their emphasis on incommensurability. The reason for our disagreement is that, when paradigm shifts occur, the new paradigm must always correspond with the older one in that domain where the older paradigm is valid. The current paradigm in physics is the quantum paradigm, which sees the universe as being fundamentally random (think of the radioactive decay of nuclei, for example). The quantum paradigm has replaced the Newtonian paradigm, which sees the universe as fundamentally mechanical and deterministic. In the domain of our everyday world of baseballs and automobiles, a Newtonian mechanical understanding of the world is perfectly valid. Within this domain the quantum paradigm agrees with the Newtonian paradigm.

The basis for the limited agreement between the two paradigms is that probability is a more general category than determinism, and probabilities that approach one are indistinguishable from deterministic certainties. When probabilities approach one, the behavior of entities subject to quantum probabilities agrees with deterministic behavior. In fact, the precondition for constructing quantum models was that, within appropriate limits, the quantum models reduce to a deterministic Newtonian model. Even within a given paradigm, more encompassing theories must reduce, within appropriate limits, to previously held theories that correctly describe a more limited domain. Both the special theory of relativity and Newtonian theory are deterministic theories. But Einstein constructed the special theory of relativity in such a way that it reduces to Newtonian theory within the limit where velocities of objects are small compared to the speed of light.

These nesting properties of both paradigms and theories within more inclusive paradigms are tremendously important. They give science its stability and continuity over time and, in particular, over paradigm shifts. Kuhn, Feyerabend, and others, in overemphasizing the incommensurability of differing paradigms, have denied the sense in which we believe that the nesting of paradigms and theories within more inclusive paradigms allows for issues of incommensurability to be resolved. We argue that the power of the scientific method is precisely its capacity for openness to the consequences of new experiments, new insights, and the possibility of anomalies, while at the same time being firmly anchored to previous theories and paradigms.

In other words, models are created as tentative exploratory means for understanding new phenomena. Successful theories must not only be able to account for new phenomena for which they were created; they must also have built into them the feature of explaining older phenomena previously explained by different models or theories. With any reigning paradigm, such as the currently held quantum paradigm, scientists act as though the paradigm were true, knowing that new experiments or new insights may well make it impossible to hold currently held theories. At any given moment in history, the current paradigm represents the best approximation

to the underlying structure of the domain of science. The current paradigm is therefore demonstrably better than previously held paradigms, but it is also open to fundamental revision in light of new experiments or insights.

If this description of science is correct, a way has indeed been found between absolutism on one hand and relativism on the other. Recall that absolutism (or foundationalism) asserts of some paradigm that "this paradigm is true." Relativism, by contrast, asserts that "all paradigms are true," given a relational conception of truth, which means "no paradigms are true" in terms of a more rigorous correspondence notion of truth (which relativists reject). The way beyond the stalemate between absolutism and relativism becomes clear once the self-critical nature of scientific models comes clearly into focus. Models are not literal representations of physical nature but are constructed with the full knowledge that they both reveal and conceal certain features of physical nature. They do, however, enable cognitive access to those structural features of nature that are included in the model, and the predictions made on the basis of the model are testable for their truth value. At the same time, models invite criticism and modification in light of their limitations. They encourage their own undermining. Models both purport to contain a limited access to truth and acknowledge their inadequacy with regard to any final sense of the truth of nature. New, improved models (which become theories and even paradigms) must incorporate into themselves the aspects of older, discarded models that did possess and present limited and partial truths. Thus, the partial truth of earlier models is nested into the more encompassing truth of new, more successful models. At the same time, anyone who constructs and uses models in advancing truth claims understands that new, more successful models will themselves be overturned subsequently in light of the aspects of truth that they cannot include or even anticipate. This open-ended and self-reflexive quality of scientific modeling shows the way beyond the opposition between absolutism and relativism.

Once the possibility of mediating between absolutism and relativism is seen, the historical accident of its having occurred in science can be ignored and the structural features that make up knowledge claims explored independently of science. Indeed our goal in the next section is to reflect on knowledge claims, with an eye toward seeing how one might develop the notion of theological modeling and the testing of theological models.

2. Reflexive Thinking and the Theory of Modeling

In order to advance to the next stage of our argument, it is necessary to introduce another set of terms. At stake is the relationship between theological thinking and scientific thinking, a relationship that requires distinguishing between several types of thinking. Let us give a working definition, appropriate to the scientific search for knowledge, of the genus *thinking*.

Thinking is the activity of presenting some object to one's mind as it is on its own and for itself. Thinking is one mode of conscious activity—distinct from other modes of consciousness, such as imagining. As such, thinking bears the intentional structure of consciousness in general: some subject ("I") is conscious of some object. Thinking is the conscious relating of a subject to an object. It includes not only cognitive but also volitional and affective components. All specific forms of thinking display the "of" structure of intentionality, or object-relatedness. The specific forms of thinking important for our argument are the following.

First, *mythological thinking* is thinking in the medium of symbolic images embedded within a system of sacred narratives. For mythological thinking, these symbolic images and sacred narratives constitute a given reality that is just as real as is the perceptually experienced physical world. Indeed, the power and meaning of symbolic images and sacred narratives exceed those of sense perceptions, which pale in comparison with the religious symbols. In mythological thinking, symbolic images (and the words denoting those images) have the immediate capacity to make present and perceptible the power and meaning of the myth. At a basic level, the sacred story is simply accepted as true and revelatory, just as it is told. Ethical, metaphysical, and mystical interpretations of the story can be added to this basic level without breaking from mythological consciousness. Indeed, such interpretations can even incorporate criticisms of prior interpretations without breaking from the immediacy of mythological thinking. Thanks to the quality of immediacy in mythological consciousness, in ritualized contexts of prayer, meditation, or liturgy, uttering (or thinking) the name *God* can literally make the being of God manifest to the participants in the myth. For mythological thinking, the "truth" of the symbolic images and sacred narratives is immediately given to consciousness and cannot be questioned without falling from the sanctified precinct of mythological consciousness. Mythological thinking is in this sense prereflective; it cannot reflect on the grounds of its own presumed truth without breaking the power that the myth has over thinking.

Second, there is the form of *objective thinking*. We associate this kind of thinking with everyday being in the world. Every subject who dwells in a world of objects and who can distinguish individual objects within the world from each other engages in objective thinking. Consequently, much of the rudimentary thinking we typically find within the various scientific disciplines—such as physics, biology, and anthropology—is identical in kind with such everyday objective thinking. The reason for this identity is that in much of science the scientist thinks directly about objects appearing in the world in asking questions such as "What is this thing?" Objective thinking makes judgments about empirical objects—including mental acts—and these judgments can take scientific form. In addition, objective thinking directs itself toward the whole structure of objectivity. In this

case, objective thinking contrasts the wholeness or power of being with distinct beings, as in the medieval distinction between *esse* and *essentia* ("being" and "beings"). With this turn, objective thinking becomes metaphysical thinking; it thinks the principles and concepts presupposed by rudimentary scientific thinking.

Third, *critical* or *reflective thinking* is a higher-order thinking than objective thinking, although it is always related to objective thinking as its own presupposition. If truth is the correspondence between a thought and a thing, understanding and reality, a subject engaged in reflective thinking primarily thinks about the truth of a particular instance of thinking as well as the conditions for knowing the truth. The objects of reflective thinking are reflective judgments about objects, relations of thoughts to being. In contrast, the objects of objective thinking are either beings (empirical objects or mental acts) or the whole sphere of objective being. Reflective thinking is thus one step removed from objective thinking, because its primary characteristic is not its thinking directly about empirical or mental objects (although it must presuppose a measure of objective thinking within its activities). Rather, the intention of reflective thinking is to grasp the relationship of identity and difference between a model or theory and some empirical or mental objects that are delimited in a domain. The subject engaged in critical or reflective thinking thinks about the truth or falsehood of the empirical judgments that are made at the level of objective thinking. In other words, in critical thinking the subject reflects on the formal and material relationships between objective thinking (a theory or representation) on one hand, and the real referent of the thought on the other hand. In that regard, reflective thinking is also critical thinking. It offers a critique of the purported truth of the theoretical constructs arising from either objective thinking or mythological thinking.

The power of critical reflection, of course, is that it can negate what appears to be self-evident for either mythological or objective thinking. By referring the given realities of mythological thinking or objective thinking to critical standards of justification, thinking in the form of critical reflection systematically dislodges the immediacy of what is accepted as true by either mythological or objective thinking. In the exercise of this power to negate what is self-evidently given to thought and experience, a new, basic, formal distinction is drawn at the level of critical reflection: the distinction between objectivity and subjectivity. Subjectivity is the source of the power to construct representations, images, models, or theories. The capacity to connect such mental constructs with the objective sphere and to distinguish them from it can also be traced back to subjectivity. In other words, subjectivity now stands out in distinction from objectivity as the source of the reflection on objectivity. Indeed, it becomes clear that subjectivity as such eludes reflection, because it is the source of reflection in establishing objectivity. The subject is precisely what is not an object

and cannot be objectified by reflection. On that basis, critical reflection draws a connection between subjectivity and negativity: subjectivity is in some sense the power of negation—the power that establishes the objective sphere of what is from the nothingness of what is not. The subject-object distinction established by critical reflection thus also establishes the distinction between being (the sphere of objectivity, actuality) and nonbeing (the sphere of subjectivity, potentiality).

Fourth, *reflexive thinking* is the culmination of this trajectory of modes of thinking. The subject engaged in reflexive thinking reflects on thinking in its various relationships to being. The difference between reflexive thinking and critical reflection is that in reflexive thinking one ponders the here-and-now act of thinking—that is, deliberates on the concrete act of thinking by a concrete, individual subject, not limiting reflection to the universal, transcendental structure of subjectivity in relation to objectivity but rather focusing additionally on the concrete, specific, and lived act of thinking. At this point thinking bends back reflexively on itself: thinking thinks its own act of thinking.

With this reflexive turn in the analysis of thinking, a new situation arises, marked in the history of philosophy by the transition from Kant's transcendental idealism to Hegel's absolute idealism. With reflexive thinking in the style of Hegel, for example, the distinction established in critical reflection between thinking and being, between subjectivity and objectivity, appears to collapse. The activity of thinking and the object of thinking appear to converge—thus raising the hope that reflexive thinking could conceptually determine the ground of the distinctions between subjectivity and objectivity, nonbeing and being, established in critical reflection. This hope is misplaced for two reasons. First, it is clear that thinking cannot adequately think its own here-and-now act of thinking. The *I* clearly and distinctly appears as the source of thinking, but in its "here and nowness" of thinking the *I* still eludes being thought precisely through the quality of its temporality. The "now" of "my here-and-now thinking" can never be gathered into a subsequent act of thought. The temporality of thinking means that thinking can never in principle be transparent to itself.[8] "Being-itself," the ultimate ground of the relationship between being and nonbeing, objectivity and subjectivity, cannot in the nature of the case receive conceptual determination. Thinking is always "on the way" to itself. As the ultimate principle of all thinking, "being-itself" is a necessary idea for thinking that cannot be defined. "Being-itself" can only be symbolized.

Second, the "here" of "my here-and-now thinking" is likewise obdurate to thinking. *Here* implies all of the ways in which thinking is historically conditioned by language, custom, worldview, interest, and other elements that constitute the preunderstandings with which thinkers approach matters of thought. Reflexive thinking is historically conscious of itself. This

means that historians can at some subsequent time situate any instance of thinking—say, in the form of written or electronic texts, with respect to its authorship, interests and prejudices, the audience, the rhetorical situation, the state of thinking about the topic, and the like. No concrete instance of thinking is abstract, universal, and impervious to such historical understanding of its particular idiosyncracies and presuppositions.[9] Moreover, all concrete acts of thinking have effects on subsequent thinkers and their patterns of thinking by contributing to the historical standpoint from which thinking occurs. Thinking is always influenced by some concrete standpoint, and it cannot in principle wholly reflect that standpoint without some distortion, difference, or negativity entering into thinking itself. As a consequence, unanimity is not available at the level of reflexive thinking.

In face of the clear recognition of the reflexive potentiality of thinking and its ability to scatter results of thinking into the open air of argumentation, the temptation arises either to retreat into safe and secure foundations or to advance into a realm of open relativism. We reject both temptations and hold that one enduring function of reflexive thinking is to reflect critically on the truth of critical or reflective thinking as such. Reflexive thinking thus takes the form of a criticism of criticism, a reflection on reflection, in its various concrete instantiations. It reflects on the truth about truth that appears in critical or reflective thinking. One of the primary tasks of reflexive thinking is to construct models of the process of reflection or criticism itself, with the purpose of being able to comprehend, explain, and test the truth of critical reflection itself. Reflexive thinking is thus one step removed from critical or reflective thinking, and a further step cannot be taken without simply repeating what can be accomplished at the level of reflexivity. A criticism of reflexivity would be no different from reflexivity itself, so reflexivity brings the series of modes of thinking to a natural conclusion.

At this point it is necessary to draw a distinction between reflexive thinking and *metacriticism*. Metacriticism is critical thinking about the principles, concepts, and rules of critical thinking. Metacriticism thus tests the truth of disputing forms of critical thinking. As such it is critical reflection applied to itself and has a "reflexive" quality. However, metacriticism may or may not attain the form of reflexive thinking as we have just defined it. Metacriticism may remain at the level of critical reflection (about critical reflection), or it may attain to reflexive thinking. It does the latter if and only if it thinks about the concrete act of here-and-now thinking. Whether fully reflexive thinking or not, metacriticism is properly associated with the discipline that has historically been called first philosophy, metaphysics, or dialectic. A long and illustrious tradition of metacriticism stems from Plato's discipline of dialectic and reaches through Aristotle to Descartes, Kant, Hegel, Schleiermacher, Husserl, Heidegger, and, most recently, Robert Scharlemann.

Most professional scientists have no need in their work to engage in metacriticism, much less fully reflexive thinking. But those thinkers who explicitly engage in the philosophy of science in the theoretically disputatious world of the early twenty-first century find themselves driven in the nature of the case to the metacritical level. Only at this level can thinking sort out and classify the various competing theoretical proposals (such as foundationalism and relativism) for conceiving the truth of the sciences. Any possible testing and adjudicating among these competing critical theories would have to come at the level of metacriticism. That is not to say that metacriticism is always in the position to adjudicate truth claims of critical theories of science. Far from it. But even the judgment that final adjudication of critical theories is unlikely or impossible must be formulated at the level of metacriticism.

It should be clear that one and the same person can engage in any of the previously discussed forms of thinking. To provide a brief example: In mythological thinking, one may have a symbolic image drawn from a master narrative of the earth as the center of the created cosmos. In objective thinking, one might have planetary motion around the sun in view as an object; objective thinking produces a model or theory about planetary motion, as Kepler did. In reflective or critical thinking, one reflects on the truth of Kepler's model and develops arguments to verify or falsify its truth claims. One thinks philosophically about the objective-scientific thinking in the first order. In reflexive thinking, one reflects on the principles, concepts, and rules of any thinking whatsoever (in metacritical fashion) *as well as the here-and-now act of thinking*. One person can perform each of these tasks, although not at the same time.

Insofar as the agent of reflexive thinking thinks the here-and-now act of thinking, reflexivity acts as a constant reminder that none of the modes of thinking can ever attain absolute knowledge. Thinking about thinking can never become transparent to itself, because thinking is always affected by the circumstances of the concrete historical act of thinking. This concrete, historical act of thinking in principle eludes reflection. Thus, reflexivity both affirms and negates the results of the other modes of thinking. Reflexivity affirms their results as historically, linguistically situated models, which must be tested; but it negates their results insofar as they have pretenses to absolute knowledge. It is this Yes and No that forms the basis for constructing and testing of theological models from the reflexive standpoint.

3. Constructing and Testing Theological Models

We turn now to an article of singular importance in the growing literature on theological models: Scharlemann's "Constructing Theological Models" (1989). Scharlemann is well known as a post-Tillichian theologian who specializes in metacritical thinking. We believe that his ideas make an

enormous contribution to the discussion of theological modeling, and we propose to extend and apply them to the task of constructing and testing particular theological models. Initially we ask, How are theological models different from other kinds of models?

Theological models differ from other kinds of models because of the uniqueness of theology. Theological models always model the reality of God. That claim may seem outlandish to many people who are familiar with the process of constructing models, for God is unlike anything that we may imagine. Physicists make models of realities in physical nature, biologists make models of realities in organic nature, chemists make models of molecules, sociologists make models of social relations, psychologists make models of behavior, literary critics make models of poems, art critics make models of paintings, and so on. But can theologians make models of God? We argue in the affirmative—theologians can construct and test models of God. To make our argument, we need to insist on one important point from Scharlemann concerning the proper domain of theology as a discipline.

Each discipline has its own proper domain, and inquirers within those disciplines construct models of observables that appear within the domains delimited by disciplinary boundaries or interdisciplinary decisions. Theology, however, has no material domain of its own—which means that it is no closer to or farther away from any one domain than any other. Another way of putting the same point would be to say that theology's domain is the domain of all domains. It may freely pick and choose among possible domains for the materials out of which to form theological models. We want to stress this point. It means that theology is by no means restricted to materials from the domains either of religion (the domain of relationships between human beings and the gods or God) or of ontology (the domain of the principles and concepts of being-itself). Religion and ontology are the traditional domains of theological modeling. Theology has often been defined both as critical reflection on the beliefs or practices of a religious community (dogmatic theology) or as a subdiscipline within ontology (philosophical theology). In principle, however, the meaning of *God* is no more or less close to these two domains than from the material of any other domain. God, we want to say, is potentially accessible by means of the material from any domain. Science, art, politics, literature, economics, and other domains are all potentially available for the purpose of constructing theological models. How did theology's unique relationship to the domain of all domains come about?

In answering that question, Scharlemann (1989, 130) makes the following point: "The recognition that theology does not have a material domain of its own, not even the domain of religion, is one of the consequences—enduring, I think—of dialectical theology's critique of religion in the 1920s." Ironically, the severance of theology from any single do-

main occurred not through the traditions of natural theology or theology of culture but through the tradition of Karl Barth's dialectical theology. The Word of God in biblical revelation, according to Barth, denies any inherent proximity to the religious efforts of human beings to know or understand the being of God by their own natural efforts. Revelation, as Barth understood it, not reason, provided the contingent historical warrant for the historic liberation of theology from any particular material domain. God, thought Barth, is "wholly other" than any object of inquiry within any particular domain. It is crucial to note that "wholly other" means that God is "free from," but also "free for," the material of any particular domain. Consequently, with the acceptance of this important insight, theology is free to construct theological models from any materials with which an inquirer has familiarity. This means that researchers in any field may learn how to form theological models using the materials with which they are familiar.

The steps for constructing theological models include the following. First, one must have an intuition that some domain is receptive to a theological model. That is, there must be a sense that the domain has the potential to provide a theological model. As we said, any domain will do so long as it is clearly definable.

Second, one must analyze the domain for its basic structure. This step is both crucially important and extremely difficult to do; it has nothing to do with constructing a theological model as such. This step is similar to that of articulating the structure of a scientific domain presented in the first section.

Once the difficult work of providing a model of the basic structure of the domain selected is done, the third step of constructing a theological model begins. From the basic structure of the domain, one discerns the *depth* of that structure. By depth we mean the standpoint from which the investigator can see the unity in difference of the structural elements. This standpoint enables one to see how the elements in the structure are necessarily related yet irreducible to each other. *The depth of the structure is a presentation of the fundamental principle according to which the basic elements of the structure are seen as both unified and preserved in their difference.* In this sense the concept of depth is always implied in the concept of structure: any structure has a depth insofar as the structure is a unified, coherent structure. The depth of a structure is thus immanently present in the structure itself as its ground, basis, and principle.

The depth of the structure of a particular domain also points beyond itself; it signifies the notion of the ultimate fundamental principle or "first principle," on the same grounds that a species signifies its genus and ultimately the "highest genus." In our terminology, the ultimate first principle is "being itself," the ground of being and nonbeing. Thus, depth is the element within the structure that signifies "being-itself"; the depth

allows the viewer to see the structure as a manifestation of "being-itself." In this sense, the depth of a structure functions as a point of transcendence within the structure. In other words, the depth is where the structure manifests its openness to the ultimate horizon of intelligibility. Depth appears when the structure (*as* the structure it is) points beyond itself to the ultimate ground and abyss of meaningfulness. When the depth of a structure appears, the structure shows itself as a contingent, finite, and significant presentation of the whole of being-itself (Scharlemann 1989, 132). Recall that by "being-itself" Tillich means the power of being in spite of the power of nonbeing. Hence, as a presentation of being-itself, the depth manifests both the power of being anything at all and the fact that it is what it is in spite of the possibility of its not being anything at all.

A fourth step remains. To complete the process, one introduces the symbolic language of *God* to the model. One does this is by adding the conjunctive "God appears" into the formulation of the depth of the structure: "God appears as the depth of the structure" means that God appears "in," "as," "through," or "on" the depth of the structure, depending on the context. God is not literally equated with the depth of the structure, nor is the depth of the structure predicated of God. Rather, the formulation asserts that in God's being God, God appears as what is literally not God but the depth of the structure. The depth of the structure is where we find the manifestation of God's being as God. The use of the theological connective to identify the model as a theological model ("God appears . . .") consciously uses the name *God* in a symbolic and not merely conceptual way. By *symbol* in its theological usage we mean a sign that not only points beyond itself to some other meaning but also participates in that meaning so as to make that meaning present and perceptible in the world. *God* is a symbol of what is ultimate in the order of both thinking and being. The point of this step is to show how the domain that is modeled reveals a theological dimension of meaning. Recall that one begins theological modeling with an intuition of divine meaning within a finite domain. A successful theological model explains why the viewer experiences this domain as mediating a divine meaning.

With those four steps, we have a methodical way of constructing theological models from the material of any domain. Now we must ask the following crucial question: How can we know whether a theological model really expresses God or the ultimate depth of thinking and being? In other words, how can we devise methods of testing theological models? We have already asserted that the ability to test a model is an essential characteristic of a model. Without a means of testing theological models, we would not have succeeded in obtaining some kind of cognitive access to the appearing or inbreaking of God within particular domains of inquiry. We would have only a new way of expressing opinions or unfounded beliefs about God. We would simply have extended the problems with any form of

confessional theology into new domains. So it becomes very important to develop coherent methods of testing theological models.

There are several criteria for testing a theological model. The preliminary step of testing a model does not yet bear on its theological import. Nonetheless, it is important to determine that the theological model coherently specifies some material domain of application and correctly analyzes its basic structure. Various tests apply to the structure. Most basically, the structure must account for all of the details at the surface of the phenomenon under analysis. The structure has not yet been adequately analyzed if particular elements belie it or if necessarily recurring elements within phenomena proper to the domain do not appear in the structure. In addition, the structure must account for the proper order among elements. Tests for basic structure are not theological in nature but rather belong to the theory of models in general.

The first step of testing a theological model has to do with the fact that the depth of a basic structure has two characteristics. First, the depth of a structure is the principle on the basis of which one can see the opposing structural elements as both unified and different. In other words, the depth is the principle that explains the structure. Second, the depth of a structure is the point at which transcendence appears within the structure. The depth points beyond itself to the open horizon of transcendence. The test we propose that captures both of these characteristics is determining whether the identified "depth" of the structure is "that than which none greater can be conceived" within the given domain of inquiry.

Recall that the phrase "that than which none greater can be conceived" was coined (in Latin) by Anselm of Canterbury and appears in *Proslogion* (Anselm [1077–78] 1970). As abbot of a monastery, Anselm undertook to compose one concise argument, "resting on no other argument for its proof, but sufficient in itself to prove that God truly exists, and that he is the supreme good, needing nothing outside himself, but needful for the being and well-being of all things" ([1077–78] 1970, 69). For Anselm, Holy Scripture is the source of faith in God, and the phrase "that than which none greater can be conceived" merely places into words the content of biblical faith. Dialectical reasoning enables Anselm to understand what he already believes on the basis of his Christian community and its sacred narrative—namely, that God exists not only in the understanding but also in reality and that God cannot be thought of as not existing. The argument proceeds by making judgments about the relative "greatness" of alternative thoughts within the structure of Anselm's ontology. Anselm's "ontological argument" for the existence of God has ever since been a lightning rod of philosophical and theological debate.

We propose to use Anselm's formulation of God as "that than which none greater can be conceived" not as an argument for the existence of God but as a test for theological models. Our point is that within the

structure of a delimited domain, the depth is the element than which none greater can be conceived. If any other element or relationship among elements can be conceived of as greater than the identified depth, what is identified as the depth is not in fact the depth. This test functions within the system (whether conceptual, mathematical, or whatever) that makes up the structure of the domain. We maintain that this test works at any of the levels of thinking we have defined. In mythological thinking, the depth is the appearance of a supreme divine agent (or hierarchical order among divine agents) within a sacred narrative. In objective thinking, the depth is the highest (unconditional) being. In critical reflection, the depth is the one true Truth in the many proposed truths of reflection. In reflexive thinking, the depth is being-itself, the ultimate ground of both being and nonbeing. At all levels, however, Anselm's formula for thinking the highest unity of opposites both affirms and negates something. It affirms that something is that than which none greater can be conceived, yet it negates any and every particular formulation of what that perfect idea-in-reality or ultimate principle might be. The Anselmian formula thus has the marvelous self-transcending capacity to point beyond the definable structure of any domain precisely at the depth of that domain.

The second test of a theological model is to determine whether the depth has the capacity to manifest the being of God when presented as part of a complex symbol through the theological connective "God appears (as the depth)." This test determines whether the depth element can function as a real symbol of God. The model must pass the test of whether the depth element itself enables the thinking of God's being (as manifest in what is not God). In other words, if the depth of the structure at hand symbolically makes present and perceptible the being of God, one is justified in applying the theological connective. To determine whether the depth enables the thinking of God, one compares what the mind recognizes in and through the symbolic element with the thinking of what happens in view of merely an objective description of the structure. Recognizing the depth must enable the thinking of transcendence, of true ultimacy, within the system of concepts or images constituting the structure. A true depth content will show some meaning on the basis of an analysis of a particular structure that can be generalized to show something applicable to and true of other domains as well. The depth shows itself in and through a given structure, but the depth overflows the structure in its power of disclosure and breadth of meaning. It has revelatory power in other structures as well.

Finally, we have to determine whether the symbol really enables a thought of God. To test this enablement, one must compare the thought indicated by the symbol with the idea of being-itself. If there is correspondence between them, the symbol does enable a thought of God rather than some other thought. The relevant test also asks whether the symbolic depth

element necessarily demands its own negation as literal presentation of the depth.[10] This test follows from the nature of reflexive thinking, which contains both a thinking about critical thinking (metacriticism) and a thinking about the finitude of thinking—the impossibility of absolute knowledge. To pass this test, the depth construed as symbol must itself affirm both a critical No and an affirmative Yes as to whether the symbol makes manifest God as the ultimate depth. No, the symbol of the depth is not a literal representation of God in some element or relations among elements within the structure. Yes, the symbol nonetheless manifests the depth dimension in and through the structure. The point is that the theological depth of a structure is both immanent in and transcendent to that structure. In its transcendence, the theological depth is not definable or representable within a structure; it is wholly other than the structure. In its immanence, the theological depth nonetheless makes its appearance in and through the structure as what is not wholly other but a participant in and present in the structure as its depth. This criterion is crucial, because it preserves both the affirmative and negative responses to the symbol of God. The No rules out the fundamentalism of many forms of confessional theology. The Yes rules out the relativism of many forms of radical, secular theology. Taken together the presence of a Yes and a No within the depth ensures recognition of a finite model of God within a limited domain, which invites criticism and creativity in improving the way it makes the being of God accessible to human understanding and cognition.

4. An Example: Scientific Theories and the Final Theory

In this section we present an example of a theological model and discuss its implications for doing theology today. As shown in previous sections, in order to construct a theological model it is necessary to be familiar with a given domain and to know the structure of that domain well enough to have an intuition of a depth that makes possible the symbolic appearance of God. If an audience is not familiar with the given domain and its structures, the modeler should provide the necessary background and explanations that make the domain and its structures comprehensible. In order to meet this demand while illustrating how a theological model works, we will construct a theological model from the domain of the history of science or, more precisely, the recent history of physics. We have chosen this domain because we have provided the background materials necessary to it in sections 1 and 2 of this article. In our analysis, terms introduced in section 1, such as *model*, *paradigm*, and *anomaly*, become elements of a reflexive model that purports to explain the unfolding of physics, to explain how it is that theories and paradigms change into newer theories and paradigms while maintaining the insights that were present in older theories and paradigms.

There are, of course, other competing models that claim to do the same thing, including both the foundationalist and antifoundationalist (or relativist) accounts briefly mentioned in section 2. In fact, Kuhn's *The Structure of Scientific Revolutions* ([1962] 1970) is an example of a book that uses the "data" from the history of science to formulate "laws," which then are shaped by models that he introduces to understand the progression of scientific models in physics and chemistry. As we have seen, Kuhn's model stresses the incommensurability of paradigms. We take a different approach, but our assumption here is that the account of scientific modeling given in section 1 is sufficiently good to enable us to use this material for the construction of a theological model from the domain of the recent history of physics. Moreover, as we will show, the choice is not arbitrary. The recent history of physics immediately lends itself to revealing a depth that generates a theological model.

Specifically, the *domain* we have in mind is the history of paradigm shifts in physics, of which the two most important are the mechanical-deterministic paradigm of the Newtonian worldview and the statistical-probabilistic paradigm of the quantum worldview. Within this domain, we are focusing our analysis on the shift between these two paradigms in the recent history of physics. The starting point for the analysis is an intuition that a depth dimension of meaning—something about the way human thinking is related to God—is embedded within this domain.

The *structure* of the domain consists of the nesting relationship in the historical succession of paradigms. The nesting relationship is the following: any reigning paradigm must not only include the successes of the previous paradigm in the limited domain in which the paradigm was valid but must also account for the anomalies that called the previous paradigm into question. As we described in section 1, in the mechanical-deterministic paradigm, Newtonian equations (such as $F=ma$) were taken as literal representations of the underlying structure of nature. These equations were considered to be thoroughgoing in the sense that all phenomena could in principle be accounted for by them. According to this paradigm, a mechanical structure governs everything in the universe.

Anomalies arose within the reigning paradigm when mechanical models were unable to account for atomic phenomena. Quantum models arose out of this failure in order to explain the anomalies, and their success led to the paradigm shift. The important point in this context is that the successful quantum models were based on probabilities rather than mechanical determinism. The fact that probability is a more general category than mechanical determinism means that the Newtonian paradigm remains perfectly valid within the limited domain of physical nature where it applies. In that domain the probabilities approach one and are indistinguishable from mechanical certainty. But outside the domain of the Newtonian paradigm, where anomalies arose, the probabilistic equations

of the quantum model provided successful explanations. Therefore, the quantum paradigm reveals this nesting property of including the superseded mechanical-deterministic paradigm within it while expanding significantly beyond its limits to account for previously anomalous phenomena. That nesting relationship between the two paradigms exemplifies the structure of our domain.

The *depth* of the structure is the fundamental principle of the domain—the place from which one can understand the identity and difference among the elements. We designate the depth of this structure the "Truth about truth." Recall the questions about truth raised by paradigm shift, which we discussed earlier, and the depth of this structure will become apparent. When, following the spectacular successes of the Newtonian equations, the mechanical-deterministic paradigm gained more or less universal acceptance, physical scientists thought that the mechanical paradigm was itself the direct expression of universal truth. With the discovery of anomalies within the Newtonian paradigm and the rise of an alternative theory—the quantum theory—that could explain those anomalies, a crisis erupted in the conception of truth. Did the quantum theory render the Newtonian view false?

Two important considerations emerge here. First, the quantum paradigm does not negate the truth of the mechanical paradigm; it rather circumscribes the limits of truth within that paradigm. Thus "truth" is both preserved and limited or contextualized. Second, the fact that the quantum paradigm supersedes the mechanical paradigm in terms of its capacity to disclose truth about physical nature has caused many physicists to recognize the limitations of scientific thinking *qua* thinking. Scientists understand that their models, no matter how successful they may be at the present time, will themselves be overturned in light of new disclosures of truth. This recognition invests the theory of modeling with its reflexive nature; scientists who construct models anticipate that they will be overturned. Indeed, scientists propose models for testing in order to learn where they are inadequate. Scientific modeling is reflexively aware of the limitations in principle that are embedded in any activity of modeling. We considered these limitations in the section concerning reflexive thinking in part 2. Thinking about being is always limited by its inherent temporality and historicality. Models are in the nature of the case models and not literal presentations of the underlying structure of physical nature. Both disclose truth through their testability, and they conceal truth through their being constructed representations, which provide selective access to reality. Thus, models that give limited access to truth with clear methods of testing, while denying that they are fully adequate to the truth, are closer to truth than models that do not acknowledge their ultimate inadequacy. Models that both affirm and deny their own ability to demonstrate truth

are closer to truth than models that lack such critical capacity of self-negation. The truth about Truth is that models do provide limited access to truth, but it is never complete; hence, no matter how successful they may be, models always contain both truth and untruth. The Truth about physical nature always surpasses the limited truth of any models. That truth about Truth is the depth of the structure, which we have designated as the nesting phenomenon in paradigm shifts.

Of course, it is not necessarily the case that a reigning paradigm is false. Even the claim that a reigning paradigm is true cannot be ascertained, for new experiments and new theories could show either that a reigning paradigm continues to be valid or that a new one is needed. At present the reigning paradigm is the quantum paradigm, and no known experiments give grounds for doubting its truth. However, there are many puzzles, such as the nature of dark matter. Future experiments with dark matter could reveal an entirely new structure, not describable by the quantum paradigm, or they could simply show that dark matter readily fits into the quantum paradigm. Similarly, theoretical investigation into the nature of space-time at tiny distances, such as the Planck length, may reveal an entirely new type of theory, which could either be subsumed under the quantum paradigm or not. Scientists act as though the reigning paradigm is true, using it to probe and test in domains previously unexplored, in the attempt to ascertain the truth or falsity of the paradigm. Thus, critical reflection on the nature of scientific modeling and the nature of theories and paradigms leads to the recognition that the reigning paradigm is superior to previous paradigms, while suggesting an openness to the future when new paradigms will come along to replace the reigning paradigm.

This openness to the future brings about the recognition of what we have called a necessary gap between the best available theory at a given point in history and a final theory—the theory that perfectly accounts for the underlying structure of nature.[11] In contrast to Steven Weinberg (1992), who argues for the possibility of attaining the final theory, our claim is that in principle such a gap can never be bridged. Because human thinking is historical and temporal, new data or new theoretical insights that are impossible to anticipate may undermine even the most successful theory. We acknowledge that the progression of nested paradigms leading to the final theory means that there is a necessary link between a reigning theory and the final theory in that the final theory will contain and can explain all prior theories leading up to it. Moreover, since the final theory is the *final* theory, it must also be able to explain itself *qua* theory. Whether quantum theory contains the elements of metacriticism is at this point an open question. However, we hold that there is both unity and difference between reigning theories and the final theory: unity in that any reigning theory always points to the final theory, and difference in that there is always a gap between a reigning theory and the final theory. With regard to this

latter point, we argue that Weinberg's position is neither metacritical nor reflexive. Weinberg's notion of the final theory seems to be that of an objective theory with no necessary metacritical elements. In addition, Weinberg's notion of the final theory does not account adequately for the historicality and temporality of thinking. In other words, Weinberg cannot include the here-and-now act of thinking the final theory within the final theory. Incompatibility exists between the systematic elusiveness of the here-and-now act of thinking, on one hand, and the final theory, on the other hand. Thus, our position differs fundamentally from that of Weinberg. We hold that the depth of the structure of paradigm shifts in recent physics emerges in the principle of unity and difference between the succession of theories and the final theory—and not in the in-principle unattainable final theory alone.

Furthermore, in our formulation of theological modeling, we argued that depth is an ontological notion. We argue, in contrast to Weinberg, that, taken as an ontological notion, the final theory is not necessarily mathematical. Both classical Newtonian theory (using differential equations) and quantum theory (using operators on Hilbert spaces) are mathematical, but it is wholly possible that future theories may use a symbol system radically different from the mathematical symbol system. The final theory thus uses whatever symbol system is required to express the depth as ground of all physical entities.

The final step in constructing a theological model is to connect the designator *God is* to the depth of the structure in order to show how and as what God appears as the depth. In our case, the theological model is to assert that "God is the truth about Truth." In other words, the being of God—the power of being itself—appears as the in-principle surpassing of any limited truth by the ungraspable nature of Truth itself. The Truth itself always both affirms and negates the partial and limited truths expressed by models. In this continual surpassing of partial truth by ultimate Truth, we see the relationship between human thinking and the being of God. Human thinking is always absolutely dependent on transcendent, divine Truth; while striving toward Truth, limited truths come clear—yet the irreducible gap between limited truths and transcendent Truth comes clear as well. Human thinking both participates in divine being and understands itself as infinitely surpassed by divine being as well.

Again, we distinguish our view from that of Weinberg. He holds that possession of the final theory may be possible and that, if actually accomplished, possession of the final theory would give us "special insight into the handiwork of God"; we would have real access to the "mind of God" (1992, 242). We hold that possession of the final theory is in principle impossible for human thinking; but, even if it were possible, possession of the final theory would, we argue, not yet give us real access to the mind of God. The final theory would give us the ultimate principles of being (that

is, principles of the created universe as the object of human knowing). It would not, however, give us the ultimate principle of the identity and difference between subjectivity and objectivity, nonbeing and being. The God whose mind would be known through the final theory is still the God of theism and not, in Tillich's terms, the God above the God of theism. Theologically speaking, Weinberg's conception of God is not yet the God whose being is "being itself"—the ground of being and nonbeing.

As stated previously, testing a theological model involves several steps. The first is preliminary in that it must be ascertained whether the structure that purports to explain phenomena in a given domain in fact does so. This is not directly linked to testing theological models and is present in all modeling in that competing models will attempt to uncover the structure of the domain. In the present example, we have thoroughly discussed the important features of scientific modeling, including the facts that scientific models have a reflexive dimension, that they invite criticism, and as such their own undermining, and that they encourage the creation of new models that may subvert previous models. Equally important, they both reveal and conceal elements in the structure of nature. Moreover, in the progression from models to theories to paradigms, the theories must have the nesting property that they reduce, in the appropriate subdomain, to previous theories that were able to explain phenomena in that more restricted domain. A progression of nested theories and paradigms thus leads to the understanding of ever-broadening domains, while incorporating a tradition of scientific thinking precisely in that each new theory is tied to older theories that correctly describe more restricted domains.

The second step is to apply three tests. First is the Anselmian test, to determine whether the depth of the model as theologically expressed ("God appears as the depth of the structure") represents that than which none greater can be conceived within the context of the domain under analysis. In our model, God appears as the "truth about Truth," which is a concrete instantiation within this model of that than which none greater can be conceived. This depth of meaning emerges from the nesting structure and expresses the appearance of transcendence within the domain. The "truth about Truth" discloses the self-transcending nature of truth in its reflexive, self-critical capacity both to affirm itself within limited contexts of testing and to negate itself as adequate to the ultimate Truth.

Second, there is the test to determine whether the depth has the capacity to manifest the being of God. This test involves determining whether the depth element corresponds to the idea of God. The "truth about Truth" passes this test, because here we see the being of God as "being itself"—the power of being as it overcomes nonbeing. In our model, God appears as the power of the Truth of being overcoming the untruth of nonbeing that adheres to the limited, contextualized forms of truth appropriate to human knowing. The "truth about Truth" is precisely the point in the struc-

ture at which the transcendent glory of God appears. In it, human thinking recognizes itself as participant in yet distinct from the transcendent being of God.

Finally, there is the reflexive test, that the denial of the theological model should in some way be included in the theological model itself. In the present example, God as the "truth about Truth" contains the ingredient recognition of the necessary gap between it and any reigning theory in history. This recognition includes knowing the impossibility of ever knowing whether any reigning theory closely approximates the final theory or is still a long distance from the final theory. Thus, No—the reigning theory is not the final theory and does not manifest the presence of God as the ground of physical being; but Yes—this reigning theory points to the final theory, which is a manifestation of the God who is the ground of all physical being. The gap between the reigning and final theories thus serves to preserve both the Yes and No responses to the theological model.

Conclusion

Theology, we have said, is a marginalized discipline in contemporary intellectual life. But it need not be. Indeed, theology should play an active and central role in the many serious disputes and discussions about the meanings of human cultural activities and the future of human life in face of dramatic social and technical changes. Human beings will surely continue to long for and struggle after a sense of transcendence in their lives, around which they can orient their thoughts, actions, and feelings. In that regard, nothing has changed. Humans still have deep intuitions of theological meanings in both their everyday existence and in their more rarified cultural activities. More generally, humans understand that their own thinking activities are not self-sufficient and wholly autonomous. We sense that the thinking activities with which we are always involved themselves depend on the givenness of being itself—a givenness that both transcends and sustains the being of human thinking activities. *God* is the theological name for this transcendent, yet immanent, power of being itself. Recently, however, theology has been struck dumb—perhaps in part by the success of the sciences and the technological overhumanization of the world.

We propose that one significant reason for the marginalization of theology is that its two major schools of thought do not make cognitive claims. Both confessional theologians and radical secular theologians cut themselves off from making universally testable claims. Thus they cannot be taken seriously by thinkers who pursue knowledge of the world around them and understand that knowledge precedes and underlies the real changes that technology causes.

We have put forward here a theory and method of constructing and testing theological models that does have a cognitive component to it.

Theology, as we are proposing to do it, can respond to and identify a depth of meaning in any domain whatsoever by locating a depth in the structure of that domain. Theological analysis comes into play with the interpretation and justification of the depth dimension of the structure as manifesting the being of God. The importance of this method is that it enables theological interpretation within any sphere of culture (including that of specific religious communities) while appealing only to universally available and testable criteria. In this regard our program is a form of theological humanism. It is *theological* in its capacity to identify a depth dimension of meaning that appears within the whole set of possible domains of inquiry. It is *humanistic* in its appeal to the nature and structure of human thinking as such, as expressed in but not limited by the particular cultural-linguistic system of any historical community.

We have presented an example of a theological model taken from the domain of the recent history of physics. We want to stress that examples can and will be constructed from domains of literature, political conflict, religion, art, biology, and any other domain conceivable by the human mind. Any and all of these domains are open to the ultimate horizon of intelligibility; they are themselves manifestations of the power of being itself. When and if the ultimate ground of being and nonbeing shows itself within them, and human minds respond to that revelation or disclosure of the depth of meaning, compelling theological models can be constructed and tested. We intend this method to be directly usable by anyone who can comprehend and follow the logic of modeling as it appears in the human, social, and natural sciences.

Notes

1. Examples of confessional theology that are popular today include those of Stanley Hauerwas (1975; 1981; 2001), John Howard Yoder (1984), and John Milbank (1993).
2. Examples of radical secular theologies are those of Mark C. Taylor (1984), Charles Winquist (1986; 1995), John Caputo (1999), Thomas Carlson (1999), and others.
3. For Tillich, because all beings are finite in space and time, the structure of being is the structure of finite being. Being-itself, as the ground of the structure of being, transcends everything that is, including the structure of finite being. Therefore being-itself is not itself a being—not a finite being and not an infinite being. Being-itself is rather the power that overcomes nonbeing and thus preserves the structure of being. Being-itself is the infinite ground of both finite being and finite nonbeing. As such, being-itself transcends strict conceptualization (Tillich 1951, 163–210; 1952, 155–90; 1955, 13, 68).
4. Some of the prominent theists writing today are John C. Polkinghorne (1994; 1996; 1998), Arthur R. Peacocke (1993), Alvin Plantinga (1990), Richard Swinburne (1977; 1994), and others.
5. See Oldroyd 1989, 248, for an account of the "received view," along with Suppe 1977, 1–241.
6. On the sociology of knowledge theorists (or "social constructivists"), see Oldroyd 1989, 342–56 for an overview, as well as Bloor 1976 and Latour 1979.
7. Kuhn (1970, 148–50) spells out what he means by "incommensurability": (1) "disagreement about the list of problems that any candidate for paradigm must resolve," (2) "incommensurability of standards," (3) shifting meanings of terms, concepts, and experiments, which "fall into new relationships one with the other," and (4) "the proponents of competing paradigms

practice their trades in different worlds," such that "they see different things when they look from the same point in the same direction."

8. Martin Heidegger, more than any other philosopher before him, comprehended the element of temporality in thinking as a reason why thinking is intrinsically finite and thus "hidden" from as well as "disclosed" to itself ([1927] 1962, part II).

9. Hans-Georg Gadamer ([1960] 1975, 305–41) comments extensively on historical consciousness, or what he calls *wirkungsgeschichtliches Bewusstsein* ("consciousness that is open to the history of its own effects").

10. This test of the self-negating quality of a true symbol of God was first coined in other contexts by Tillich (1957, 97–98; 1955, 61–62).

11. Weinberg calls the final theory "a simple set of principles from which flow all arrows of explanation . . ." (1992, 233), a theory "that would be of unlimited validity and entirely satisfying in its completeness and consistency" (1992, 6).

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