MONOGRAPH IN PHILOSOPHY

WAVES, PARTICLES, AND PARADOXES

WILLIAM H. AUSTIN

VOL. 53, NO. 2

SPRING 1967
RICE UNIVERSITY STUDIES
JOURNAL OF WILLIAM MARSH RICE UNIVERSITY

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PUBLISHED BY
WILLIAM MARSH RICE UNIVERSITY
HOUSTON, TEXAS

VOL. 53, NO. 2 SPRING 1967
ACKNOWLEDGMENTS

I am indebted above all to Prof. W. A. Christian for patient encouragement and for many valuable suggestions. Prof. H. Margenau and Dr. A. Petersen have read and commented helpfully on earlier versions of the material which now constitutes Chapter II. I have profited from discussions with Dr. Mary Hesse and Profs. R. L. Calhoun, H. W. Frei, P. L. Holmer, and J. J. Pelikan.

Several of those named have made suggestions which I have, to my loss, been unable (or too stubborn) to follow; none, of course, can be blamed for the essay's deficiencies.

An earlier (and longer) version of this essay now reposes among the dissertations at Yale University.

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WAVES, PARTICLES, AND PARADOXES

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CHAPTER I
INTRODUCTION

1. Problems and Program

Three related questions are explored in this essay. All three fall within a domain of investigation which could be called “the logic of theological discourse,” in a broad sense of “logic.” The familiar image of concentric circles can serve as a rough indication both of their mutual relations of scope and inclusion, and of their respective places in the plan of the essay.

The broadest of the questions which will concern us is one to which, for brevity and convenience, we will give the formulation, “Is theology a science?” It is not, however, very similar to the question discussed by Father M. D. Chenu in his little book of that title (or those discussed in the first quaestio of the Summa Theologiae). Father Chenu asks how well theology, as an activity of disciplined reasoning aiming at a sort of knowledge, fits certain conceptions of “science” current before the Scientific Revolution. He regards it as quite clear that theology cannot proceed “along the lines and according to the methods of ‘science’” as it has come to be understood since that Revolution.1 Granting that theology is in many ways a quite different sort of enterprise from the disciplines now generally known as sciences, we nevertheless wish to pursue some possibly illuminating analogies between its procedures and theirs.

One feature of theology which might seem to set it sharply apart from the empirical sciences is the presence in its discourse of paradoxes. Many writers would concur in the view stated by Philip Wheelwright in The Burning Fountain, that its paradoxicality is a reason for classifying religious discourse together with myth and poetry as a form of “expressive” or “depth language,” as opposed to the “steno language” of science and everyday practical literality. Our second question, then, will be the significance of paradoxes in theology, and in particular their bearing on the possible analogies between theology and the empirical sciences.

But are the empirical sciences free of paradox? The wave-particle duality in quantum physics is sometimes cited as a striking example of paradox in physical science, and Niels Bohr’s “principle of complementarity” as an interpretation of that paradox which shows that it is not a contradiction and that it is an inescapable feature of physics in the submicroscopic domain. Several writers have suggested that the principle could be applied

(1)
in the interpretation of theological paradoxes. According to John Baillie, Bohr himself concluded his (never-published) Gifford Lectures in 1949 by saying, "I think you theologians should make much more use than you are doing of the principle of Complementarity." One place where they might make good use of the principle, Bohr suggests, is in interpreting the relation of justice and love. All cultures aim at "the closest possible combination" of both, yet the strict application of either in any situation excludes the other.

This situation, which in many religions is mythically illustrated by the fight between divine personifications of such concepts, is indeed one of the most striking analogies to the complementary relationship between physical phenomena described by different elementary concepts which were combined in the mechanical conception of nature, but whose strict applications in wider fields of physical experience exclude each other.

A detailed exegesis of this passage, which comprises about all that Bohr says in print on the subject, would be out of place in this Introduction. But the statement seems to invite a comparison between the procedure of the physicist and that of the theologian. The physicist, interpreting phenomena of light and matter at the submicroscopic level, must combine as closely as possible pairs of complementary concepts such as wave and particle, position and momentum, while recognizing that the conditions for the strict and precise application of one concept of a complementary pair exclude the application of the other. The theologian, interpreting the religious and moral experience of men, must similarly aim at the closest possible conjunction of love and justice (he must attribute both to God), while recognizing that the conditions of their application are mutually exclusive.

The attempt to state the comparison briefly, yet with reasonable comprehensiveness, has resulted in a number of ambiguities which are not hard to detect and which we will attempt to clarify in the course of the essay. Others have suggested similar or related comparisons. One of the more incautious forms of the comparison is provided by Thorlief Boman at the end of his well-known book, Hebrew Thought Compared with Greek. Boman thinks that many of the paradoxes in theology result from the combination of Hebraic and Greek ways of thinking, which he tries to show have their respective quite different and unitary characters; they are incompatible, yet both must be used. That is, they are complementary. Bohr, he says, has continually emphasized that the findings of atomic physics are complementary, i.e., they cannot be correctly described without resorting to expressions which are logically irreconcilable. Thus, some experiments show that the atom has wave structure, and others show that it consists of particles (quanta). If both are right, reality possesses opposite properties which complete each other. Bohr calls the unitariness of opposite manifestations of a phenomenon complementarity. In that sense, Hebrew and Greek thinking are complementary; the Greeks describe reality as being, the Hebrews as movement. Reality is,
however, both at the same time; this is logically impossible, and yet it is correct.4

Boman has misunderstood Bohr's principle; I quote him because his misunderstanding is a rather common one. Bohr does not mean that microphysical entities possess irreconcilable characteristics, nor even merely that we are constrained to attribute irreconcilable properties to them in order to interpret all the available evidence. Our epistemological limitations are such that we must use conflicting models to interpret the phenomena completely, but we do not fall into contradiction because (1) the models must be recognized as merely models, (2) the conditions for their unambiguous use are mutually exclusive, so that they do not come into direct contradiction.

Writing from a point of view quite different from Boman’s, Ronald Hepburn has suggested that theologians could appeal to the analogy of the wave-particle duality as a first line of defense against the charge that their paradoxes are mere contradictions or muddles. We should not be surprised if the theologian, grappling with mysteries far more profoundly beyond the reach of our familiar concepts than microphysical entities are, finds it necessary to use models he does not know how to reconcile. Does he use his paradoxical models in a way parallel to the way in which the physicist uses his? Hepburn suggests the question, but does not go into it.5 This is the third of our questions: to what extent can theological paradoxes be understood as analogous to the wave-particle duality? That is, how adequately can they be understood as resulting from the use of conflicting models in a complementary way?

It is this third question with which our inquiry is most directly and consistently concerned, and which governs the choice of topics to be discussed. We do not attempt to treat the two broader questions comprehensively; they are considered mainly as they arise in connection with the exploration of the third. However, because of their intrinsic interest and because much of the interest of our principal question derives from its bearing upon them, at some points they are discussed in some detail.

The first task of our inquiry, then, will be to discover what the “paradoxes of microphysics” are, how they are summed up in the “wave-particle duality,” what Bohr’s “principle of complementarity” asserts, and how it is related to the wave-particle duality. Finding the principle somewhat obscure and its relation to the wave-particle duality somewhat problematic, we will introduce a definition of complementarity as a certain kind of relationship between two models, a definition which seems suitable for our purposes and close enough to Bohr's intentions to be responsible. This task will occupy us in the first three sections of Chapter II. In a fourth section we will briefly consider some attempts to show, on physical and philosophical grounds, that the wave-particle duality cannot or need
not be taken as a permanent feature of microphysics. We will argue that even if the duality is a "museum piece," it guided thought in physics at a significant period, and that the idea of complementarity might still be a valuable tool in the attempt to understand the functions of paradoxes in theology as a quasi-scientific discipline.

We turn then to the examination of paradoxes within theology. The question whether they can be traced back to the complementary use of models is investigated in three stages. First, in Chapter III, we consider the principal standard alternative ways of treating paradoxes: (1) attempting to resolve them, i.e. to remove the appearance of contradiction, and (2) taking them as distinctive consequences of theology's attempt to make affirmations about a religious ultimate which is transcendent and mysterious. We will argue that the first approach is compatible with theology's being regarded as a science, but not with the suggested analogy between theological paradoxes and the wave-particle duality; in any case, there are paradoxes which stubbornly resist resolution. Such paradoxes are often taken to show the superiority of the second approach. But we will try to show that it too is inadequate, and that there is no evident reason why the religious mystery should not, to whatever extent it admits of being modeled at all, admit of complementary models.

The next step is to examine the most promising contemporary theory of religious discourse, Ninian Smart's, for its bearing on the interpretation of paradoxes. In particular, we want to see whether it might provide either the basis for a complementarist approach to them, or a viable alternative thereto. Smart is much concerned with the conditions and results of the combination into single doctrinal schemes of "strands" of religious discourse oriented toward different kinds of experience. In Chapter IV we examine his theory and try to extend it by more specific attention to the relationships obtaining between models drawn from different strands. Some promising lines of research are opened up, but because the factors with which the theory deals operate well below the surface of doctrinal development, a great deal of historical study would be required before we could apply the theory with confidence to particular familiar paradoxes.

In the last chapter, the third stage of our exploration of the possibly complementary character of theological paradoxes, we turn attention more directly to some familiar paradoxes of Christian theology. Consideration of them is prefaced by a brief summary of the main results obtained in earlier chapters, but the discussion is not confined to the application and illustration of earlier results. Rather, there is a shift in approach. Whereas in Chapters III and IV the possibility of a complementarist interpretation is considered in relation to some important general theories of religious paradox, in this last chapter general theories recede into the background and the paradoxes treated are examined individually to determine to what
extent they might plausibly be considered analogous to the wave-particle duality.

Two tasks of clarification remain to be performed in this Introduction. We must specify what we mean by “paradox,” and must explain the rather broad sense in which we are using the term “theology.” In connection with the latter task, a brief indication of the grounds for suggesting a limited but significant analogy between theology and empirical sciences will also be given.

2. Paradox Defined

Discussions of “paradox” tend to suffer from the fact that the meaning of the term has undergone a major shift in the course of its development. We ordinarily think now of a paradox as a statement which, on the face of it, seems self-contradictory. But there is an older sense, corresponding to the Greek paradoxos, in which a “paradox” is a statement which is surprising, contrary to general expectation or belief, but not necessarily having even the appearance of self-contradiction. (Thus Henry More could speak, in his *Antidote to Atheism*, of “that pleasant and true Paradox of the Annual Motion of the Earth.”) And not only statements, but also events, situations, even people were characterized as “paradoxes” or “paradoxical” in the older sense. (Liddell and Scott inform us that among the Greeks extraordinary athletes, musicians, etc. were sometimes styled “paradoxes.”) To some extent the older sense survives in our usage. In theological discussions of paradox it is often unclear which sense is meant, or whether the same sense is meant throughout. Also, the distinction and relation between paradoxical statements and paradoxical events or realities are often left unclear.

For our purposes we will confine the term to statements, and define a paradox as a statement which appears to be either self-contradictory or incompatible with other statements which are generally taken to be true. In part this definition straddles the two senses just mentioned, but it excludes statements which are merely surprising. It seems reasonable to bridge the senses in this way, since if $S$ is a statement which is paradoxical in the sense of contradicting some apparently true statement $T$, then the conjunction $S \& T$ will be paradoxical in the sense of being apparently self-contradictory.

On this definition it is irrelevant to the paradoxical character of a statement whether or not it turns out on investigation actually to contradict itself or some true statement. The *prima facie* appearance of contradiction is the decisive factor.

Some examples, chosen with a view to later exposition, follow. The first three are from the Upanishads, the rest from the Christian tradition. The first is chosen as an example of a statement, not *prima facie* self-con-
tradictory, which falls under our definition in virtue of its apparent incompatibility with other statements which we have good grounds for considering to be true.

(1) “That [Brahman] art thou” (Chandogya VI. 8.7).
(2) “That One, the Self, though never stirring, is swifter than Thought . . . though standing still, it overtakes those who are running . . . .
   It stirs and it stirs not” (Isa 4f).
(3) “[Brahman] is both far and near: It is within all this and It is outside all this” (Isa 5).
(4) “Whoever would save his life will lose it; and whoever loses his life for my sake and the gospel’s will save it” (Mark 8:35).
(5) Jesus Christ is Very God and Very Man.
(6) God is a merciful Father and a severe Judge.

3. Theology and Science

We can conveniently suggest what we shall mean by “theology,” and what sorts of analogy between theology and empirical science we wish to explore, by contrast with the ways “theology as a science” is treated by Chenu and his fellow Dominicans, Thomas Gilby and J. M. Bochenski (and St. Thomas himself). Gilby cites two definitions of science, given by St. Thomas at different times, in accordance with which Aquinas thought theology could be considered a science. He defines science as “a thinking process leading from the known to the unknown” and later as “the knowledge of a thing in its proper cause.” St. Thomas’ argument in the Summa Theologicae (la. 1, 2) shows that he thinks of a science as a body of knowledge obtained by deduction from first principles which are either self-evident or else theorems in a “higher science.” Theology is like geometrical optics, a body of doctrines obtained by deduction from premises supplied by a higher science—in the one case geometry, in the other God’s own knowledge of himself and his creation, shared with the saints in the beatific vision. (God’s knowledge would seem to be “science” only by the second of the definitions quoted above, while either definition would fit our knowledge.)

Thus Gilby is right when he says that for St. Thomas theology is a science neither in the way that mathematics is, nor as “a method of observation and experiment which allows provisional validity to propositions or generalizations relating different items of experience only so long as they can be verified or shown not to be superfluous by the facts.” But it is much more closely analogous to mathematics, or rather to a derivative science which obtains its premises from mathematics but otherwise proceeds by the same methods. Neither St. Thomas nor his thoughtful disciples would claim that the analogy is exact; for one thing, neither he nor they wrote theology in the form of deductive systems.
It might seem that this fact destroys the analogy, and does not merely qualify it. But even sciences whose proper final form is a pure deductive system are seldom built up by starting out with a set of axioms and methodically drawing out chains of theorems from them. Before the final deductive system is achieved, much spadework needs to be done by the working mathematician—working out particularly simple special cases and trying to generalize them, guessing theorems and trying to find appropriate postulates to which to trace them back, looking for analogies between features of the problems being considered and features of previously-worked-out portions of the theory so as to adapt the latter’s sequence of reasoning to the former, etc. It is with this stage of mathematical work that actual theological work can be plausibly compared.

Chenu agrees that theology is not like modern natural science, and adds two further reasons besides the point that it does not employ a method of hypothesis, deduction, and test. It is unlike natural science because its object is the mystery of God and not natural phenomena, and because it “involves an inwardness which is . . . averse to the objectivity and cold rationality which . . . are the indispensable conditions for a critical investigation of nature.” What sort of science is it like? The nearest thing in Chenu’s book to an explicit definition on this point is his statement that theology builds up knowledge and in so doing “must normally involve the valid and fruitful task of rationally and systematically using the methods and resources of the intellect in accordance with the capacity thereof.” Science, then, is just rational knowledge, obtained (in part, at least) and ordered by means of the normal functioning of the intellect. Chenu states his general agreement on this point with St. Thomas. Presumably he would agree that if theology is to be compared to a particular science, it should be mathematics.

The principal objections to considering theology a science, Chenu thinks, have to do with the “inwardness” and mystery mentioned above, and with the apparent conflict between the demand of any science for rationality and evidence and the central place in theology of faith and authority. Of these problems, we shall deal only with certain of the questions posed by the point that the ultimate object of religious discourse is a mystery. The others, while obviously genuine and important, are less evidently connected with the question of the significance of theological paradoxes.

Bohenski disagrees with his fellow Dominicans on an important point, and in such a way that his conception of theology is a step closer to ours than theirs is. “Theology,” he says, “is more like physics than like mathematics.” He is referring to the relation of theological conclusions to what he calls \( \rho \)-sentences, i.e. the sentences of Scripture and other authoritative religious statements. They are not axioms from which theological conclusions are deduced; rather, the aim of theology is to find theological prin-
principles from which they can be deduced. One starts with a set of $\rho$-sentences, explains them by finding theological conclusions which will serve as premises from which they can be deduced, and tests the theological conclusions by deducing other sentences from them and determining whether they are $\rho$-sentences. Thus a theological system is to $\rho$-sentences as a physical theory is to statements of experimental findings (or "protocol sentences," as they are often called).

Bochenski's comparison is reminiscent of a well-known suggestion by Whitehead. "The dogmas of religion," Whitehead says, "are the attempts to formulate in precise terms the truths disclosed in the religious experience of mankind. In exactly the same way the dogmas of physical science are the attempts to formulate in precise terms the truths disclosed in the sense-perception of mankind." With Bochenski's and Whitehead's analogies between physical science and theology before us, we are in a position to indicate the analogy, the validity of which we wish to explore. Theology, we suggest, aims to provide a theoretical interpretation of the "religious experience of mankind," as physical science aims to provide a theoretical interpretation of sense experience. So far we have not diverged greatly from Whitehead. But there is a question about the meaning of "religious experience." Whitehead's formulation tends to suggest that theology is concerned with the interpretation of a special, non-sensory type of experience called "religious" (or perhaps "mystical"). While such experiences are important for theology (in our sense of the term), it is concerned also with the interpretation of events (historical events such as the Exodus, and occurrences in the individual religious man's experience as well) in the sensible world. There are other passages in Whitehead which suggest that our formula is not radically incompatible with his intentions, e.g. the often-quoted statement that "rational religion appeals to . . . the elucidatory power of its concepts for all occasions" and the definition of religion as "a system of general truths which have the effect of transforming character when they are sincerely held and vividly apprehended."

To say that theology can be regarded as a systematic interpretation of (at least certain aspects of) our experience of the world is to suggest a fairly weak analogy with empirical science. We are interested in the stronger suggestion that theology, like science, aims to explain given experiential statements by finding theoretical statements from which they can be deduced, and from which additional testable statements can also be deduced.

What sort of empirical test is possible for theological theories? The difficulty of this question is notorious, and we shall not attempt to provide an adequate answer here. But a brief suggestion or two will be in order. Predictions of future events play some role, at least in some traditions,
but in general the role is secondary and ambiguous. The “inferences” from theological doctrines are more typically directives as to ways of looking at the world and its phenomena, and ways of behaving in it. A set of doctrines is “tested” for its fertility in suggesting directives which enhance the quality of their holders’ awareness of the world and of their behavior in it. Very briefly and baldly put: do the doctrines enable their holders to make sense of the world, and to be better men? There is a point in saying that theology is a science of the practical reason, though to be sure the explication of the saying would be a difficult and intricate business.

Three major objections must be stated and briefly answered. The first objection is that the sort of “verification” we have ascribed to theological doctrines is weak and vague, and too little like the verification of scientific theories for the proposed analogy to have much pertinence. Moreover, systems of religious doctrine tend to specify the criteria by which their fruits are to be judged: how can we judge a theology by the quality of life it engenders if it also stipulates what characteristics make a style of life good? These are serious questions, comparable in magnitude to the problem which is the main business of our essay. They merit extended consideration, and can hardly be answered in the concluding pages of an introduction to a study of another problem. We may note, however, that recent studies in the philosophy of science have shown how intricate a matter the confirmation of scientific theories is, and how tenaciously a fundamental theory resists falsification. One way, indeed, that a fundamental theory resists falsification is that it tends to dictate what can count as an observation sentence. Vulnerability in principle remains, but on the view of theological theories we are advocating they too are vulnerable in principle; the difficulty is one of practice, and while on the whole it seems greater in theology than in science, it does not seem so much greater as to rule the proposed analogy out of court. We can go on with our hearing on another aspect of the case.

The second objection is one which Chenu and Gilby would raise. The primary purpose of theology, they would say, is not the interpretation of experience but the knowledge of God, which is to be sought for its own sake and not as a means to the explanation of something else. This point has substantial validity, but need not disturb us. It may well be that we are dealing with a secondary aspect or function of theology, but it is enough for our purpose that it be a real one, and few theologians would deny that it is.

The third objection is that we have failed to distinguish between theology as a systematic discipline and religious thought generally. Here at least we can claim the support of Chenu, who urges the “devout believer with the simple evangelical faith,” wary of “theology,” to recognize that he is in fact practicing theology when, for instance, he tries to understand
the reasons for recent liturgical changes. Authorities aside, the reason for failing to make the distinction is that it would unduly complicate the discussion, and would be likely to mislead. In the first place, several distinctions would have to be made, since “theology” comprises several disciplines—dogmatics, philosophical theology, scriptural exegesis, etc.—the relations among which are the topic of much discussion. More importantly, the line between wissenschaftliche theology and the thoughtful believer’s attempts to interpret his experience is extraordinarily difficult to draw. Practitioners of the former are to a large extent guided by the latter, which provide not merely data for the professionals but lines of thought which it is their business to clarify and systematize. Thus it seems that the two enterprises correspond to two phases of the scientific enterprise, rather than to science and something else.

The difficulty of drawing the distinction can be seen when we consider the status of such statements as “Jesus is Lord.” Should this be considered a protocol sentence which the systematic theologian tries to explain by deducing it from higher-level theological premises? Or is it a “theoretical statement” of theology-as-a-science, which the Christian thinker uses as a principle in his interpretation of experience? It seems that it can be regarded in both ways, and that to opt exclusively for either would unduly restrict the field in which we can search for analogies between theological and scientific thought. This is not to say that the distinction suggested is not in itself worth working out, but rather that the attempt to work it out would hinder, not advance, our present task of exploration.

Our primary task in this essay, it will be recalled, is not to explore the general merits and problems of the analogy between science and theology, but to consider one particular objection to it (namely, the occurrence of paradoxes in theology)—and still more specifically, one possible counter to the objection. We shall be concerned primarily with Christian theology, though many of the problems which concern us arise in other traditions as well, and we shall consider examples from Indian religious traditions at several points.

Before we can examine any theological tradition for analogies to the wave-particle duality, we must gain some understanding of the duality and how it arises in physics. In our next chapter we consider the experimental and theoretical developments which led physicists to speak of a duality, and the “principle of complementarity” which Bohr developed to interpret it.
CHAPTER II

WAVES, PARTICLES, AND COMPLEMENTARITY

The difficulty of determining exactly what Bohr means by the “principle of complementarity” is notorious. Einstein complained that “despite much effort” he had been “unable to achieve” a “sharp formulation” of the principle.1 Karl Popper echoes the complaint.2 Bohr strove for clarity, but the results were rather oracular. There seem to be two reasons for the obscurity. On the one hand, he was trying to formulate an epistemological principle of great generality.3 On the other hand, he was never fully satisfied with any formulation, and in his writings tried to make the principle clear through a considerable variety of applications, rather than a precise definition.

For our purposes it seems desirable to formulate a specific and reasonably simple definition of complementarity, and to frame the definition in such a way that the wave-particle duality will be the paradigm case of complementarity. Our definition will be presented, and its relation to Bohr’s ideas discussed, in the third section of this chapter. The first section summarizes the evidence which has led physicists to speak of a wave-particle duality, and indicates a way of relating the duality to the Heisenberg uncertainty relations. The second section surveys Bohr’s principal uses of the idea of complementarity in atomic physics.

When we have obtained our definition, it will be convenient to consider some objections to the idea of complementarity, and their bearing on our project.

1. The Wave-Particle Duality and the Uncertainty Relations

Four stages may be discerned in the modern history of the physical interpretation of light phenomena. Roughly corresponding to the seventeenth, eighteenth, nineteenth, and twentieth centuries, the stages are (1) wave and particle theories rivals, (2) particle theory dominant, (3) wave theory dominant, and (4) wave-particle duality.

In Newton’s time, wave and particle theories were both in the field, and the evidence was insufficient to settle the issue. Newton’s writings contain traces of a wave theory, but his theory is predominantly corpuscular—largely because of his general commitment to atomism and opposition to anything (such as Huygens’ wave theory) which seemed to him too closely associated with the Cartesian cosmology.
The aspects of Newton’s thought which tended toward a wave theory dropped into the background in the following century; it was not so much direct investigations of light phenomena as the general character of eighteenth-century physics that vindicated the corpuscular theory. The great achievement of this period was the development of a very elegant analytic mechanics of point-masses. Continental mathematical physicists developed mathematical tools of great power, by means of which Newton’s mechanics of point-particles could be simply and elegantly laid out and developed. Though point-masses are not the same as tiny billiard balls, and the success of point-mass mechanics does not necessarily imply that the basic constituents of matter are particles in that sense, still the mathematics had been developed by people who were thinking of such particles, and had lent a certain plausibility to the corpuscular hypothesis. Understandably, physicists tended to believe that success in other areas would be found along similar paths. Light phenomena were to be explained by bringing them under the same equations, and one naturally thought of light rays as consisting of streams of particles, especially since no known phenomena grossly contradicted such a picture. And when one thought of light, one naturally thought of light rays. This can be attributed to the dominance of geometrical optics in the previous history of thought about light, and to the phenomenon that illuminated objects cast sharp shadows, indicating that “light travels in straight lines.” This fact was one of the main objections to the wave theory. For sound and water waves diffract around the edges of obstacles. So do light waves, but the phenomenon is detectable only by means of special arrangements, because the wavelength is so small.

The corpuscular picture was grossly contradicted, however, by interference phenomena demonstrated near the beginning of the nineteenth century by Thomas Young. When monochromatic light is shone on a screen through two slits in an intervening screen, alternate dark and light bands will be formed. It is hard to see how streams of tiny particles could produce such an effect, but the effect is easy to explain if one considers the propagation of light as a form of wave motion. For waves can reinforce and interfere with each other. If their peaks coincide, they reinforce each other; when a peak of one coincides with a trough of the other, they interfere destructively (i.e., cancel each other out at that point). The musical phenomenon of beats is a familiar example: the silences result from destructive interference. Suppressing some complications, we can think of our light and dark bands as analogous to beats and silences respectively. From the dimensions of the bands, the wavelength can be calculated.

Young’s experimental demonstrations left the corpuscular theory in great trouble, but it was Fresnel’s development of a powerful mathematical apparatus for the wave theory which brought about the general conversion of physicists to it. Now that a satisfactory mathematical account
was available, physicists gave more weight than they had previously done to certain long-standing objections to the particle theory.\(^4\) One was that light had never been observed to possess mass, and the idea of massless particles is not a comfortable one. Besides, Huygens’ Principle, which describes the propagation of light, can be demonstrated on the premise that light is a wave motion, but not on the premise that it is a stream of particles. Furthermore, polarization phenomena had been accounted for on the corpuscular theory only with the help of some unsatisfactorily ad hoc assumptions. Before Young and Fresnel, these had been regarded as unsolved problems for the corpuscular theory; thereafter, they appeared as weighty objections to it.

There were still some problems for the wave theory. Waves require a medium. So an all-pervasive “luminiferous ether” had to be postulated. Not only did efforts to detect the ether fail, but some very strange results were obtained when scientists tried to calculate what its properties should be. Indeed, these strange results could well be called “paradoxes” in our sense; and the term was applied by many physicists. Nevertheless, the wave theory was regarded as established, and the paradoxes were regarded as difficulties to be cleared up rather than as objections to the theory.

When, early in this century, physicists began to speak again of corpuscular properties of light, it was because of certain newly discovered phenomena rather than the anomalies of the ether. One of the most noteworthy of these phenomena is the photoelectric effect. When light falls on a metal surface, electrons are given off by the metal: energy is transferred from the absorbed light to the electrons, and they “tear themselves loose from their metallic confinement.”\(^5\) Now according to the wave theory, the energy of the emitted electrons should depend on the intensity of the incoming light. And since the electrons could be expected to build up energy gradually and continuously until the escape-threshold is reached, we should expect to be able to calculate a time (a fairly considerable time, in fact), that should elapse before the first electron is emitted, and swarms should follow quickly after that. But in fact the electrons start to come out almost immediately, and in an irregular pattern which cannot be reconciled with the wave picture; and their energy depends not on the intensity of the light but on its frequency. What does depend, and quite strictly, on the intensity is the number of electrons emitted per second.

Both of these puzzling phenomena can be explained quite well—almost—if we regard light as a shower of corpuscles (“photons”), each carrying a quantum of energy. The explanation is that an electron gets the energy to break loose by absorbing an individual photon. Since the electron gets its escape energy all at once instead of building it up gradually, there is no reason to expect a time lag before emission of electrons begins; and since
the absorption of one photon is quite independent of what is happening to
other photons and how many of them there are, the energy possessed by a
given electron is independent of the intensity of the light (i.e., the number
of photons striking per second).

There is one catch. The energy does depend on the frequency of the on-
coming light, and it is difficult to see what the "frequency" of a shower of
photons would mean. "Frequency" is definable only within a wave theory.
(It is equal to the velocity of the wave divided by the wavelength. So red
light, with greater wavelength than blue, will impart less energy to electrons.)

The relation between energy and frequency is given by the equation
$$E = h\nu,$$
where $\nu$ is the frequency and $h$ is Planck's constant. It will be
worth our while to pause to consider briefly the way in which this equation,
and this constant, were introduced into physical theory.

One of the few visible trouble spots in physics at the end of the nine-
teenth century was black-body radiation. A "black body" is one which
absorbs all radiation (e.g. light) falling on it, and does not reflect any. It is
thus a theoretical entity, though very close approximations to black bodies
can be constructed experimentally. Such a body will radiate when heated,
emitting a continuous spectrum of radiation, whose wavelength distribution
depends on the temperature in accordance with an empirically-determined
law.

The problem was to account for the law. Several attempts, based on
classical models, had failed. Planck succeeded in deriving the empirical
law on the basis of one of the previous models, modified by the radical
assumption that "the radiation was being produced by mechanical oscilla-
tors whose energies could not take on a continuous range of values as in
classical physics, but were 'quantized' to the particular values $0, h\nu, 2h\nu,$
etc." The symbol $\nu$ here refers to the frequency of vibration of the oscilla-
tor; $h$ is Planck's constant, and is simply a number (an exceedingly small
number, by ordinary standards). Since the values of the energy which an
oscillator is allowed to have form a discrete set, the energy of the oscillator
cannot change continuously: the energy must be absorbed or emitted in
small 'bursts' $h\nu$ (or multiples thereof). This is quite contrary to classical
theories of radiation and energy transfer. It is hard to judge what phys-
icists would have done with it if the same quantized relation of energy to
frequency had not appeared in other contexts also. The photoelectric
effect provides one of these contexts; we turn now to a second.

Another anomaly for the wave theory is the Compton effect, which has to
do with the scattering of X-rays. Early investigations after their discovery
in 1895 seemed strongly to indicate that they are electromagnetic waves,
like light waves but with shorter wavelength. The phenomena of inter-
ference, reflection, refraction, polarization, and diffraction (by means of
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which wavelengths can be calculated) were all discovered.

Scattering is the phenomenon that makes light beams visible when dust particles are suspended in the air—the particles reflect the light in all directions, and make it visible. Something similar happens when X-rays pass through substances, but with a puzzling difference. The scattered X-rays are of two frequencies—some retain the original frequency, but others have a different frequency which depends on the angle at which the odd wave is deflected, but not on the scattering substance. This was unheard-of behavior for waves; their frequencies had never been known to change in any process. But the observed results could be derived quite accurately if the X-rays were regarded as photons, colliding with electrons and bounding off in good billiard-ball fashion, in accordance with the classical conservation laws for such collisions.

But, just as with the photoelectric effect, these X-ray photons are odd particles, in that (among other oddities) their energy and momentum (which figure prominently in the above-mentioned calculations) are functions of their frequency, in accordance once again with the relation \( E = h\nu \). Thus, one should be cautious about the familiar formula, “The wave theory accounts for some light phenomena; the particle theory for others.” “Phenomena” is a vague enough term so that it could perhaps be so defined as to save the formula, but if the photoelectric and Compton effects are taken to be examples of “phenomena,” then there are “phenomena” which we can account for only by mixing the two theories. “Mixing” here does not mean finding a unified picture; it means bringing in constructs (momentum, frequency, etc.) and equations from both theories, as necessary to yield derivations of the observed phenomena. We will be saying more later about the principles which govern the mixing and save it from being merely ad hoc.

We must first complete our picture of wave-particle duality by indicating briefly how it arises in the case of matter, e.g. electrons. The evidence for their particulate character can be summarily stated. They have mass and electric charge, neither of which seems to make sense as a property of waves. They travel with different velocities, even in a vacuum, whereas in a vacuum all electromagnetic waves travel with the same velocity \( c \). Traveling in a cloud chamber they leave a narrow trail of water droplets as visible evidence of their path (a cloud chamber is, in fact, a device to make them do just that), whereas a wave would be expected to spread out in space.

The idea that electrons might in some sense be waves arose originally from high-level theoretical considerations rather than (immediately) from experimental anomalies. We have mentioned that the energy of a photon is a function of its frequency. We have also mentioned that photons exchange energy with electrons. Symmetry suggests, then, that we might associate with an electron a frequency \( \nu \), which would depend on its energy, of
By using arguments drawn from relativity theory, Louis de Broglie was able to derive a formula for the wavelength of any particle with mass $m$ and velocity $v$: $\lambda = \frac{h}{mv}$. The formula can also be obtained without recourse to relativity theory. Bringing together as it does equations from widely different theoretical contexts, de Broglie’s work was considered a fascinating mathematical analogy and pretty much left at that until Davisson and Germer found that electron beams produce the same kind of diffraction patterns when reflected from crystals as X-rays do. And the wavelengths computed from the diffraction patterns agreed with de Broglie’s formula. Other experiments have uncovered polarization and the full panoply of wave properties for electrons.

We are now ready to take up the question of the relation between the wave-particle duality and the famous uncertainty relations of Heisenberg. The most commonly cited of these relations is: $\Delta x \cdot \Delta p \geq \hbar$. In words: if the position and momentum of a particle (e.g., an electron) are simultaneously measured, each will be determined to within a certain range ($\Delta x$ and $\Delta p$ respectively) of possible values. And the product of these ranges will always be at least of the order of magnitude of Planck’s constant. This is not a statement about the crudeness of our measuring apparatus. The impossibility of reducing the product below $\hbar$ is a theoretical, not a practical impossibility. If by use of some fantastic instrument we were able to make $\Delta x$ exceedingly small (i.e., to determine the position exceedingly accurately) the price we would have to pay would be that $\Delta p$ would be big—all we could say about the value of the momentum would be that it was somewhere within a large range.

There are several such uncertainty relations, all involving pairs of “canonically conjugate” variables. “Canonical conjugacy” is a relation used in advanced classical mechanics, referring to certain pairs of variables whose products have the same dimension, i.e. gm. x cm. x cm./sec. Thus position and momentum are conjugate variables, as are energy and time. The ways in which the relations are derived in the literature vary somewhat in a number of respects.

They vary with the different pairs of variables, and of course they vary according to what the expositor considers a suitable compromise (for his purposes and his audience) between exactness and intelligibility to the uninitiated. More importantly, there is a difference of opinion among physicists as to whether the uncertainty relations have anything to do with the wave-particle duality at all. Several contemporary authorities, notably H. Margenau and A. Landé, hold that they do not; they have to do not with single electrons but with statistical spreads in ensembles of measurements. We cannot pursue the question here. Here we shall describe how the uncertainty relations have been derived from the wave-particle duality, by
Heisenberg and others, without attempting to assess the validity of the derivations. The relation between the duality and the uncertainty relations is important for our overall argument, and it is therefore important to note that we are opting for one view in a controversy among competent authorities. The respects in which our overall argument does and does not require our choice are discussed in the last section of this chapter.

The uncertainty relations can be thought of as representing those limitations on the use we can make of particle models in talking about the so-called “basic particles” of light and matter, which are imposed by the fact that we must also employ a wave model. More specifically: the variables involved in the uncertainty relations are all characteristic of particles; and the mathematical form of the relationship \((\Delta a \cdot \Delta b \geq \hbar)\) comes from a general mathematical property of wave packets. Wave packets come in wherever localized wave phenomena have to be represented. A single plane wave spreads out over all space, and thus is not useful for representing localized electromagnetic phenomena, such as the pulse of light produced when a bulb is turned on for a small fraction of a second. But, as we have mentioned, if two waves are added together they will reinforce each other at some points and tend to cancel each other at other points. It is possible to add together groups of waves “of slightly different wavelengths, with phases and amplitudes so chosen that they interfere constructively over only a small region of space, outside of which they produce an amplitude that reduces to zero rapidly as a result of destructive interference.” Such a group is called a wave packet. By mathematical analysis of the functions used to represent waves (the addition of which represents wave packets) it can be shown that the more narrowly we want to localize the wave packet in space (or in time—the form of the mathematical function is the same), the greater the range in the frequencies of the summed waves must be. The relation is \(\Delta x \cdot \Delta \nu \geq \hbar\) where \(\Delta \nu\) is a measure of the range of frequencies.

The link between this property of wave packets and the “particle” variables is the relation \(E = h\nu\) (energy equals frequency times Planck’s constant) which we mentioned in connection with the photoelectric effect. Energy is linked with the concepts of position, momentum, etc. by a skein of classical equations, and frequency figures in the inequality, just described, from which the uncertainty relations derive their mathematical form.

To improve the intelligibility of the above highly schematic account we will give three familiar derivations of uncertainty relations. First we will take one which comes very quickly from the above equation. Suppose we wish to determine the energy of a photon at a particular time. Because \(E = h\nu\), this is equivalent to finding the frequency of the wave representing
this photon. But of course it is a wave packet and not a single plane wave, and thus we have to reckon on a range \( \Delta \nu \) of frequencies, which will be the greater the shorter the time interval within which the energy is to be specified, as the relation \( \Delta \nu \cdot \Delta t \geq 1 \) indicates. If \( \Delta \nu \) is the range of frequencies, then \( \Delta E = \hbar \Delta \nu \) will be the range of energy values for that wave packet, and we immediately see that \( (h \Delta \nu) \cdot \Delta t \geq \hbar \), i.e. \( \Delta E \cdot \Delta t \geq \hbar \). Thus we can say very precisely what the energy of the photon was—sometime or other within a rather long time interval. If we want to specify the time exactly, we have to accept a large uncertainty in the value of the energy.

The most familiar of the uncertainty relations is that involving the position and momentum of an electron: \( \Delta x \cdot \Delta p \geq \hbar \). There are two standard derivations. The simpler has a stream of electrons (or other “particles”) passing through a slit in a barrier which they are approaching at right angles. We will know the position (in one dimension) of the emergent electrons to an accuracy \( \Delta x \), where \( \Delta x \) is the width of the slit. That is, we know that \( \Delta x \) is the uncertainty in position as the “particle” passes through the slit. Since it is moving perpendicular to the \( x \)-direction, its momentum in that direction is zero. If we could treat an electron as a simple particle, of course it would go on through in the same straight line, but we have to treat it as a wave also, and when waves pass through slits they diffract and spread out. The greater the wavelengths, the greater the angle through which they will spread: \( \sin \alpha = \lambda / \Delta x \). The greater the angle, the greater the component of momentum in the \( x \)-direction, since this is equal to \( p \sin \alpha \) where \( p \) is the momentum before the slit is reached. But according to de Broglie’s relation, \( p = h / \lambda \). So the uncertainty \( \Delta p \) in momentum will be at least \( (h/\lambda) \sin \alpha \). Substituting the above value for \( \sin \alpha \), we have

\[
\Delta p \geq \left( \frac{h}{\lambda} \right) \left( \frac{\lambda}{\Delta x} \right) = \frac{\hbar}{\Delta x}.
\]

Thus \( \Delta p \cdot \Delta x \geq \hbar \).

If we decrease the width of the slit, we will increase the angle by which an electron of given wavelength will spread, and thus increase the uncertainty in momentum. Conversely, we can make the uncertainty in momentum as small as we like—if we make the slit wide enough.

We will give the other derivation in a qualitative way only, since the mathematics of even an idealized quantitative derivation would be too complicated. Suppose we are observing an electron through a microscope. To do so we need light, which comes in the form of quanta, which collide with the electron and change its momentum—thus spoiling the accuracy of our measurement. We can minimize the change in momentum by using light of very low frequency (i.e., large wavelength \( \lambda \)—recall de Broglie’s relation). But the greater the wavelength, the fuzzier the image in the
microscope will be, i.e., the less accurately the position of the electron will be observed. Conversely, we can use light of short wavelength and large frequency, but then the momentum transferred to the electron will be greater.

Two features of this “experiment” should be noticed, because they can be used as pegs on which to hang important observations. The way it has been described tends to support the idea that the uncertainty relations arise from the unavoidable disturbances in the state of the physical system which result from our observing it. In trying to locate precisely the position of the electron, we hit it with a light quantum and thus change its momentum, by an unspecifiable amount. But why by an unspecifiable amount? It has to be an unspecifiable amount if the uncertainty relations are to be saved, because otherwise it would be theoretically possible to measure the new momentum at a later time and calculate from it the momentum at the time of the original observation. It is an unspecifiable amount, because the trouble-making light quantum has to be considered as a wave packet involving a range of frequencies, therefore a range of wavelengths, therefore (since \( p = h/\lambda \)) a range of momentum values. Thus it is not because our experimental arrangements interfere with the physical processes being observed that we get the uncertainty relations; it is because of the way that wave and particle properties have to be combined in our description of the situation. If we try to describe any interaction between light and matter, whether it results from a physicist’s meddling or not, the uncertainty relations will still prevail. This point is now quite generally agreed upon among Bohr’s followers, although the interpretation of the uncertainty relations as limitations, due to our interference with the physical processes, on the knowledge we can possibly hope to have of what is going on, was widely accepted (by Bohr and Heisenberg, among others) at an earlier time. I have laid some stress on this point because many interpretations and extensions of the principle of complementarity rest on the experimental-interference doctrine.

The pseudo-realistic character of the above “experiment” should also be noticed. We don’t “see” electrons through microscopes with lenses. Such pseudo-realistic “thought experiments” are common in the literature of microphysics (not just in popularization). Their role in guiding thought about the logical structure of the theory is a subject that would repay more study than it seems to receive. Mary Hesse considers their main function to be the exploration of the consequences of the informal models which scientists use as guides for the construction of the mathematical formalism of the theory, and for the setting up and interpretation of experimental procedures.

It may be pointed out that the uncertainty relations are part of the mathematical formalism of the quantum theory. That is, they find expres-
sion within the set of equations, which are to quantum mechanics as Newton's Laws (or rather, some mathematically more sophisticated equivalents and extensions) are to classical mechanics. This would not be very interesting, if the mathematical formalism had itself been derived from the kind of physical reasoning, simplified examples of which have been given above. But in fact the mathematical formalism was developed first, and the physical interpretation has come later. This statement is liable to misunderstanding. It does not mean simply that quantum mechanics is one of those often-mentioned cases where a body of pure mathematics, worked up with no applications in mind, turns out to be useful to physicists. That has happened in quantum mechanics, but is not what we are talking about. The mathematical formalism was worked out as a basis on which correct predictions of macroscopic phenomena (such as the positioning of lines in the spectra of various elements) could be derived. These are phenomena which should, to put it crudely, have been derivable from the combination of the equations of classical mechanics, the accepted model for the structure of the atom of a given element, and the accepted theory of the connection between these phenomena and the structure of the atom. This model and this theory provided the means by which the equations could be linked to the phenomena, i.e., by which solutions of the equations (with particular parameters) could be translated into predictions as to the phenomena. But the predictions failed; or, to put it another way, the phenomena could not be derived. It was found possible, however, to alter the mathematical formalism in such a way that the anomalous phenomena could be derived, by the old means. In fact, two apparently quite different formalisms were worked out, each of which provided the right predictions; then it was shown that they are mathematically equivalent. But physicists were still left with the task of reconstructing their models of the atom, and their (qualitative) theories about the relation of atomic structures to such things as spectral lines—that is, with the task of providing a physical interpretation of the mathematical formalism. It is in the course of that effort that the theory of complementarity was worked out; and some who are dissatisfied with that theory are still engaged in the effort.

2. Bohr on Complementarity

The principle of complementarity is the heart of Niels Bohr's interpretation of the dualities of quantum theory. This "Copenhagen Interpretation," as it is often called, has won wide acceptance among physicists, though it is now under attack by a number of physicists and philosophers of science. It is Bohr's way of "resolving the paradoxes of atomic theory into rational physics," i.e., of showing why they cannot be taken as actual contradictions.
Bohr's discussions of complementarity as applied in microphysics are to be found primarily in the collection of essays *Atomic Theory and the Description of Nature*¹⁴ (hereafter cited as ATDN) and in his contribution to the Schilpp volume on Einstein. His later writings provide, for the most part, either (1) elaborations and refinements too subtle for us to pursue here or (2) applications to other fields (e.g., the relation of biology to physics, or of psychology to physiology). We shall ignore these ramifications and concentrate on complementarity in microphysics.

Quite a variety of pairs of entities are described in ATDN as “complementary” or as related in a complementary way. The term “complementary” is also used of the “new mode of description” which the situation in atomic physics forces us to adopt: its sense is “that any given application of classical concepts precludes the simultaneous use of other classical concepts which in a different connection are equally necessary for the elucidation of the phenomena” (ATDN, 10). Two “classical concepts,” or two sets of them, which exclude each other in this way are said to be complementary. We will take this brief and general formula as a convenient working definition for the term as Bohr uses it, and seek to elucidate it in three stages: (1) a word on “classical concepts” and their use, (2) a summary statement of some important general points about the way the definition should be understood, and (3) illustrations of its application to certain pairs of concepts.

To begin with: “Classical concepts” are concepts used in classical physics. What “classical physics” signifies is neatly summed up by von Weizsäcker,¹⁵ whose viewpoint is not far from Bohr's:

> Newtonian mechanics, Maxwell's electrodynamics, and all the disciplines which by any interpretation of their basic phenomena through the use of models can be reduced to mechanics and electrodynamics: such as acoustics (on the basis of the interpretation of sound as wave motion), the theory of heat (on the basis of the kinetic theory of heat), optics (on the basis of the electromagnetic theory of light).

But what does Bohr mean by “concepts?” He uses the term in a very general sense, covering such things as state-variables (e.g. position and momentum), principles (e.g. the conservation laws), “pictures” (e.g. the wave and particle “pictures”), models (e.g. the planetary model of the atom), and features of models (e.g. the “stationary states” of an atom). Corresponding to the variety of things designated as “concepts” is of course a variety of ways of “using” or “applying” them, as we shall see.

Before we proceed with detailed illustration and exegesis of Bohr's formula, it will be helpful to state some of his chief general points, so as to avoid their being lost in detail.

First, complementary concepts are used in restricted senses. This often involves a renunciation of certain natural expectations and certain types of
knowledge claim. The mutually exclusive concepts may be concepts which physicists had been accustomed to use jointly in describing the state of a physical system—e.g., position and momentum. We simply must abandon hope, says Bohr, of being able to visualize the atom and give the kind of complete spatio-temporal and causal description of its inner workings that we are used to giving for macroscopic systems. On the other hand, concepts like “wave” and “particle,” which classically had appeared only in quite different contexts, may now be combined in the same description—though in restricted senses.

Second, it is always the need to allow for the discontinuous exchange of energy in quantum units which forces us to use complementary concepts “one at a time” or with special restrictions. The necessity of taking account of Planck’s quantum of action disrupts our use of classical concepts in two ways. The concepts of classical physics “rest on pictures which demand the possibility of a continuous variation” (ATDN, 29), whereas in quantum physics we have to reckon with discontinuous transfers of energy and momentum. And in classical physics we can ignore the interaction between object observed and instrument of observation, which the interchange of quanta of energy forbids us to do in the quantum-mechanical case (ATDN, 68).

Third, if we are to use pairs of concepts in a complementary way, we must use them in such a way that our theory forms what Bohr variously calls a “rational transcription” or “rational generalization” or “natural generalization” of classical theory. This involves (1) keeping our equations as close as possible to the classical equations and (2) so formulating our laws that they yield a close approximation to classical laws when the quantities involved are large compared to Planck’s constant.16 Thus, although Bohr’s quasi-mechanical model of the hydrogen atom cannot be taken as a literal “scale model,” and the laws which we must suppose its “inner workings” to obey are not the (classical) laws according to which the scale model would work, still Bohr considers it important that the former laws be such as to yield close approximations to the latter for microscopic quantities.

Why all this deference to classical concepts, laws, and equations? Why should we not simply strike out afresh in this new domain of the very small, and forge new concepts which we can use in a straightforward way without paradoxes and without the drastic requirements Bohr has to impose in order to avoid paradoxes? This is indeed a question which several of Bohr’s critics raise; we shall return to it in the last section of the chapter. For the present, we continue with the exposition of Bohr. Having stated our major points, we can proceed to illustrations of the complementarity relation. First we will consider Bohr’s own favorite application of the idea of complementarity, then its application to the relations (a) of the con-
cepts "wave" and "particle," and (b) of the concepts "position" and "momentum."

Our first illustration will show complementarity at its most elusive, but we will take it first because Bohr considers it the most basic and general, and because it seems most closely related to the probable origin of his ideas on the subject. This favorite theme in Atomic Theory and the Description of Nature is the complementarity of causal description (or application of the laws of conservation of energy and momentum) and space-time description of atomic processes.

The very nature of the quantum theory . . . forces us to regard the space-time coordination and the claim of causality, the union of which characterizes the classical theories, as complementary but exclusive features of the description, symbolizing the idealization of observation and definition respectively (ATDN, 54f.; cf. 87).

What is meant by the last clause is unclear to the present writer, but it is worthwhile to note that as early as 1927 Bohr was saying that complementarity has to do with exclusive possibilities of definition as well as observation. Of course they are not wholly unrelated; it is useless to define a quantity if there is no way of measuring it (or calculating it from equations which link it with measurable quantities).

Although Bohr applies his analysis to the phenomena we discussed in the preceding section, it seems very likely that he first obtained it from consideration of the peculiarities of his own theory of the structure of the atom. It will be instructive to consider that theory, which takes its start from Rutherford’s “planetary” model of the atom as a sort of miniature solar system: a heavy nucleus, circled by electrons (much lighter) as by planets. There was much to be said for this model. Rutherford had been able to prove that almost all the mass of an atom is concentrated in a proportionally very small region, the nucleus; that the nucleus contains all the positive charge of the atom; and that the rest of the atom offers no significant obstacle to the passage of alpha-particles, so presumably contains nothing but electrons. Moreover, the model promised to suggest an answer to the puzzling question of how there could be a stable arrangement of positive and negative charges within the space of an atom. It had been proved that no stable arrangement of positive and negative charges at rest is possible; but perhaps if the electron circles the nucleus like a planet, a stable situation could be achieved. The suggestion was especially attractive because the electrical forces operating between charged particles obey an inverse-square law, i.e., a law of the same mathematical form as that governing gravitational forces.

But the model is afflicted with paradoxes (Bohr’s word; cf. ATDN, 60, 81), as regards the mechanics of its inner working, its usefulness in explaining macroscopic phenomena, and the combination of these two items.
For an orbiting electron would be accelerated, and therefore according to classical electromagnetic theory should give off radiation. In doing so it would lose energy, and therefore would spiral in toward the nucleus. Thus the problem of stability is still not solved. Moreover, as it spiraled in the electron would give off radiation of continuously increasing frequency. But according to the spectroscopic evidence an atom of a given substance emits only certain characteristic frequencies, rather than a whole continuous spread of them as the picture would imply. Besides, normally substances radiate only when "excited" (by heating them, or passing electrical discharges through them, or the like), and as we have seen our atomic model would have them radiating all the time. And more generally, the model seems to leave no way of accounting for the definiteness of the chemical properties of each element, which requires that the atom have a stable internal structure.

By means of a daring extension and application of Planck's quantum hypothesis, Bohr succeeded in overcoming these difficulties in the special case of the hydrogen atom (one proton in the nucleus, one electron circling it). His solution depends on a special hypothesis, namely, that the electron is not free to move in just any orbit, but is restricted to orbits in which the angular momentum for the system is an integral multiple of $h/2\pi$, where $h$ is Planck's constant. Thus there are a certain number of definite "stationary states" the atom can be in (depending on which possible orbit the electron is inhabiting), each with a characteristic energy level. If the atom moves from one stationary state to another (i.e. the electron moves from one orbit to another) it will gain or lose a quantum of energy. When it loses energy (i.e. when the electron moves from an orbit of greater to one of lesser radius), light is emitted, with frequency dependent (in accordance with the quantum law $E=\hbar \nu$) on the difference between the energy levels of the two states. Thus there are a certain number of frequencies which can be emitted; calculation shows them to be in close agreement with the frequencies actually observed in the hydrogen spectrum. Thus by extending Planck's quantum theory to the atomic domain, by means of a postulate which in retrospect seems neither merely ad hoc nor a straightforward deduction from the Planck theory but a plausible extension of it, Bohr constructed a model of the hydrogen atom which accounted not only qualitatively for the sharp lines in the hydrogen spectrum, but also quantitatively for the wavelengths. (An empirical formula for the wavelengths had been worked out, but before Bohr no one had given any explanation of it. The situation has been compared with that confronting Newton: Kepler's laws constituted empirical formulas for the motion of the planets, but no good explanation had been offered as to why they should move in accordance with just these laws.)

Accounting for the hydrogen spectrum was a highly impressive achieve-
ment, but Bohr’s theory was a strange hybrid, a “remarkable combination of principles taken over from classical theory with postulates radically at variance with that theory.”\(^7\) Bohr solved the problem about the electron spiraling in toward the nucleus by simply postulating that (contrary to classical theory) an orbiting electron will not radiate, and will stay in its orbit unless the atom is excited. Why, it may be asked, does exciting an atom (increasing its energy) cause it to radiate, when radiation is supposed to accompany a loss of energy? The answer is that the atom has a normal or ground state in which it is stable, namely that in which the electron has the smallest allowable orbit. Exciting it will cause it to absorb energy, in which process the electron moves to a higher orbit. But the atom is not so stable in these higher states, and is apt spontaneously (note this ominous word) to revert to the ground state, or at least to a lower state, thus losing energy and emitting radiation.

Besides the mechanically inexplicable stability of the atom, the confinement of electrons to certain orbits, and the spontaneous changes of the atom from one state to another, there is another variance from classical theory. The law governing the frequency of the radiation is quite different from the classical law, depending on the difference between two energy levels rather than the electron’s frequency of revolution in orbit. However, for very large orbits, the quantum and classical laws give nearly the same results.

All three of the general points mentioned at the outset can be illustrated from Bohr’s theory of the hydrogen atom. Classical concepts are used, but with a renunciation of any attempt to combine them in a coherent, visualizable picture; they must be regarded as “abstractions” and “symbolic pictures” (ATDN, 34f, 69, 77). Because of the element of discontinuity introduced by the quantum of action, we cannot trace continuous paths of particles obeying causal (conservation) laws, as we are accustomed to do classically. But the laws are chosen to agree with classical laws wherever possible, and (as we have just seen with respect to the frequency of the radiation) to yield the same results (to an approximation within the limits of experimental accuracy) for large values of the variables.

Now where do we find the complementarity of space-time description and causal description in Bohr’s atomic theory? By our working definition, the two types of description should be mutually exclusive. But it is very hard to imagine what a causal description without reference to space or time, or a space-time description without reference to causality, would be like. At another point, however, where he is speaking of the application of this pair of complementary concepts in theories of the nature of light, Bohr offers an important clarification:

Of course, there can be no question of a quite independent application of the ideas of space and time and of causality. The two views of the nature of light
are rather to be considered as different attempts at an interpretation of experimental evidence in which the limitation of the classical concepts is expressed in complementary ways (ATDN, 56).

Here it would seem that the use of one concept does not strictly exclude, but imposes limitations on the freedom and completeness of, possible uses of the complementary concept. When we preserve the conservation laws, there will be gaps and disruptions in the space-time description: the atom's spectra are accounted for, in full accordance with the conservation laws, but the stationary states and transition processes leave holes in any kinematic account we might try to give of the electron's motion over a period of time (ATDN, 69). For the immediate purpose, those aspects of the model are irrelevant and a description of them can be foregone. Bohr gives less indication of the way a space-time description excludes or limits our attention to the claims of causality. Perhaps what he has in mind is that if we do try to trace out the succession of events within the atom we will have to speak of spontaneous jumps for which no mechanical cause can be assigned, even of a “free choice on the part of the atom” (ATDN, 4).

It will be apparent, even from these few examples, that the senses in which “space-time description” and “causal description” of atomic phenomena may be said to exclude each other are several and various. For instance, there would seem to be differences between the complementarity of different features of the atomic model, and the complementarity of detailed descriptions of what is going on in the model with its use in explaining macroscopic observations. But Bohr does not go into these matters in detail, and the writer is not physicist enough to reconstruct the way he might have done so. In any case, the main point is that the familiar spatiotemporal-causal sort of description cannot be given for atomic processes; we can put together parts of the traditional kind of picture in different ways, but gaps and breaks will always appear at some point or other (on the side of causality, or that of space-time description, or perhaps a little of both), for the Piper—i.e. Planck's quantum of action—must be paid.

Bohr's theory of the atom has been replaced by one derived from the general, mathematically formulated quantum theory that was developed after his original proposal. The newer theory suggests a quite different picture of the behavior of the electron while in a quantum state. In the new theory it is only about half true that the electron is in motion in the atom. . . ; at least, it cannot be said to follow a definite orbit.

But

because of the abstractness of the new theory, the original simple Bohr picture is commonly felt to retain something more than mere historical interest.18

It is still used as a working model, perhaps especially in chemistry. Bohr
holds that complementary relationships of concepts can be seen in the newer atomic theory, as well as the quantum theory generally. Our next task will be to see how Bohr applies the principle of complementarity to the interpretation of the wave-particle duality.

Bohr's references to the complementarity of the wave and particle "pictures," as he usually calls them, are frequent but brief. He associates this complementary relation very closely with the relation between causal and space-time descriptions of atomic processes, and treats the latter relation as the heart of what is at stake in the former. The reason for this association is that it is in terms of the particle model that the conservation laws can be shown to be satisfied (see above on the Compton effect), while the wave picture seems (to Bohr) best adapted to provide a continuous spatio-temporal account of what is going on.

A passage we have already cited shows the close association in Bohr's thought between these two examples of complementary relations.

Of course, there can be no question of a quite independent application of the ideas of space and time and of causality. The two views of the nature of light are rather to be considered as different attempts at an interpretation of experimental evidence in which the limitation of the classical concepts is expressed in complementary ways (ATDN, 56).

The "two views of the nature of light" are of course the wave and particle pictures. The ways in which they limit each other, when they are mixed in the interpretation of microphysical phenomena, were indicated in the first section of this chapter. The uncertainty relations show how precision in use of the "particle concept" of position precludes precision in use of the "wave concept" of momentum. (Momentum, it will be recalled, is a "wave concept" in that it is linked by the relation $p = h/\lambda$ to the wavelength of the electron.) Moreover, in these contexts we speak of "waves" and "particles" in restricted senses. Photons lack properties normally associated with particles, e.g., mass and a variable velocity. Certain properties of waves, e.g., phase amplitude, which are significant in ordinary contexts can be given no interpretation when electrons are treated as waves, and so on. Bohr will often go so far as to say that in microphysics the application of the ideas of free particles and of radiation is "merely symbolic," and that they are "abstractions" (ATDN, 77).

There is an important ambiguity in our discussion of complementarity thus far, an ambiguity which comes clearly to light when we consider what Bohr has to say about position and momentum as complementary concepts. When wave and particle "pictures" are the complementary concepts in view, we find that their complementarity consists in a mutual limitation or restriction on the ways either can be used, caused by the need to combine them. A "mutual limitation" interpretation of complementarity
seems to be required in this case and in the case of the complementarity of causal and spatiotemporal accounts of atomic processes. And we have found textual support for this interpretation. Still, in the passage quoted at the outset as a provisional definition of complementarity (in Bohr's sense), "... any given application of concepts precludes the simultaneous use of other concepts which in a different connection are equally necessary for the elucidation of the phenomena," it appears to be a relation of mutual exclusion rather than mutual limitation.

Now on the evidence presented thus far we might suppose that the "mutual exclusion" formula is merely a sweeping preliminary definition, and the "mutual limitation" formula a more careful and precise definition. But when he discusses the complementarity of "position" and "momentum," Bohr tends to revert to a "mutual exclusion" formula, and makes a significant addition to it.

The proper role of the indeterminacy relations consists in assuring quantitatively the logical compatibility of apparently contradictory laws which appear when we use two different experimental arrangements of which only one permits an unambiguous use of the concept of position, while only the other permits the application of the concept of momentum. Thus it appears that two "concepts" (models, laws, state variables, whatever) are complementary if the conditions for the definition or application of one are mutually exclusive with the conditions for the definition or application of the other. And the conditions in question are experimental arrangements; for Bohr (here perhaps influenced by current positivistic philosophies of science), the way to determine in exactly what restricted sense a given concept is used is to specify the experimental context in which it is employed. More about these "experimental arrangements" in a moment. The point to notice here is that from the above quotation one might suppose that the use of one of a pair of complementary concepts precludes the use of the other. Many subsequent expositors have taken this to be Bohr's meaning. But then it would seem that the wave-particle duality is not an instance of complementarity after all, and the significance of the indeterminacy relations becomes obscure. For they do not say that we can have exact position but not exact momentum, or vice versa, as the "mutual exclusion" interpretation of complementarity requires. Since $h$ is a positive number, the relation $\Delta x \cdot \Delta p \geq h$ implies that neither $\Delta x$ nor $\Delta p$ can be zero, i.e., that we can have neither exact position nor exact momentum, though we can get either as nearly exact as we like (at the expense of great inexactness in the other).

However, a careful reading of the passage cited above shows that it does not contradict the "mutual limitation" interpretation of complementarity. For it says that concepts are complementary if their unambiguous use requires mutually exclusive experimental arrangements. In practice,
complementary concepts are usually used together, even at the cost of ambiguity. But not all ambiguity necessarily results from our using complementary concepts. Some ambiguities are avoidable. Bohr is saying that a given ambiguity in the use of concepts $C_1$ and $C_2$ is genuinely an effect of complementarity, and thus unavoidable, if the use of $C_1$ can be rendered unambiguous only within an experimental context within which $C_2$ cannot be unambiguously defined. That is, if analysis of the experimental conditions for the unambiguous definition or determination of $C_1$ and $C_2$ shows that these experimental conditions are mutually exclusive, then the relation of $C_1$ and $C_2$ is complementary when they are used together—in ambiguous and mutually limiting ways—in physical theory.

A word should be said about the “experimental arrangements” which have figured in the above discussion of the definition of complementarity. Bohr does not spell out what these are, and the examples he gives (especially in his contribution to the Schilpp volume on Einstein, his fullest single statement) are characteristically “thought experiments.” Thus it is hard for a non-physicist (at least) to be sure how far we are dealing with mutually exclusive experimental arrangements, and how far with mutually exclusive conceptual models, translated into terms of imaginary experiments. It seems safe to say that when Bohr describes a thought experiment, he does not think of what he is doing as a way of working out the consequences of a model, though a philosopher of science, reading his description, might make bold to characterize it so. Bohr thinks of his thought experiments as simplified idealizations of experiments that could actually be carried out. But the simplification and idealization are not merely for the sake of popular or semipopular exposition; Bohr would not claim to be able to set up and describe actual experimental arrangements for all the matters he discusses; the thought experiments are meant to call attention to results that would come from any relevant actual experimental arrangement, as well as to suggest ways in which relevant experiments might be devised. And these are functions of theories and, in particular, of models.

It is not our purpose here to plunge very deep, or for very long, into the thicket of problems about the relation of theories, models, and experiments. The main reason for calling attention to the uncertainty that exists as to how Bohr’s references to “experimental arrangements” should be taken is this: when we come to inquire whether religious paradoxes exhibit complementarity, we will not want to be misled by too narrow a specification of the kind of “experimental arrangements” for which analogies should be sought.

3. A Definition of Complementarity

It is not surprising that complementarity should prove difficult to define
precisely when it is taken as a relation which can hold between such diverse pairs of entities as wave and particle models, position and momentum of an electron or photon, and spatiotemporal and causal accounts of atomic processes. To simplify our task, I propose a definition of complementarity according to which it is a relation between two *models* used in an inquiry of some kind, e.g. an attempt at interpretation of a range of phenomena. Two models will be said to be complementary if both are used in the inquiry but the need to use both imposes restrictions on the freedom and precision with which each can be used. For example, if we are to use both wave and particle models for the electron without falling into outright contradiction, we must use wave packets as approximations to particles, and therefore (as indicated above) cannot handle the particle model in all the accustomed ways. We cannot, in particular, expect to attribute exact position or exact momentum to the particle, and the more nearly exact we make one the less exact the other can be.

In defining complementarity this way, we depart at several points from the usage of Bohr and his interpreters. But the changes are simplifications, rather than violations, of his usage. Perhaps the most obvious, but perhaps also the least important, change is our defining complementarity as a relation between *models* rather than “concepts” in Bohr’s broad sense. Bohr usually speaks of wave and particle “pictures” rather than models; the most likely reason is that he prefers to reserve the term “model” for more specialized artifacts constructed for particular purposes, like Rutherford’s atomic model or his own modification of it. But the difference between Bohr’s “pictures” and our “models” seems terminological rather than substantive. As it stands, our definition restricts the range of entities which could be called “complementary” more than Bohr’s does. For our purposes, this simplification seems desirable. But there is no conflict with Bohr. For it is easy to see how, on the basis of our definition, derivative or extended senses of “complementarity” could be defined which would cover the relation between concepts such as position and momentum. Two such concepts $C_1$ and $C_2$ could be said to be complementary if they can be defined only with the help of models $M_1$ and $M_2$ respectively, and $M_1$ and $M_2$ are complementary models according to our definition.

In our definition we have ignored the role of *classical* concepts or models, because it seems irrelevant to our inquiry into the possible functions of complementary models in theology, which does not seem to display a classical phase and a “quantum revolution” after which classical concepts are used in restricted senses. It is true that theology takes concepts drawn from ordinary experience and employs them in *analogical* senses. It would be interesting to try to work out a comparison between the theologian’s use of ordinary concepts in analogical senses and the microphysicist’s use of classical concepts in “restricted” senses. But while the
comparison is touched on at several points in later chapters, to attempt to work it out in systematic detail would complicate our inquiry excessively.

Similarly, we have omitted from our definition any reference to the factors (e.g. the necessity of reckoning with the quantum of action) which require the complementary use of models in a given inquiry. The role of the quantum of action is obviously peculiar to microphysics. It is beyond the scope of our investigation to speculate as to the factors which might require that models be used in complementary ways in theology; it will be enough if we can find out whether they are so used.

Our most important deviation is from that strand in Bohr's thought which emphasizes that concepts are complementary if their unambiguous definition requires reference to mutually exclusive experimental arrangements. We have omitted this requirement since it is difficult to tell just how literally Bohr means the reference to "experimental arrangements" to be taken. It is often taken to support a "mutual exclusion" rather than a "mutual limitation" understanding of complementarity. According to this way of understanding complementarity, there is no contradiction between the statements (1) "an electron is a wave" and (2) "an electron is a particle" because their very meanings depend on reference to quite different experimental arrangements. But as we have seen, in fact wave and particle models are mixed in the interpretation of the same experimental evidence. Therefore, if complementarity is so defined that the uses of complementary concepts are mutually exclusive, the wave-particle duality is not after all an instance of a complementary relation. Since we are primarily interested in the wave-particle duality, it seems best to define complementarity in such a way that that duality will be the paradigm case of it. Also, our definition fits Bohr's usage better on the whole than a "mutual exclusion" definition would.

Note again, however, that the wave-particle duality fits our definition only if our interpretation of the duality and of the uncertainty relations is correct. Not a few physicists and philosophers would dispute it. It is possible, then, that microphysics does not provide examples of complementarity at all. This possibility, and its relevance to our enterprise, must now be considered.

4. Objections to Complementarity

Many have expressed dissatisfaction with the quantum theory, and/or with the Copenhagen Interpretation of it, and for a great variety of reasons. Heisenberg, writing in 1955, surveyed a dozen opponents of the Copenhagen Interpretation, including two Russians who complained of its "idealism" and (epistemological) "agnosticism." The list would be longer now.

We may distinguish conveniently, if roughly, between those who attack
complementarist interpretations of the present quantum theory, and those who attack the principle of complementarity. Many critics, of course, do both. But there are those, such as the philosopher P. K. Feyerabend, who are relatively sympathetic to the Copenhagen Interpretation of the present evidence, and concentrate their fire on Bohr's belief that all physical theories must henceforth be complementaristic. Feyerabend's arguments, in one of the most thorough treatments of these matters extant, seem generally persuasive on this point. If, in this essay, we had adopted the approach of treating complementarity as a general epistemological principle and undertaking to demonstrate its exemplification in theology, then our program would indeed be called into serious question by the arguments of Feyerabend and similar critics. As it is, we need only consider those who would impugn a complementarist interpretation of the present situation in microphysics.

Among the latter are Ernst Schrödinger, who never abandoned the belief that a satisfactory unitary wave theory could be worked out, and A. Landé, who has advanced a unitary particle theory in a series of books and articles in the last decade. "The duality of pictures," Landé writes,

has never been more than an ingenious attempt of talking us out of a difficult problem of theoretical physics rather than solving it by the means and methods of theoretical physics itself. Indeed, what is the easiest way of getting rid of a bothersome paradox? First give it a fitting name; then declare it to be a "principle." . . . Believe, obey, and calculate, and do not worry about an elusive reality. Let philosophical reflection save you from a dilemma of physical theory and teach you modesty.

Physicists, he adds, have gone in for all this dualistic talk because they have been reluctant "to concede that matter particles . . . in their statistical reaction to measuring instruments are controlled by wavelike laws, and we still do not know why." Landé holds to an old view, which Bohr himself had sponsored at one early stage, namely that the "waves" with which we have to do are "probability waves," the amplitude of which at a given point represents merely the likelihood of an event of the relevant sort occurring there. He undertakes to derive the "wavelike laws" governing the behavior of particle ensembles from certain symmetry assumptions which he considers plausible. Neither the assumptions nor the derivations can be considered here; what matters for us is that Landé has provided a possibly-workable alternative to the complementarist interpretation of quantum theory. Whether it is actually a preferable alternative is for the physicists to judge.

The same can be said of the proposals advanced since 1952 by David Bohm. Bohm is working toward a theory in which neither a wave model, nor a particle model, nor yet a complementary combination of them, is dominant. Electrons and other basic "particles" are held to be entities
which are neither particles nor waves, but can be made to behave rather like either. This sounds familiar; but for Bohm it is not our experimental instruments which elicit particle-like or wave-like behavior. Rather, both sorts of behavior are caused by the activity of sub-quantum-level entities and forces, where “sub-quantum-level” means “for magnitudes substantially less than those involved in the current quantum theory.” It may well, indeed probably will, be necessary to invoke quite new and different models to characterize these as-yet-undiscovered entities and forces.

Bohm does not deny that his speculations are somewhat ad hoc, and does not claim that his theories have yet generated predictions other than those obtainable from the current theory. For these reasons most physicists view his theories with reserve. He does claim to have shown that his working theory is compatible with the mathematical formalism of the present theory, accounts for all the data it accounts for, and opens up promising new lines of research. He looks for further progress to come from work in the domain of very high energies and “elementary particles,” a domain now in a state which all agree is unsatisfactory. The theoretical prediction and experimental discovery of more and more ultra-short-lived “particles” obtained by high-energy bombardments has led to a situation which has invited comparison with the era of multiplication of epicycles, and expectations that a fundamental conceptual revision is due.

So far, Bohm’s work has not yielded advances sufficient to sway the community of physicists generally, though a number of others are working along his lines. More, probably, would accept a different thesis, namely that the quantum theory is not in fact afflicted with paradoxes, and therefore needs neither complementarist interpretation nor Bohmian revision.

The fundamental error, according to Henry Margenau, of those who find paradoxes in quantum theory is their hankering after “classical intuition” and visualizable (anschauliche) models. The “renunciation” of which Bohr speaks must be made once and for all: we simply cannot represent atomic processes by visualizable models at all, and there is no need to use them in complementary combinations and restricted senses. Thus the proper conclusion to draw from the anomalies which have led to talk of “wave-particle duality” is that electrons, photons, etc. just are neither waves nor particles; they were forced to give the (fragmentary and conflicting) appearances of such by the “inappropriate instrumental chase” of classical physicists. There is no more reason to suppose that they must be waves or particles than there is to suppose that they must be hot or cold, red or blue. Not only do none of these sets of alternatives apply; they are all theoretically precluded from applying.

What are electrons, then? They are theoretical constructs, our knowledge of which is summed up not in models like “wave” but in state-functions $\phi$. Packed into a function $\phi$ is all the information obtainable
(and quantum-theoretically relevant) concerning the electron or other system to which it refers. From it can be derived probability distributions for the results of all measurements (of "position," "momentum," etc.) that can be performed on the system. That is, we can find the chance that a single measurement will yield any given value, and we can find the distribution of the values that will be obtained if we take a large number of measurements. The quantities measured have the same names as the standard measurables of classical particle physics: "position" and the rest. I put quotation marks around them to indicate that they are not related to quantum "particles" as their namesakes are to classical particles. An electron as such has no location; for it "position" is what Margenau calls a "latent observable"—i.e. measurements will yield values for it, but it is not a secure "possession" of the electron in the sense that all measurements of an electron "at rest" would yield the same unique value.

Margenau does not dispute that the Heisenberg uncertainty relations hold between "position" and "momentum" (and between the other pairs of canonically-conjugate variables). But they result from considerations quite other than those sketched in the second section, which are at the very best "intuitively suggestive" of particular instances of the general principle's consequences, but "logically inadequate." The uncertainty principle holds because quantum theory has to do with statistical ensembles and irreducible probabilities; it "relates the state of atomic systems to an aggregate of data1 experiences and not to a single complex called one measurement." Where the equations of classical physics are set up to enable the calculation of position, etc. of a particle at time \( t_0 + t \) from its known position at \( t_0 \), the equations of quantum physics are meant to enable us to predict the probability distribution at \( t_0 + t \) on the basis of that obtaining at \( t_0 \). Margenau does not mean that the uncertainty relations result simply from the fact that quantum physics is a statistical theory, as though any statistical theory would be marked by uncertainty relations. Where the statistical character of the theory comes in is in the proper interpretation of \( \Delta x \) and \( \Delta p \), which can best be identified with the standard deviations (in statisticians' terminology) of the functions representing the probability distributions for "position" and "momentum" respectively. The relation \( \Delta x \cdot \Delta p \geq \hbar \) is embedded in the mathematical structure of the quantum theory; it is a consequence of the axioms thereof. So far from being a consequence of supposed difficulties involved in making single measurements, it has nothing directly to do with single measurements, since \( \Delta x \) and \( \Delta p \) are defined only for ensembles of measurements.

But what is it to say that the uncertainty relations are consequences of the "mathematical structure" or "axioms" of the quantum theory? Where do these "axioms" come from? What kind of evidence supports them? This whole discussion would come to little if thought experiments
of the sort outlined above were an important part of this evidence. But it appears that they are not. The mathematical structure of the quantum theory, it will be recalled, was worked out (and yielded satisfactory derivations of the observed phenomena of line-spectra and the like) before "physical interpretations" were advanced. Thus, since the uncertainty relations can be derived from the basic propositions of quantum theory, they are supported by the whole mass of phenomena correctly predicted by that theory. The "physical interpretations," in which the aforementioned thought experiments appear, are desperate efforts to regain some shreds of classical visualizability, and as such fail to recognize the power and adequacy of quantum theory, as well as the finality of its break with classical intuition. The very use of the term "physical interpretation" reflects the idea that one hasn't a properly explanatory physical (as opposed to mathematical) theory until some sort of more or less visualizable models are provided. Margenau of course rejects this idea, though I think he would agree that it is clung to by many physicists, and not just by misguided laymen.

A complex of constructs qualifies, in Margenau's view, as a fully physical (and fully explanatory) theory if it has a double link with sensory observations: if, that is, it is possible to move from the field of measurements via rules of correspondence $R_1$ into the complex of constructs, and logical and mathematical operations within the complex yield a construct from which can then be generated (via further rules of correspondence $R_2$) predicted outcomes of measurements at another point in the phenomenal plane. In quantum theory the constructs are highly abstract, the mathematics of their manipulation high-powered, and the rules of correspondence elaborate and intricate. But the principle is the same as in more familiar theories. It is the constructs' linkage with phenomena by rules of correspondence, not their visualizability, that constitutes them a physical theory rather than just a lot of mathematics.

Margenau's argument is powerful. We cannot here assess its validity as a way of disposing of the wave-particle duality. If it is to be rebutted, the rebuttal should probably focus on the "rules of correspondence." How are these bridges between observation and the mathematical formalism of the theory constructed? Is it possible to design measurement-yielding apparatus, and infer from the formalism of the quantum theory what values the measurements should yield, without resorting to visualizable (and complementary) models? Many physicists think not. We could do without models, E. H. Hutten says,

if our theories were given as formalised systems and if we could state explicitly all the rules necessary for determining the meaning of any sentence within the theory. In fact, this cannot be done for any present-day theory, and so we need the model also for climbing down the ladder to reach the experiment.26
Moreover, others would argue, even if the rules could be spelled out so explicitly that no recourse to models was necessary, the theory would thereby become sterile. It would be essentially a calculating device, such as could indeed enable us to predict such things as the position of Venus at time $t$, but could not yield such more interesting predictions as the discovery of Neptune or of a new chemical element. Predictions of the latter sort are possible, it is argued, only if the theory contains models to suggest extensions and new applications of the formal calculus of the theory.

The role of models in science is too large, complex, and confused a question to be dealt with here. At any rate, we must reckon with the possibility that the wave-particle duality is a museum piece and complementarity has no real role in physics.

How does this possibility affect our inquiry? Our definition of complementarity, while constructed with the wave-particle duality in view, is logically independent of it. The idea of complementary models may be a useful instrument in the study of theological paradoxes, even if it is no longer useful in physics or the philosophy of physics—even if, as a radical critic might insist, it was from the beginning a red herring there.

We can, therefore, proceed with our main line of inquiry, whether the critics of complementarity are right or not. Their contentions are, however, relevant to the wider question whether theology is a science. Apart from complementarity, there is no reason to suppose that there are paradoxes in science. More precisely, apart from complementarity there is no reason to suppose that the apparent contradictions which sometimes arise in science represent anything more than a temporary incompleteness in our understanding; they can be expected to be removed as our theories are improved, and require no special interpretation. If complementarity is correct, on the other hand, some paradoxes will remain, although the principle of complementarity offers a way of showing that the paradoxes are not actual contradictions. The question of the validity of complementarity in physics thus bears on—though it is not equivalent to—the question whether the paradoxes of theology show that it is not a science.

But one of our principal reasons for exploring the narrower question, whether theological paradoxes can be given a complementarist interpretation, was precisely its bearing on the wider question, whether theology can be regarded as a science. If this motive were removed, what would be left? The answer is, that in any case theological paradoxes require some sort of interpretation. We shall see that the more obvious candidates fail for some paradoxes. Complementarity, as we have defined it, may provide a more successful interpretative key, wave-particle duality or no.
CHAPTER III

ALTERNATIVE APPROACHES TO THEOLOGICAL PARADOXES

We are here concerned mainly with statements which are paradoxical in the sense that they seem to be self-contradictory, such as "Brahman is both far and near," "God is a merciful Father and a severe Judge," and "Jesus Christ is Very God and Very Man." Our question is whether at least some such paradoxes can be understood as reflecting the use of complementary models. Such an understanding of a paradox will be called a "complementarist interpretation" of it. Some ways in which complementarist interpretations of theological paradoxes may be sought will be suggested in succeeding chapters. The purpose of the present chapter is to consider some alternative ways of treating theological paradoxes, and to show that none of them is satisfactory for all theological paradoxes, though each is satisfactory for some.

Two main alternatives to a complementarist interpretation will be considered. A section will be devoted to each. The first alternative is to try to remove the appearance of contradiction from the paradox, either by making appropriate distinctions or by more indirect methods. This way of treating paradoxes will be called the "paradox-minimizing approach," since its successful application to a paradoxical statement shows that the element of paradox is inessential to the cognitive content of the statement. The paradoxical formulation may have rhetorical or suggestive power, but the content it suggests or rhetorically enlivens can be stated in a non-paradoxical way.

According to a second view, considered in a second section, theological paradoxes are neither dissoluble nor fundamentally like (say) the paradoxes of poetry. Rather, they are distinctive of theology and express the fact that its ultimate object is a mystery which both can and cannot be talked about in human terms. This view will be called the "sui generis interpretation."

On the face of it, each of these ways of treating a paradox would seem to preclude a complementarist interpretation of it. On the whole this is correct, though some limited qualifications will be suggested in the second case. In each case I will argue that there are paradoxes to which the ap-
proach in question does not do justice. The way is thus left clear for our inquiry whether a complementarist interpretation might be more adequate for some paradoxes, e.g. those mentioned at the beginning of the chapter.

1. The Paradox-minimizing Approach

Bochenski tersely expresses the paradox-minimizing attitude:

An amazing amount of astonishing things have been said both by believers and non-believers about the inconsistencies in RD, among which many sorts of 'dialectics' and theories of 'paradox', (that is, doctrines according to which RD is inconsistent) are the most conspicuous . . .

However, the normal attitude taken by men when they meet with contradictions in their discourse is to try to overcome them. This may be done by two methods: (a) by a linguistic analysis of the terms used, (b) by an enquiry into the correctness of the assumptions (both logical and other).1

“RD” is Bochenski’s abbreviation for “religious discourse.” The “assumptions” to be questioned are those involved in certifying the paradoxical sentences in question as members of RD. To qualify as a member of RD, a sentence must be a \( p \)-sentence (one which “the believers directly believe,” as in creeds and catechisms) or a sentence obtained from \( p \)-sentences by accepted rules of theological derivation.2 Thus the “assumption” in question for each sentence is that it has been correctly identified as a \( p \)-sentence, or that it has been obtained from \( p \)-sentences by the correct application of sound rules.

The present essay is concerned primarily with paradoxes among generally accepted theological sentences. We are therefore chiefly interested in the first of Bochenski’s two methods of overcoming apparent contradictions, “linguistic analysis of the terms used.” Bochenski gives an example. The combination of sentences “The Father is God; the Son is God; yet the Father is not the Son” appears inconsistent. But it appears so, Bochenski suggests, only if the “is” of the first two clauses is taken to be reflexive and transitive. There is no need to take it so, and therefore we need not admit a genuine contradiction.3

Bochenski’s argument fends off one obvious challenge to the self-consistency of Trinitarian doctrine. The challenger is likely, however, to demand some account of the properties of the “is’s” in the above combination of sentences; and an account free of inconsistencies may not be discoverable. Consider an example. We can observe a difference in sense between the “is” of “The Father is God” and the “is” of “The Father is not the Son.” The one is an “is” of predication, the other an “is” of identity, we can plausibly say. But if the word “God” functions as a proper name in the above assertions, then the distinction between an “is” of predication and an “is” of identity will not help. For from the statements “The President of the United States is Lyndon B. Johnson” and “The father of Lynda
Bird Johnson is Lyndon B. Johnson” we can infer the identity of the President of the United States and the father of Lynda Bird Johnson. The cogency of the parallel between this case and the Trinitarian case can be questioned on the ground that the identification of the President with the father of Lynda Bird Johnson is time-dependent and therefore involves a weaker (or at least different) sense of identity than would the identification of Father and Son. But the parallel is good enough to suggest that we need to carry out a more thorough logical analysis before we can judge whether the occurrences of “is” in the Trinitarian formulas function differently enough to preclude the derivation of actually contradictory statements from them.

What form should the “thorough logical analysis” take? What should its strategy be? In general, a natural strategy for attempts at dissolution of paradoxes is to look for a key term that is being used in distinct senses in the two sentences which make up the paradox. More will be said about this strategy below. We have just seen an apparently unsatisfactory, or at least inconclusive, use of it in connection with the Trinitarian paradox. Perhaps it could be made to work with a different, and more precisely specified, set of distinctions in meaning of “is.” But the strategy of formulating distinct senses is hard to implement with the verb “to be,” and thus seems fairly unpromising as an approach to the Trinitarian paradox.

An alternative strategy, which circumvents the difficulty of establishing sufficiently concrete and specific distinct senses of “to be,” is adopted by the New Zealand philosopher G. E. Hughes. Hughes suggests that the Trinitarian section of the Athanasian Creed sets out “part of . . . the logical grammar of a certain segment of Christian theological language” by introducing a vocabulary and specifying acceptable and unacceptable sentences constructed out of that vocabulary—the specimen sentences being so arranged as to adumbrate principles for judging the acceptability of other sentences constructed out of the given vocabulary. He then proceeds to formalize the “logical grammar” in question. The statements about the Father in vss. 8-17 of the Creed are taken as “special postulates.” From them, together with the “general postulates”

\[(f_1) [(f_1 a = f_1 b) \& (f_1 b = f_1 c)]
\]
\[(f_2) [(f_2 a \& f_2 b \& f_2 c) = (E1\alpha) (\alpha(a,b,c) \& f_1 \alpha)]
\]

all the other statements in vss. 8-18 can be derived. In the postulate-formulas \(a, b, c, \) and \(\alpha\) stand respectively for Father, Son, Holy Spirit, and an entity (the Trinity) to which \(a, b, \) and \(c\) stand in the “constituting relation.” The variable \(f_1\) is a variable over monadic predicates, such as \(A\) (“almighty”) and \(G\) (“God”). Thus the first “general postulate” reads, “A monadic predicate is true of the Father if and only if it is true of the Son, and true of the Son if and only if true of the Holy Spirit.” The second
reads, "If a certain monadic predicate is true of Father, Son, and Holy Spirit, then there is exactly one further entity which both is constituted of them and has the property in question."

It is not quite clear that all the propositions of vss. 8-18 are either postulates or theorems in Hughes's system. What is doubtful is whether there are formulas in the system to express the denials in the statements: "There are not three eternals but one eternal; . . . not three almighties but one almighty," etc. From the first general hypothesis we can easily deduce that the Son is almighty if and only if the Father is almighty (Aa = Ab), and corresponding theorems, but it does not seem that these theorems adequately represent the creedal statements quoted. Closer to the mark is another set of theorems Hughes derives, i.e.:

\[(E1a) [\alpha(a,b,c) \& Aa]\]

and the corresponding theorems for the other monadic predicates.\(^7\) Whether these theorems represent the Creed's "not three almighties," etc. depends on the scope of the negations in the Creed and the interpretation of \(\alpha\) in the formalization. Both these conditions can be made clearer if we consider another example of the "constituting relation" which Hughes proposes in his informal discussion. "I listen to a symphony and I find the orchestration admirable, the form admirable, and the harmonic texture admirable." In one sense there are three admirable things here, and in another sense one, he continues; but it would be a type-mixing fallacy to say that there are four. The relation of form, orchestration, and harmonic texture to the symphony is an example of the "constituting relation." Thus, if we may attempt to spell out what Hughes presumably had in mind, the predicates \(A\), etc. in his system are permitted to range over two distinct classes of object—\(a\), \(b\), and \(c\) being the only members of one class and \(\alpha\) the only member of the other. The fact that within the system there is only one member of the latter class to which \(A\) could apply is the representation within the system of the Creed's "not three almighties"; the fact that \(A\) does apply to \(\alpha\) is the representation of "but one almighty." Both Hughes's formal system and his informal discussion leave room for a sense in which there could be said to be "three almighties," namely that there are the three objects \(a\), \(b\), and \(c\) such that \(Aa\), \(Ab\), and \(Ac\) are theorems. If the Creed intends to deny that there is any sense in which one could say "three almighties" (or "three Gods"), then Hughes's formalization seems defective. In any case, as Hughes would not deny, the "constituting relation" needs more precise definition and perhaps a more elaborate machinery for its representation within the system.

Nothing that has been postulated or proved thus far precludes the possibility that Father, Son, and Holy Spirit might be identical. For this purpose Hughes introduces dyadic predicates (e.g. "begotten of") and a
series of further postulates expressing the relational statements of vss. 21-23 of the Creed. Then if we let $f_2$ be a variable over dyadic predicates and define $f_2$-identity for any two objects $x$ and $y$ by the formula

$$ (f_2) (z) [f_2(xz) = f_2(yz)] $$

it is easy to see that the Persons of the Trinity are not $f_2$-identical. We have then a precise sense in which they are not identical (together with a precise sense in which they are identical, i.e. $f_1$-identical, i.e. having all the same monadic properties, including that of being God). Hughes has thus given the precision of symbolic-logical formulation to the old principle that the Persons of the Trinity are distinguished not by any property but by a network of relations obtaining among them.

We can, then, derive within Hughes’s system formulas representing all the propositions, “The Father is God,” “The Son is God,” and “The Father is not the Son”—without, apparently, any inconsistency. At this point a familiar objection recurs. Hughes, like Bochenski, has taken “God” as a predicate rather than a proper name. The treatment of the word “God” as a predicate is supported, however, by the arrangement of statements in the Creed. The statements that the Persons of the Trinity are “God” occur in a series of apparently parallel statements, i.e. that the Persons are “eternal,” “uncreated,” etc. And these latter seem more like predicates than proper names.

Hughes acknowledges that his formalization is not fully worked out, and that inconsistencies may turn up in it. He offers it “only as a step towards expressing the structure of the doctrine of the Trinity in a form in which both accusations of inconsistency and their rebuttals can be presented with greater clarity than is often the case.” Such an intention, none can fail to endorse. Formalization is a promising tool for the investigation of paradoxes. Where it can be effected, it has the particular merit of enabling us to attack paradoxes even where we are unable to specify the meanings of certain terms contained in the paradoxes or in traditional efforts to explain them—as with the terms “begotten” and “proceeds” in the Creed. Obviously, in cases where the paradox (or an attempted dissolution of it) hinges on the meaning of certain terms, formalization will not enable us to bypass the meanings, though it may help us to clarify the distinctions we wish to make. Hughes’s example suggests, however, that not all paradoxes are of this sort.

Only in a few cases is formalization a presently feasible program. With respect to the Trinity, and to christology, there are authoritative documents which are, so to speak, ready to be formalized. This is not the case with such paradoxes as Luther’s simul justus et peccator and the union of justice and mercy in God. We are far from knowing how to formalize such paradoxes, not to speak of such an enterprise as formalizing a whole
doctrinal system or a generic scheme of religious discourse of which the
doctrinal systems of particular religious communities would be specializa-
tions. A lot of preliminary spadework is needed. Meanwhile, if paradoxes
are to be dissolved, it will have to be done on a piecemeal basis, with
ad hoc methods.

Perhaps the most obvious method is to look for a key term which is
used in one sense in one sentence of the paradox and in another sense in
the other sentence. Generalizing this method a little, we can see two ap-
proaches to a paradox of the form

\[(M \text{ is } A) \& (M \text{ is } \sim A).\]

One might distinguish two senses of the predicate, \(A_1\) and \(A_2\), and obtain

\[(M \text{ is } A_1) \& (M \text{ is } \sim A_2).\]

Or one could distinguish two subjects \(M_1\) and \(M_2\), and obtain

\[(M_1 \text{ is } A) \& (M_2 \text{ is } \sim A).\]

Either way the paradox is eliminated. The two ways correspond to what
Stace calls the “theory of ambiguity” and the “theory of double location”
in his account of the ways philosophers could attempt to avoid the con-
clusion (which Stace himself upholds) that the characteristic paradoxes
mystics utter are in fact flat contradictions.9

A familiar example of a paradox which seems to yield to the method of
distinguishing senses \(A_1\) and \(A_2\) is the one which Luther makes the keynote
of his Freedom of a Christian: “A Christian is a perfectly free lord of all,
subject to none. A Christian is a perfectly dutiful servant of all, subject to
all.” He is lord of all, subject to none, in the sense that no creature can
set conditions which he must meet in order to be saved. He is subject to all
in the sense that in all temporal matters he is quick to serve the needs of his
fellow-men, indeed to give their interests priority over his own. On the
face of it, there is no contradiction here. Luther’s simul justus et peccator
may yield to similar treatment. The believer continues to perform actions,
and have attitudes, which judged by the Law make him peccator; but in
accordance with the promises of the Gospel he is adjudged justus by God.
If we then let \(P_1\) and \(J_1\) stand for “sinner as measured by the require-
ments of the Law” and “righteous man as measured by the requirements of
the Law,” respectively; and let \(J_2\) and \(P_2\) stand for “righteous man” and
“sinner” as judged by God in accordance with a man’s accepting or not
accepting the promises of the Gospel; then Luther’s statement can be
represented by

\[(M \text{ is } P_1) \& (M \text{ is } J_2).\]

If we suppose that \(P_1 = \sim J_1\) and \(P_2 = \sim J_2\), we have

\[(M \text{ is } P_2) \& (M \text{ is } \sim P_2).\]
The cogency of this demonstration that Luther’s paradox is no contradiction depends, of course, on the clarity with which the relation between Law and Gospel can be set out and the Law-related and Gospel-related senses of “sinner” and “righteous man” defined. I shall not attempt to expound the Law/Gospel relation here. The literature on it is vast, consisting (one need exaggerate but slightly to say) of all theological writings of all Lutheran theologians.

Attempts to resolve paradoxes by means of distinctions between $M_1$ and $M_2$ have been fairly common, but within Christian theology they have usually been of dubious orthodoxy. There is a recurrent temptation to attribute wrath and justice to the Father, love and mercy to the Son, but this is clearly unorthodox. A much harder case is the attribution of omniscience and omnipotence to the divine nature of Christ, suffering and fatigue and historically-conditioned limitation of knowledge to the human nature. This is of course a standard way of dissolving the paradoxes implicit in such questions as, “How could the omnipotent God suffer injury?” And many—probably most—theologians of good repute have upheld it. (It is stated, for instance, in the Tome of Leo, sanctioned as orthodox at Chalcedon.) Nevertheless there are difficulties about this solution. In general, its effectiveness depends on the clarity with which the two Natures/one Person theory can be worked out. What sorts of attribute are to be ascribed severally to the Natures, and what sorts are to be ascribed to the Person? In particular, one may question how well Pope Leo’s solution accords with the favorite Patristic theme of the “blessed exchange” whereby the Son of God became as we are so that we might become as he is. Here is Leo’s most direct statement on this matter:

On account of this unity which is to be understood as existing in both the natures, we read, on the one hand, that “the Son of Man came down from heaven,” inasmuch as the Son of God took flesh from that Virgin of whom he was born, and, on the other hand, the Son of God is said to have been crucified and buried, inasmuch as he underwent this, not in his actual Godhead, wherein the Only-begotten is coeternal and consubstantial with the Father, but in the weakness of human nature.

This exposition of the *communicatio idiomatum* can, I suggest, be given a minimal or a maximal interpretation.

According to the minimal interpretation, Leo is saying that there are some names, like “Son of God” and “Son of Man,” which properly belong to the one Person. As these examples show, the names may have natural associations with the divine or the human Nature, but properly they belong to the Person. It is an acceptable manner of speaking to attribute any actions of the Incarnate Son to the Person under any of his names. But any action belongs properly to the Person in one Nature or the other. Weakness and suffering belong to the one Person in his human Nature,
even though it is an acceptable manner of speaking to say that “the Son of God suffers”—provided it is understood that the name “Son of God” refers to the Incarnate Son, the Person, and not to the Son as he is from eternity. Neither humanity nor God, neither the human nor the divine Nature of Christ, undergoes any change; the attributes proper to each remain as they have always been. I call this the “minimal” interpretation because it claims that Leo is trying to provide sanction for use of the Scriptural and Patristic formulas of the “blessed exchange,” while denying that any actual exchange of attributes took place.

According to the maximal interpretation, there is an actual exchange of attributes. Suffering can really be predicated of the divine Nature, immortality of the human Nature—though of each only when it is united with the other. God, considered apart from the Incarnation, cannot be said to suffer. Similarly, it is not intrinsic to human nature as such to be immortal; human nature has this property only as it participates in the Incarnation. Where the maximal interpretation differs from the minimal will be clearer if we consider the context—i.e. the theory of salvation—in which it is likely to be found. This context is the theory—more characteristic of the East than of the West in Patristic times, and now certainly more familiar in Catholic than in Protestant theology—that salvation comes to men by their participation in the Mystical Body and thus in the human Nature of Christ. Since that Nature is indissolubly united with the Trinity, indeed participates in the Trinity’s internal life of caritas, so too do the men who participate in the human Nature of Christ. It is important to recognize that these expressions occur not only in rhetorical sermons, but also in theological expositions. For our purposes it is not essential to judge which is the better reading of Leo, nor to explain the difficult doctrine which lies behind the maximal interpretation. Probably the minimal interpretation is closer to Leo’s intentions, the maximal interpretation closer to the intentions of the Fathers who expounded the “blessed exchange” theory. The essential thing for us to observe is that we get into very deep waters if we try to resolve the paradoxes in question by assigning one set of attributes to a “divine aspect” of Christ and the other set to a “human aspect.” Many theologians, at least, will protest that his resolution is too quick and superficial a way of treating a mystery.

The relation of theological paradoxes to mysteries remains to be discussed below, and Christological paradoxes will be treated further in the last chapter. Our examination of several attempts to remove the appearance of contradiction in various prima facie paradoxes has shown that such attempts often raise difficult questions, concerning which it is hard to obtain agreement among theologians. This is hardly surprising, for if it were not so, there would have been no reason for other interpretations to be advanced. Nothing that we have seen thus far shows the program of
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eliminating paradoxes from theological discourse to be impossible. If it were carried out, there would be no room for a complementarist interpretation. A believer in the eventual eliminability of religious paradoxes could still find a provisional utility in the idea that they reflect use of complementary models. This idea could be for him a useful key to the interpretation of previous doctrinal developments, for it may be that some theological reflection has been guided by an implicit principle of complementarity in the past. And just as a physicist might find heuristic value in the wave-particle duality and Bohr’s principle without accepting the orthodox Copenhagen belief in the finality of the principle, so too a theologian might find in a complementarist interpretation of paradoxes a guide toward discovery of the distinctions he must make and concepts he must use to formulate a paradox-free theology.

2. Religious Paradoxes as Sui Generis

There is one paradox in theology, which I shall call the “affirmation-negation paradox,” which appears not to be susceptible to a complementarist interpretation, or indeed to any of the other interpretations we have mentioned. The affirmation-negation paradox can be illustrated by the following two quotations from the Pseudo-Dionysius:13

(1) Surely it is truer to affirm that God is life and goodness than that he is air or stone.

(2) The Universal Cause transcending all things is neither impersonal nor life-less nor without understanding . . . nor is it darkness, nor is it light, or error or truth; nor can any affirmation or negation apply to it.

We can formulate the paradox more generally thus:

(1) On the one hand, some properties can be attributed to the religious ultimate (while others cannot); yet,

(2) On the other hand, no properties can be attributed to the religious ultimate: it (or he) is beyond them all.

This paradox seems to be characteristic wherever a religious ultimate is recognized, whether it is Nirvana or Brahman-Atman or the God of Christian belief. Thus in classical Christian theology it is true, and yet again it is not true, to say that God is just; in Buddhist thought, that Nirvana is peace. The affirmation-negation paradox (or “paradox of the religious ultimate,” as we may also call it) seems further to be basic, so that many or even all of the other paradoxes of theology might be reducible to it. And if they are, then—one might well suppose—the comparison with the wave-particle duality is inept, and so is the attempt to eliminate paradoxes.

“Quite the contrary,” runs an obvious reply. “This paradox is no contradiction, and in fact there is a remarkable parallel with the way concepts are used in contemporary physics. Rather than indulge in riddling
talk about its being true, and yet not true, to say that God is just, we must recognize that when we make any statements about God we are talking analogically. When Bohr says that in talking about electrons we must use classical models and concepts but must use them in restricted and symbolic senses, he is saying that physicists must talk analogically too."

Our hypothetical objector has made two suggestions, which must be considered separately. First there is the suggestion that a proper doctrine of analogy enables us to see that the paradox is not a contradiction. Equipped with a doctrine of analogy, we might even be able to see distinct senses in which a predicate like “just” is and is not applicable to God, and thus obtain a “paradox-minimizing interpretation” of the affirmation-negation paradox. The second suggestion is that there is an affirmation-negation paradox in quantum physics paralleling that in theology—namely the simultaneous applicability and non-applicability of “classical concepts” to electrons and other “elementary particles.” This second suggestion leads at once to a question of central importance. Supposing that there is a genuine parallelism between theology and microphysics in that an affirmation-negation paradox lies at the base of each, can we go on and claim a parallelism also in the ways that these putatively basic paradoxes are related to the other paradoxes of their respective disciplines? Is the wave-particle duality related to the affirmation-negation paradox concerning electrons in the same way that the love-justice duality is related to the affirmation-negation paradox about God? If so, then a complementarist interpretation of religious paradoxes must be possible (provided, of course, that the above supposition holds and that complementarity is valid in physics). On the other hand, if the claim that religious paradoxes are sui generis is to be maintained, then the supposed parallelism between theology and microphysics will have to be shown false, either at the point of their respective affirmation-negation paradoxes or at the point of the relation of these to the other paradoxes of the two disciplines.

An agenda for the remainder of the section can now be drawn up. First I shall argue that the paradox of the religious ultimate cannot be eliminated by a doctrine of analogy. Second, that this paradox is in important ways more drastic than the paradox of the applicability and non-applicability of classical physical concepts to elementary particles. Third, that not all religious paradoxes can be regarded as special expressions of a fundamental ground plan provided by the paradox of the religious ultimate. The upshot of the latter two points can be stated concisely with the aid of some abbreviations. Call the theological and physical affirmation-negation paradoxes the PRU and the PCC respectively. Then we find that the similarity between the PRU and the PCC is not so great as to provide in itself grounds for expecting a complementarist interpretation of religious paradoxes to hold, but neither is the distinctiveness of the PRU such as to
require a non-complementarist interpretation of them. Finally, we shall observe that the distinctive character of the PRU neither supports nor is incompatible with a “poetic interpretation” of other religious paradoxes.

What the doctrine of analogy asserts, and how it should be formulated, are matters of extensive and intricate controversy. There are scattered brief discussions of analogy in St. Thomas, but no elaborated theory. The elaboration and defense of a theory of analogy requires the prior possession of a theory of Being and its kinds or modes. A thorough discussion of the subject is therefore beyond our scope. For our purposes the following sketch may suffice. Granted that God is a mystery to us such that we cannot say of him what he is but only what he is not, we know nevertheless that he is the First Cause of everything that is. We know that God is the First Cause of all just men and just acts, and we may express this by saying that God is just. Our speaking so does not contradict the principle that we can say of God only what he is not, because that principle refers to our inability to conceive the divine attributes as they exist in God. We possess a concept of justice in accordance with which we can say a legal decision is just, and we have another (closely related) concept of justice in accordance with which we can say that a man is just, but we possess no such concept in accordance with which we can say God is just. We can say that God is just because he is the First Cause of justice, but for any concept of justice that we can form we must say that that concept does not apply to God. God is not just_1, where “just_1” is the attribute that a man may have or fail to have; God is not just_2, where “just_2” is the attribute that a legal decision may have; and similarly for any other concepts of justice that we might form.

For any other concepts? What about the concept “First Cause of all justice,” or “just_0,” as we might call it to preserve parallelism in our notation? Should we not say that God is just_0, and reject the proposition that he is not just_0? The Thomist will presumably reply that “just_0” is not a concept we possess. We possess the concept “just_1” because we can experience what it is like to be just_1. And we know enough about the relation between just men and just decisions to obtain the concept “just_2” from “just_1.” But we do not know what it is like to be First Cause of justice (or anything else), and we do not know enough about the relation between Creator (First Cause) and creature to obtain “just_0” from “just_1.”

So much by way of exposition of the doctrine of analogy. What conclusions can we draw with respect to the affirmation-negation paradox? One conclusion, ready to hand, is that there is a sense in which we can say that God is just and a sense (or collection of senses) in which we cannot say so. It does not follow, however, that we can eliminate the paradox by the technique of distinguishing senses. For that technique involves our speci-
fying the senses concerned in such a way that we can replace the paradox with two statements between which there is no appearance of contradiction. In other words, we must be able to replace the paradox with two statements which do not contain the term on which the original paradox turned. But as we cannot possess the concept “just” we cannot specify the sense in which God is just, or replace the statement that he is just with one in which the term “just” does not appear. The doctrine of analogy can give us grounds for supposing that the paradox of the religious ultimate is not an outright contradiction, but it cannot provide the means for eliminating the paradox.14

It would seem strange to say of the electron that we can say only what it is not, not what it is. If we can see why this is an important thing to say about the religious ultimate, but an odd thing to say about electrons, we can thereby see how the affirmation-negation paradox in theology is more drastic than its counterpart in physics.

To say that God is beyond all our concepts is to make an important point about God, a point which should qualify in an intimate (and unspecified) manner all the assertions which theologians do nevertheless undertake to make about him. The theological point being made in that statement is that God is marked off from all other things as quite transcending them in value, importance, and ontological status. It is for this reason that he is a mystery beyond the reach of human concepts, which are after all fashioned to deal with things on our side of the great ontological divide. Moreover, theologians who claim that we can say of God what he is not claim also that this ability constitutes a real sort of knowledge of God on our part. For saying of God what he is not does not mean listing all known predicates \( P_1, P_2, \ldots \) and systematically denying that God is \( P_1 \), that he is \( P_2 \), etc. It is significant to say “God is not just,” and our ability to do so constitutes a sort of knowledge; there is no such significance in the statement “God is not red.” The predicates which it is significant to deny of God are just those which we can, in an unspecified analogical sense, affirm of him. God is really just, according to classical Christian theology; the significance of the denial that he is just is that the sense in which he is just cannot be obtained by any finite modification of any sense of the term “just” which we can formulate.

It seems odd to say that the electron is “beyond our (classical) concepts” or that “we can say of it only what it is not,” because these statements make no point about electrons that cannot be made in other, less mystifying, ways. When physicists acknowledge that an electron is not a wave or particle or “wavicle,” and does not have a position or momentum in the classical manner, they acknowledge it and carry on—wary of the pitfalls of an unduly literal use of their models, and at the same time free
to handle them in a more uninhibited and adventurous way. ("Since the particles aren't 'really' particles anyway, we can endow them with all sorts of remarkable properties that the paradigm cases of 'particles' do not possess.") There is no reason to say that an electron is "really" (in some analogical sense) a particle; rather, particles provide models which can, subject to specifiable restrictions, profitably be used to talk about electrons. On the other hand, between the subatomic realm and the realm of objects dealt with by classical physics there is no such infinite ontological gulf as there is between God and creatures. As we have seen, one of the functions of the denial of all attributes to God is to indicate this gulf, and since there is no such gulf in physics the denial that electrons are particles cannot have a like function.

At this point there is, of course, a significant difference between Bohr's account of the microphysical situation and the accounts of his critics. Some of his critics say that we have perfectly good (mathematical) concepts to apply to electrons and thus have no need of analogies. Others say that we need models but these models are unlike theological analogies in that any model might conceivably serve and we are free to use any that prove helpful. According to Bohr the quantum of action does impose a gap between the realms of classical and atomic physics, and we are restricted to those models which occur in classical physics. But the gap is not infinite, we need no via negativa to indicate it, and the qualifications which it imposes on our use of classical concepts can be specified in the Heisenberg indeterminacy relations. Thus, even in Bohr's version of quantum physics, the affirmation-negation paradox is weaker than in theology, and "analogy" is used in a more general, non-technical sense.

I have suggested that the affirmation-negation paradox in theology is more drastic and more important than its counterpart in Bohr's quantum physics, and has different functions. The suggestion can be extended in a way which seems plausible but is not (I shall try to show) sound. The extension consists in the second and third steps of the following progression. (1) The affirmation-negation paradox is of fundamental importance in theology, giving expression to the principle that the religious ultimate is beyond all human concepts, so that what is affirmed of it must also be denied. (2) It is because the religious ultimate is beyond our concepts that theology has its familiar paradoxes (besides the PRU itself); otherwise, it might well be free of them. (3) Each of the paradoxes of theology is a consequence, a special case, or a particular spelling out of the affirmation-negation paradox. That is, the PRU provides a ground pattern to which each of the particular paradoxes of theology can be "reduced."

One can accept the first step without being thereby committed to accept the second, and can accept the second without commitment to the third.
There is no evident inconsistency in accepting the PRU while maintaining that the whole system of theological affirmations is (or could in principle be brought to be) internally consistent. Similarly, there is no evident inconsistency in holding that the PRU requires that there be other paradoxes within the system of theological affirmations, while denying that these other paradoxes are individually deducible from or in some other fashion "reducible to" the PRU. There may be a certain intuitive plausibility in the moves from (1) to (2) and from (2) to (3), but they are not necessary. I shall confine myself here to showing the non-necessity of step (3).

The argument against (3) can be conveniently presented with the aid of a simple schematism. A paradox might be of any of the forms

(i) \( (M \text{ is } A) \land \sim (M \text{ is } A) \)

(ii) \( (M \text{ is } A) \land (M \text{ is } \sim A) \)

(iii) \( (M \text{ is } A) \land (M \text{ is } B) \)

where \( M \) is a logical subject and \( A \) and \( B \) are two apparently incompatible predicates (e.g. "wave" and "particle" or "just" and "merciful"). To illustrate the schemata and their differences, let us substitute for \( M \) "an electron," for \( A \) "green," and for \( B \) "red." Now clearly \( (M \text{ is } B) \) is more informative than \( (M \text{ is } \sim A) \), and if a reasonable convention is adopted it will be clear that \( (M \text{ is } \sim A) \) is more informative than \( \sim (M \text{ is } A) \). The proposed convention is that \( (M \text{ is } \sim A) \) be restricted to cases where \( A \) is a predicate that logically could apply to \( M \), but does not, and that \( \sim (M \text{ is } A) \) be allowed to cover also the cases where \( A \) is inapplicable to \( M \). In our example, \( \sim (M \text{ is } A) \) is the correct formula, since electrons have diameters less than the smallest wavelength in the visible spectrum, and thus cannot have color.

We can expect, then, that there will be at least some paradoxes of form (iii) which cannot be reduced to paradoxes of form (ii) without loss of specificity and informativeness, and similarly some of form (ii) which cannot be reduced to paradoxes of form (i) without such loss. In particular, there are theological paradoxes of form (iii) which cannot be reduced to form (ii), etc.

Form (i) is clearly the appropriate schema for the affirmation-negation paradox. Form (ii) is exemplified by the last sentence ("It stirs and it stirs not") of the Upanishadic passage quoted as number (2) in our list of paradoxes in Chapter I, section 2. "Brahman is both far and near," the Christological paradox, and the paradox of the justice and mercy of God are all of form (iii). Let us look a little more closely at two of these form (iii) paradoxes.

If all religious paradoxes were reducible without loss to the PRU, then "Brahman is both far and near" would be merely a way of saying that
"far" can be predicated of Brahman and yet (since no predicate applies to the religious ultimate) cannot be predicated of Brahman. But on the face of it this interpretation seems highly arbitrary; one would expect to find that something more specific is intended when "near" is predicated of Brahman. When we consider this paradox in more detail in Chapter IV, we shall find that this expectation is justified, and further that "Brahman is both far and near" means more than merely "Brahman is both far and not far" (form ii). The reasons for saying that Brahman is near are (if Ninian Smart's analysis is correct) substantially independent of the reasons for affirming (or denying) that Brahman is far.

Similarly, the paradox of the righteous justice and loving mercy of God is seriously distorted if one tries to interpret it as a special expression or instance of the PRU. A dialectically-inclined theologian might attempt to do so in something like the following way. "We affirm God's loving mercy toward men. But because of the infinite qualitative difference between God and the world, every affirmation about God requires its balancing negation. Better expressed (since the initiative is always with God), every divine "Yes" to men must carry with it a "No." His word of mercy must carry with it, since he is God, a word of righteous judgment." Now there may well be good theological reasons for saying that every divine act (or word) of justice is also an act of mercy, and vice versa. But if so these are two distinct characterizations of the same act, and the relation between them is a substantial and significant problem. The statement that God is just is surely meant to convey more information than merely that there is a sense in which "mercy" (like other human concepts) is inapplicable to God. The latter point is most naturally expressed by a paradox of form (i): "God is merciful, and yet there is a sense in which 'merciful' is inapplicable to him." Even the form (ii) paradox, "God is merciful yet not merciful," if it is an acceptable theological statement at all, is not merely an instance of the affirmation-negation paradox. For it says that in the same sort of sense in which God can be said to be merciful he can be said to be unmerciful, where "unmerciful" could mean "rigorously just," "capricious," "vindictive," etc. The paradox of mercy and justice differs from this at least in being more specific. (There is also the question, consideration of which we have postponed to the last chapter, whether justice and mercy are really incompatible, either generally or in God.)

These points seem obvious; why insist on them? Because there is an attractive simplicity and power in the idea that all religious paradoxes can be treated as special expressions of one fundamental paradox. It would be a long step toward understanding religious paradoxes and their functions if we could show how they all stem from one paradox. Once the symbolic or analogical character of statements about the religious ultimate is recognized, both the desirability and the immediate plausibility of the
reduction are increased. For if predicates are attributed to the religious ultimate analogically or symbolically, there is a considerable factor of indeterminateness in their meanings. Thus the reduction is desirable as a means of partially fixing the meanings. And since the meanings of terms like “far” and “near” or “just” and “merciful” as applied to the religious ultimate are not clearly fixed, the relations between them are not necessarily the same when applied to the religious ultimate as when applied to finite beings. In particular, it becomes more plausible to suppose that they have the kind of “dialectical” relation required by the reduction. So the proposed reduction has a seductive simplicity and power. But I have suggested that this particular way of seeking simplicity is very much to be distrusted, because likely to lead to serious distortions in the interpretation of religious paradoxes. The simplicity is bought at too high a price; it does too much violence to the ways the concepts in question are actually understood and used by religious thinkers.

We may deny, then, that the PRU so fixes the interpretation of other religious paradoxes as to preclude a complementarist interpretation of them. But there is another way of arguing that it does. The PRU characterizes the religious ultimate as a mystery. Poetry is the appropriate language in which to speak of mysteries. Therefore religious discourse and its paradoxes must be poetic in character. The basic error in this argument is that it does not take “mystery,” as applied to the religious ultimate, in a sufficiently radical sense. There may be in human experience “mysteries” for speaking of which poetic images are more adequate than prosaic concepts. But the reason why human concepts are inadequate to the religious ultimate is not that they are concepts, but that they are human. Poetic images, being as creaturely products as concepts, must equally be negated as well as affirmed when they are used to speak of the divine mystery.
CHAPTER IV
NINIAN SMART AND COMPLEX
DOCTRINAL SCHEMES

We may now profitably examine a theory of how strands of religious discourse are combined into doctrinal schemes. The theory, and the terms “strand” and “doctrinal scheme,” are Ninian Smart’s. Smart’s theory is laid out most fully in his *Reasons and Faiths*, where he argues (among other things) that some religious paradoxes result from the “weaving together” into one doctrinal scheme of strands of discourse based on different types of religious experience. Like many philosophers, Smart wants to trace religious utterances to their empirical bases; unlike most, he finds at least two types of experience that provide empirical reference for religious utterances. The two primary types involved are the experience of mystical union or enlightenment, together with the “path” of discipline which is held to lead to it, and the encounter with the numinous, together with the forms of worship which arise in response to it and serve to evoke it.

In any religious community one or both of the numinous and mystical types of religious experience will be present, and where either is present a body of discourse will grow up around it. This discourse will not be logically homogeneous; it will include doctrines about the religious object (the object of worship or of the mystic’s quest); interpretations of various things in the world as they relate to the religious object; instructions as to how one ought to seek, or behave in face of, the religious object; and more. Each such body of discourse is called a *strand*. If only one kind of religious experience figures in a given religious community, the associated strand will also be that community’s *doctrinal scheme*. The most prominent examples of such a situation are Theravada Buddhism and early Islam, where the numinous and mystical elements are respectively missing. The more common situation, however, is that which prevails in Mahayana Buddhism, most of the Hindu religious communities, and the Christian communions, where the doctrinal scheme results from the interweaving of strands from both types of experience. (Hence the choice of the term “strand.”)

Besides the two primary strands, Smart speaks of several other strands that may be woven into a doctrinal scheme, of which the most important
are an incarnation strand and a moral strand. The sense of moral obligation is not a form of religious experience, according to Smart, and, since moral discourse and practice can stand without religious backing, moral experience by itself cannot form an empirical basis for religious doctrinal propositions. Thus moral discourse does not exactly constitute a "strand" as here defined, although moral elements (injunctions as to conduct) will be present within each of the primary strands. The justification for speaking of a distinct strand is that religious communities do not merely draw moral consequences de novo from their encounter with the object of worship or from the conditions of the mystic path, but incorporate pre-existing bodies of moral doctrine into the doctrinal scheme. Moral duties are (for instance) identified with divine commands, and thus a moral and a religious strand are woven together, with more or less subtle modifications of the "flavor" of some of the main concepts of each, much as two religious strands are woven together.

An "incarnation strand" is a body of discourse relating to a man or men taken as distinctive manifestations of the divine. (Smart counts Indian avatar doctrines as examples, as well as the more exclusive Christian doctrine.) Though in some schemes an incarnation strand is very important, I do not call it a "primary" strand because it never occurs independently of the worship strand; there are no one-strand schemes centering on it. Also, the empirical appeal is much more complicated and indirect than in the cases of worship and mystical discipline.

Thus the "doctrinal scheme" of a community is understood as the main outline of its doctrines, interpretations, and commandments. The word "scheme" is chosen to indicate that these doctrines, etc. hang together organically but rather loosely, in such a way that the connections cannot be fully and precisely specified. Their coherence is not like that of a deductive system. Not, indeed, like any of the forms of system which philosophers and theologians have conceived. For Smart's concern is not with individual thinkers' systematizations of doctrine but rather with the underlying corpus of beliefs and injunctions which are characteristic of a community. This "underlying corpus" is of course subject to various interpretations and distributions of emphasis by various groups and at various periods within the community's history.

A study of Smart's theory promises, then, to advance our investigation in two ways. First, another approach to the interpretation of religious paradoxes is suggested. It may be that the two sides of a paradox can be traced back to bases in different sorts of religious experience. Second, the suggestion that many doctrinal schemes are formed by the interweaving of strands may provide a good starting point for a complementalist interpretation of paradoxes. For we are reminded of how classical physics contained two (separate) strands, dominated by wave and particle mod-
els respectively, and of how complementarity resulted from the interweaving of these strands in quantum theory.

Our study is in two main sections. In the first, Smart’s treatment of the paradox “Brahman is both far and near” will be considered in some detail. In the second, the suggestions (a) that paradoxes may arise from the combination of strands, and (b) that if so they can be given a complementarist interpretation, will be considered more generally.

1. “Brahman is both Far and Near”

Before we undertake a systematic examination of the functions of doctrinal schemes and what happens when they are “woven together,” it will be convenient to consider Smart’s paradigm case of the paradoxical identification of key terms from different strands. (This identification is at the heart of the weaving process.) He calls attention to the Upanishadic paradox: “[Brahman] is both far and near; It is within all this and It is outside all this.” Smart suggests that the paradox arises in the following way. Brahman is “far” and “outside all this” because it is the object of worship in cults, out of commentary on which the Upanishads in large part arose. It is characteristic of worship-oriented strands of religious discourse to speak of the object of worship—the Holy One—as “wholly other” than the worshipper, remote from him and screened off from him.3 There is an immeasurable gulf between the Holy One and the worshipper in respect of worth, significance, and power. One does not become unduly familiar with the Holy One; one is to keep distant. Its ways and manifestations are unpredictable and uncontrollable; it is remote. Such considerations as these go to support (and indicate the force of) the saying that Brahman is far. Nothing in the world is identifiable with Brahman; it lies hidden behind all things; it is “outside all this.”

It is hidden but it is also, partly and obscurely, revealed. Saying that Brahman is “outside all this” expresses the point that the whole range of visible phenomena constitutes a screen behind which Brahman is hidden, as cult objects are hidden behind screens in temples. But its being screened off from us does not mean that we are simply cut off and isolated from it, unaware of it. The screening phenomena can and do at times become more or less translucent, so to speak, permitting us to see the shadow of the Holy One, as through a veil. We shall return to this point; for the present the thing to observe is that “outside all this” is to be interpreted by reference to the idea of the phenomenal world as a screen behind which Brahman is hidden.

How then does Brahman come to be spoken of as “near” and “within all this”? Such terms are characteristically applied to Atman, the great Self which one seeks within by a method of disciplined contemplation. But why should the goal of the mystic’s meditative path be called a Self,
and why should the path be thought of as directed “within?” A proper answer to these questions would require a considerable disquisition on the history of Indian philosophy and yogic procedures. For our purposes, it may suffice to say that the meditative method involves a determined exclusion from awareness of all external distractions, and proceeds in stages toward the elimination of all contents of consciousness which are even tenuously related to the external world.

One typical system of meditation begins with concentration on a particular sense-datum, as we might call it (e.g. a blue flower, looked upon merely as a colored shape): the first stage is to achieve total concentration on that depthless blue shape, without even fleetingly entertaining other images. Some stages later, when effortless concentration has been achieved and irrelevant feelings of pleasure and excitement over one’s accomplishment have been eliminated, one strives to eliminate the sensory image, substituting in turn a series of idealistic-sounding propositions as objects of meditation.

Perhaps it would be better to say “guides to meditation” rather than “objects of meditation.” For when in the first of this new series of stages the aspirant to Nirvana takes the proposition “It is all infinite space” as content of consciousness, his aim is not to reflect on the meaning and consequences of such a statement, in a sort of metaphysical reverie. The aim is rather to replace the visual image by a feeling of being surrounded by unbounded space. (Here “feeling” is to be taken in a kinesthetic sense; instead of visualizing a colored shape, one “kinesthetizes,” if the word may be excused, the situation of being in a dark, silent, empty room—and then imagines away the walls.) This replacement is a step toward the final goal, because (1) a definite finite shape has been replaced by a feeling of indefinite extent, (2) kinesthetic sensations are generally vaguer and more inchoate than visual ones, and (3) there is a shift from the external toward the internal in that the meditator’s own sensations, unconnected with any particular object, are now the center of attention.

This latter shift is completed in the next stage, where the formula for meditation becomes “It is all infinite consciousness.” Here again, the monk is not engaged in weighing the merits of a panpsychistic cosmology, but (one surmises) is aiming at modifying the previous feeling in two ways. The previous feeling was of oneself, surrounded by unlimited and characterless extension, with a vivid awareness of the self as contrasted with its environment (reduced as the environment is to the next-to-nothingness of mere extension). Now the contrast is to be overcome: the tenuous ghost of the external world is to be eliminated, and so is limitation of self-awareness to a finite spot. We now have left only the sense of vaguely kinesthetic awareness, unbounded but presumably not extended. Elimination of even this trace of the world of illusion is the object of the next stage, in which
"There is nothing" is the formula for meditation. The final stage—Nirvana—is reached when no special meditative effort is needed to keep the world of illusion out of consciousness.

The whole process may be compared with Peer Gynt's peeling away layer after layer of the onion trying to get at the core, the true self. But for the Indian mystic, reaching the "empty" core is not a disappointment but an arrival at the goal. The force of "within all this" can be fully appreciated only when it is realized that for the Indian mystics and associated philosophers, the "external world" ("all this") extends deep into what Westerners would call the "personality" or "empirical self." Dreams, for instance, are part of the "all this" on the inward side of which Atman is to be found.

But still, if all identifiable subjective feelings are part of "all this," what meaning is there left in saying Atman is "near" and "within all this"? Why is "within" any truer than "outside?" Because the meditative path moves away from attention to the external world (Western sense) to attention to subjective states, and by successive operations on them moves on to its goal.

We have, then, answered the question why the mystic's path should be said to be directed "within," but not the question why its goal should be called a Self. And of course the goal isn't always called Atman, or any equivalent name. In Buddhaghosa's account of the path, sketched above, the goal is called Nirvana. The reason why the Upanishads speak of Atman is, briefly, that in the circles from which they came the mystic's path was generally interpreted in terms of certain philosophical doctrines about the self—doctrines from which the Buddha and his early followers wished, as is well known, to separate it. The path, however, remains substantially the same.

Thus we find that "far" and "outside all this," "near" and "within all this," are being used in special senses, the first pair to be understood by reference to the worship-oriented context of religious experience and the second by reference to the mystical context. Drawing their senses from different contexts, "far" and "near" are not necessarily in conflict. So far, "Brahman is far" and "Atman is near" seem like incommensurables rather than contradictories. But then the identification is made: Brahman = Atman. It follows that Brahman is both far and near.

We have not, however, understood the paradox when we have placed "far" and "near" in their appropriate contexts and noted that they are not necessarily in conflict. For weaving the two strands together is more than just laying them side by side, and more than just insisting that both are good and sound. To understand the paradox we must also see why the identification was made, and why making it was a plausible procedure.
But here Smart has a word of warning: “It is only through the greatest religious insight, born of the activities which give rise to doctrines, that anyone can discover new doctrines or show how old ones have been found.” As a philosopher he cannot show us why the Atman-Brahman identification was made; he can only point to some analogies which make the identification possible.

The formal similarities which Smart sees between the experiences of the mystic’s goal and the object of worship are principally in respect of timelessness and imperceptibility. The experience of mystical bliss is timeless, in the sense that in it there is no awareness of the passage of time. Brahman also is timeless, because it is beyond “all this” world of shifting phenomena wherein the concept of time has application. The reflection comes at once to mind that the sense in which Atman is “timeless” is quite different from the sense in which Brahman is “timeless.” Whereas being “beyond time” is a characteristic of the object of worship itself, it is a character of the experience of Nirvana (or Atman) to be “outside time.” Nirvana, the Theravada monk would doubtless say, is neither in time nor timeless. Two considerations make it hard to estimate how serious a difficulty the objection raises. Since the aim of the mystic path is to get beyond “experiences” in any ordinary sense to enlightenment or mystical union, it is unclear what distinction is left at the end between “Nirvana” and “experience of Nirvana.” Then too, there would seem to be another reason for speaking of Nirvana as “timeless” besides the one Smart gives. Just as Brahman is timeless because it is beyond the world of shifting phenomena, so too Nirvana is timeless because it is to be found on the other side (the inward side) of that world. The aspirant arrives at it by stripping away from consciousness everything on which the notion of time depends. Indeed, the very first step is to turn away from everything to which the passage of time is relevant, and concentrate on a single static object. And further, the initial motive for undertaking the mystic quest is to escape the cycle of rebirth—to escape, one might say, the tyranny of time.

Nevertheless, though we allow that Nirvana, and not merely the experience of it, may properly be spoken of as “timeless,” it remains true that Nirvana (or Atman) and Brahman are timeless in rather subtly different senses. Before we indicate the difference, we should pause and try to clear up a puzzlement which the reader may feel. We attributed to the Buddhist monk the assertion that Nirvana is neither in time nor timeless; then we presented reasons for speaking of it as timeless. But the respective senses in which Nirvana is and is not timeless are like the senses in which it is and is not “within all this.” Nirvana is timeless and within all this because in seeking it one must turn away from the changing and external toward the changeless and inward. But the quest must not stop too soon. Even when one arrives in imagination at “deep dreamless sleep”—as
quiescent, time-independent, and external-stimulus-independent a state as the untutored imagination can reach—one has still only a poor parable of Nirvana. One has reached the inmost shell of the onion, perhaps, but not the core. Any timelessness and any inwardness that we can imagine are still entangled in the external world. Nor has any timelessness and inwardness that philosophical thought can conceive the requisite freedom from involvement with “all this.” In this sense one must deny that timelessness can be attributed to Nirvana.

Now as to the different senses in which Brahman and Nirvana are timeless, we may recall that temporal events have been described as screens behind which the Holy One is hidden but through which it can be glimmeringly revealed. One can say that it is “beyond” time, that temporal events “cannot contain it,” and the like. Moreover, in comparison with the Holy One everything temporal is as nothing—“dust and ashes”—in value and importance. In a curious way the devaluation of temporal things is both a consequence and a condition of encounter with the Holy One. When Job and Isaiah “see God,” they count themselves, and all that they do and say, and all that is done and said to them, as nothing. Here the devaluation is a consequence of the numinous encounter. On the other hand, a certain turning away from temporal things is considered a desirable and normal, but neither a necessary nor a sufficient, condition for the encounter to take place. (It is not a sufficient condition, because the Holy One does not appear on demand, whatever conditions may have been satisfied. That it is not necessary is shown by the example of Jacob at Bethel and elsewhere.) Whether we consider it as consequence or condition, the nature of the devaluation must be carefully considered, because it is characteristically different from the mystic’s devaluation of temporal things, and on this difference hinges the difference between the senses in which Brahman and Atman respectively are “timeless.”

Because temporal things are more or less translucent screens through which the Holy One makes himself known, their devaluation does not call for a complete turning of attention away from them. Rather they are to be valued and attended to, not in and for themselves but as screens or masks of the Holy One. The mystic quest, as we have seen, requires a different kind of devaluation of temporal things. Attention must be turned away from them; if they are screens, one must get behind them and leave them behind. Once the arahat has attained Nirvana, temporal things have no further value or importance.

Perhaps enough has been said to give an indirect indication of the difference between the senses in which Brahman and Atman are said to be timeless. It is very difficult, if not impossible, to capture the difference in a formula. Another indirect way to suggest the difference is to consider other
phrases that might be offered as equivalents or explications of "timeless" in the two contexts. It would seem more natural to speak of Brahman as "beyond time," of Atman as "outside time." Though the holy may reduce the temporal to dust and ashes in importance, there is no way of encountering it unconnected with temporal things. Atman is to be found in fundamental disjunction from what’s seen, and thus "outside time." Thus too the initial similes by means of which one tries to start the quest in the right direction are temporal states as nearly as possible disconnected with other temporal states, e.g. deep dreamless sleep. States of quiescence are not, of course, really free from entanglement in the temporal system, but they are pointers toward Nirvana. In the worship-oriented strand there is no such preference for states of quiescence as parables; they are not necessarily more translucent to the Holy One than active states.

As Brahman and Atman are both timeless, though in rather different senses, so are both imperceptible, again in rather different senses. The basis for saying that Atman cannot be seen is that it is to be found at the end of a disciplinary-meditative path which involves purging the consciousness of all images. Brahman is said to be imperceptible because if we are to understand references to it we must attend to the experiences which give rise to worship, and those who have these experiences characteristically report that in them they apprehend themselves as too small and unworthy to behold the object of worship. In order that they may have some apprehension of it and not be blankly stupefied (or, indeed, destroyed) it is necessary that it be screened off from their view. Because the empirical bases for calling Brahman and Atman imperceptible are so different, we must suppose that the senses in which they are imperceptible are likewise different.

The last statement may seem like a rather doctrinaire application of an implausible form of a verificationist theory of meaning. If two men both conclude, on the basis of different evidence, that S is P, it does not seem plausible to infer that they are using P in different senses. James, looking out the window, and John, listening to the patter on the roof, may both say "It's raining," and we would generally grant that they mean the same thing. The religious case is different, however. Barring borderline cases of drizzle and the like, which are irrelevant here, "It's raining" is a good example of words being used in a straightforward ordinary way. And we have a variety of ways of ascertaining whether it's raining or not, and are in a position to compare their results. But when Atman and Brahman are being spoken of, words are used in special parabolic senses, the bases for statements involve unusual experiences, and we have not nearly so readily available means of cross-checking the ways statements are supported. So it is not a general theory of meaning, but peculiarities of religious discourse, which warrant saying that appeal to different kinds of ex-
experience in support of a predication constitutes presumptive evidence that the predicate is being used in different senses.

Another sort of ground for the identification of Brahman and Atman is a similarity between the behavioral consequences of the quest and achievement of mystical enlightenment, and the behavioral consequences of encounter with the holy. "The mystic path involves self-abnegation, the sacrifice of ordinary interests and pleasures," and "This self-negation has an affinity to the self-abasement of the worshipper." Moreover, there is a power and freedom about the mystic saint which sets him apart and makes him uncanny, an object of reverence to the ordinary worshipper. He is himself holy, in the derivative sense in which elements of the empirical world can be holy when they are translucent to the Holy One. And this is much like the sense in which the especially devout worshipper himself can be holy. Hence there is a strong motive for accommodating the mystical strand of discourse within a doctrinal scheme based on the numinous strand, in spite of the difficulties and tensions (dangers of heresy and blasphemy: "I am He") to which such accommodation leads. And in particular, the dependence of the mystic's holiness on his relation to Atman—i.e. his achievement or approach to achievement of enlightenment—is a motive for the identification of Brahman and Atman.

A closely related motive, much stressed by Otto, is the mystic's own sense of power, and simultaneous thrill and abashment, as he comes to enlightenment. Both abasement and exaltation are involved in the confrontation with the holy, and the amazing fact on which (according to Otto) the Brahman-Atman identification is based is that the same unmistakable situation is reached by the mystic at the end of this inward quest and the worshipper in his encounter with the Holy One.

It would seem, however, that for the pure mystic the polarity of abasement and exaltation, the numinous thrill and dread, is a sign that Nirvana has not quite yet been achieved. The aspirant who has arrived at this point has travelled far along the path, but has not yet reached the serenity and bliss of true enlightenment. The encounter with the holy is thus one of the last stages to be transcended. To realize this helps us to understand the position of Sankara, that non-dualism is the truth but devotional theism is a lower form of the truth, suitable for those who have not attained enlightenment. It is a lower form of the truth for Sankara, but quite genuinely a form of the truth, and not merely a helpful fiction for those who are not yet ready for the truth. Since non-dualism and theism seem so incompatible, it is hard to see how he can maintain this position, and he is often interpreted as really meaning the "helpful fiction" doctrine. But if the numinous encounter is a phenomenon that appears at a stage well along the mystic path though short of its goal, then devotional theism as its doctrinal expression is true in at least as strong a sense as
“Nirvana is timeless” and “Atman is within all this” are true. For as we have seen, the truth of these statements is a function of their appropriateness to certain stages along the mystic path, which help to fix its direction.

2. Complementarity and the Formation of Doctrinal Schemes

With the Brahman-Atman identification before us as a paradigm, we can now attempt some more general and systematic reflections on Smart’s interpretation of complex doctrinal schemes, particularly as paradoxes and possible complementary relations among models may figure in them. By “complex” doctrinal schemes we mean those in which two or more strands are combined. Our reflections will be centered on three questions: What are the functions of doctrinal schemes? What factors make the combining of strands possible and desirable? When doctrinal strands are combined, are their respective dominant models related in a complementary way?

a.) Functions of Doctrinal Schemes. The most explicit statement of Smart’s understanding of the functions of doctrinal schemes is found in his inaugural lecture at the University of Birmingham.

To say that a doctrinal scheme is organic is to say more than that the key concept, God or nirvana, derives its sense from the whole set of propositions which go to make up the scheme. It implies that the different parts hang together in some sense, and bring different events and experiences and facets of existence into an intelligible relation with one another. A doctrinal scheme serves to lend to diverse and apparently unrelated “events and experiences and facets of existence” a coherence not otherwise evident in them. This coherence is a function of the (more evident) coherence of the doctrinal scheme itself. Each of the elements (individual doctrines, entities mentioned, etc.) of the scheme is related to certain events, experiences, and facets of existence. From the coherence of the elements a coherence of the related phenomena is obtained.

What range of events and experiences is to be brought into correlation? It would appear that schemes of religious doctrine differ one from another in this respect. Complex schemes aim to bring a wider range of experiences into coherent relation than do one-strand schemes. Yet to state the case thus is to view it from a standpoint basically sympathetic to complex schemes, for it credits them with greater adequacy. Smart’s view seems to be that defenders of one-strand schemes should concede this point, but urge as a counterbalancing advantage the greater simplicity of a doctrinal scheme like that of early Islam or Theravada Buddhism. But it is not clear that the Theravada Buddhist, for example, need concede the point about adequacy. The charge against him is that his scheme does not do justice to the experience of encounter with the Holy One in worship, and particularly that his scheme does not show how this encoun-
ter fits together with the mystic path. Simplicity is not the only defense available to him. He can urge that his scheme does not leave the experiences of worship uninterpreted and unrelated to the mystic path. The interpretation he will suggest for them is the same one he will suggest for the general run of human activities: they are forms of entanglement in the great spatiotemporal-causal illusion machine from which we must break free to achieve salvation. The impulse to worship is one of the many forms of craving, from which the mystic’s path of discipline is designed to free him.

An apologist for a complex doctrinal scheme will presumably not be satisfied with the Theravadin’s defense of his scheme’s adequacy to the experiences of worship. It may have an interpretation of them, he will say, but it scarcely does them justice. One way in which it could be said not to do them justice is suggested by Whitehead’s well-known statement, “Rational religion appeals to the direct intuition of special occasions, and to the elucidatory power of its concepts for all occasions.”10 The point at issue between our disputants is, what occasions are special? The Theravadin treats the occasions of worship as ordinary; his opponent insists they are special. Since the opponent we have in mind is a defender of a complex scheme (Mahayana Buddhism, perhaps, or Catholicism), for him a doctrinal scheme to be adequate must show how at least two different kinds of special occasion cohere, and how ordinary occasions are to be understood in relation to both. Thus the question of adequacy and coherence comes in two stages. First there is the question how successfully the scheme achieves adequacy to and coherence among the events and experiences taken as especially significant. Then one must ask how successfully coherence is brought into the range of ordinary experience when the scheme is applied to its interpretation.

Whitehead seems more interested in the second stage, Smart in the first. For the religious man as Smart sees him, what makes the special occasions special (i.e. especially important) is primarily their intrinsic quality rather than the illumination they provide for the interpretation of occasions in general. One major function of doctrinal schemes is to introduce people to (and guide them in) distinctive new territories of experience. Since these new territories are evaluated as more important than the old familiar ones, naturally the doctrinal schemes tend to be more concerned with the exploration and mapping of the new than of the old.

Two qualifications must be introduced immediately. First, attention should be paid to an ambiguity in the question whether doctrinal schemes serve for the “interpretation” of ordinary experience. Continuing the mapping analogy, we may suggest two different ways in which doctrinal schemes may help in the mapping of ordinary experience. They might help us draw otherwise unavailable detail maps of regions of “ordinary experience,” or
instead they might take known maps of these regions and place them in larger maps where their relation to wider territories may be seen. Thus if we compare the territory of ordinary experience with, say, the British Isles, we might say that our scientific theories and common-sense ideas about the world provide us with a map of the British Isles, with no suggestion of other lands or waters beyond. If someone then said that religious doctrinal schemes help us to map the British Isles, his statement could then be taken as meaning either that they make new and different detail maps available, or that they guide us in the exploration and mapping of other oceans and continents, so that a globe can be constructed, on which Britain's (rather minor) place can be seen. They might, of course, do both; one of the ways in which travel is said to be broadening is that it sharpens our perception of the familiar, opening our eyes to features of it not previously noticed.

Dropping the analogy, we may state the two senses of “interpretation” thus: doctrinal schemes might (1) bring out distinctions and relations among particular features of ordinary experience so that they cohere better than before, or (2) “interpret” ordinary experience as a body by exhibiting its relation to the special kinds of experience of which they treat.

The second qualification is simply that doctrinal schemes differ in the extent to which they relegate ordinary experience to a position of unimportance. On the whole, schemes in which the mystical path is dominant can be expected to depreciate ordinary experience more than worship-based schemes. Many contemporary Christian theologians hold that the presence of an incarnation strand heightens the valuation placed on everyday events and experiences. Hence William Temple's “Christianity is the most materialistic of the great religions.”

Where importance is conceded to ordinary experiences, a corresponding importance will be attached to the task of discovering and showing their coherence with the special occasions. Even here, however, the primary interest is in the relation of the general to the special occasions—of work and worship, say—rather than the coherence found in the general occasions when they are interpreted in the light of the special occasions. That coherence may be valued, but is something of a by-product.

Why, then, do preachers make so much of it? Here we must distinguish between the grounds on which doctrinal schemes are commended, and the impetus to their construction. People are indeed often urged to adopt a particular scheme because it will help to make sense of the perplexities of life. But doctrines and schemes seem to arise out of the need to interpret certain events and experiences which impress the formulators of the doctrines as exceptionally important. Because the Holy One encountered in worship is so incomparably important, it is necessary to interpret all things in relation to him. Enlightenment about their relations to each other is a
welcome consequence. But if a man adopted the Muslim doctrinal scheme because he found it lent coherence to his everyday experience, without being led to see how incomparably more important is Allah than the problems of everyday existence, he would be thought to have missed the point.

b.) Paradox and Complex Schemes. We have already considered the principal motive for the weaving together of strands, viz. to bring coherence to a wider range of experience—specifically, to interpret two or more of the basic kinds of religious experience within one scheme. There may be a second kind of motive. It may be that the combination of strands helps overcome difficulties in the interpretation by each strand of its own characteristic kind of experience. This possibility can be discussed most conveniently after we have examined some features of single-strand schemes that make weaving together possible.

Besides analogies of the sort considered in connection with the Brahman-Atman identification, the *imprecision* of religious discourse is the main feature which Smart identifies as making the combination of doctrinal strands into complex schemes possible. The context shows that at least part of what Smart means by saying religious propositions are imprecise is that they are analogical. It would be a mistake to try to read elaborate doctrines of analogy into Smart’s argument. The main point is that religious propositions are not literal and cannot be replaced by literal ones. There are religious reasons for this state of affairs, not merely general metaphysical and epistemological reasons. The reasons are similar to the reasons why Atman and Brahman must be spoken of as timeless. The object of the mystic’s quest cannot be spoken of literally, because the only available terms in which to speak of it are drawn (or abstracted) from images of the sensible and temporal, and it must be sought beyond all these. Hence “neti, neti.” What we say about Brahman is analogical because nothing we say could constitute adequate praise of the holy object of worship. This reason, as Smart states it, seems unconvincing, but it can be made more persuasive by a slight generalization. It seems unconvincing because praising the Holy One and making factual statements about him seem to be different activities. An Englishman during the war might have said that Winston Churchill’s leadership “could not be praised enough,” but it would not follow that he could make no literal true statements about Winston Churchill and his leadership. The worshipper’s rejoinder would be, “But Winston Churchill is not the Holy One, whom a man should praise in everything he says and does. Thus in principle the difference between praise and factual description collapses.” This is a sound enough reply from the worshipper’s point of view. The philosopher might want to make a related but slightly different point. The worshipper’s encounter is with a
Holy One before whom he and all that pertains to him are as nothing. A great gulf is fixed between the Holy One and the whole realm from which the worshipper draws his language. Therefore nothing the worshipper has words to say would be fitting. His words would not "fit" and would not be fit. Thus the ontological and axiological "wholly otherness" of the Holy One is the basic reason for the worshipper's inability either to praise him properly or to make literal statements about him.

But have we not forgotten about grace and revelation? The worshipper believes that the Holy One graciously makes certain words and propositions and forms of praise fit. When he says this, echoes of theological arguments about justification come to mind. Does he "make" them "really" fit, or does he accept them as fit (though they are not)? However these discussions come out, the outcome will not seriously affect Smart's point. For even if the revealed and sanctioned formulas are regarded as fit and literally true, the fitness and literalness do not extend to our explications, interpretations, and applications of them. In particular, the authority of revealed formulas does not carry over unimpaired to theologians' inferences from them. Precise as they may be in themselves, they are imprecise in the sense that theologians are not in a position to specify precisely what statements follow from them, nor what statements are or are not compatible with them. And thus, when doctrines from a mystical strand of discourse appear to clash with doctrines from a worship-oriented strand, there is enough uncertainty about the meanings of each that it is possible to combine the strands. But how can one tell when the uncertainty allows a combination and when it does not? This, according to Smart, is a judgment requiring a high degree of religious insight; philosophical insight may help too, but is not sufficient, and procedures for deciding such matters cannot be laid down.

The "imprecision" of religious discourse covers not only its analogical character and the uncertainty as to what follows from doctrines, but also their paradoxical character. The only paradoxes with which Smart concerns himself are those which result from the combination of strands, but he does not claim that all paradoxes arise in this way. As we shall now show, paradoxes occur within each strand separately.

Mystics utter—and teach, and insist upon—many paradoxes. Stace drives this point home with vigor in his *Mysticism and Philosophy*. But most of the mystics he cites come from traditions into whose doctrinal schemes other strands are woven. At least some of their paradoxes may thus result from their undertaking to interpret the mystical experience within the framework of a complex doctrinal scheme. Stace does not think so. He agrees that mystics in theistic communities often try to describe and interpret their experiences in such a way as to conform to the community's
doctrines. But, he holds, the result is not the production of paradoxes but
the attempted mitigation of them. Stace tries to show that the paradoxes
which occur in the straight reporting of mystical experiences are in fact
outright contradictions. When the attempt is made to bring the reports into
line with theistic doctrine mystics like Eckhart have recourse to dualistic
interpretations which mitigate the paradoxes by providing distinct loci for
the two sides. And, Stace thinks, they tend to waver about this, sometimes
advancing paradox-mitigating interpretations and sometimes adhering more
faithfully to the language required by the experience, let the contradictions
fall where they may. Stace does not claim that doctrinal conformity is the
only reason for paradox-mitigating interpretations. When they return to the
world, mystics share the ordinary logical man's discomfort at stark contra-
dictions, and therefore try so to interpret their own utterances as to give
less offense to logic. But the importance of doctrinal pressure is shown by
the fact that attempts to interpret the paradoxes away are much stronger
and more persistent in the West, where doctrinal conformity is a major
factor, than in the East.

In a review-article on Stace's book, Smart says that Stace fails to apply
to his own theory of mysticism the test which he rightly recognizes as cru-
cial for any theory, namely its applicability to Theravada Buddhism. At
least one of the principal paradoxes which Stace believes to be characte-
ristic of the mystical experience wherever it occurs, is not to be found among
the adherents of the Theravada school. This is what Stace calls the Vacuum-
Plenum Paradox, which has three variant forms or aspects: (1) that the
One or Universal Self has qualities, yet has no qualities; (2) that it or he is
personal and impersonal; (3) that it or he is dynamic and active yet static
and motionless.

In poetic and metaphorical language the positive side is often spoken of as
light or sound, the negative side as darkness or silence. Hence the expression
the 'dazzling obscurity' of Suso expresses both sides of the paradox, whereas
Ruysbroeck's phrase 'the dark silence in which all lovers lose themselves'
refers only to the negative side.

(Stace had previously quoted a passage from Ruysbroeck in which only
the positive side is specifically mentioned. Because it bears on a criticism
we have to advance against Stace, we shall quote it here: "The God-seeing
man . . . can always enter, naked and unencumbered with images, into
the inmost part of his spirit. There he finds revealed an Eternal Light." )

Stace believes that the first version of the vacuum-plenum paradox, i.e.
that the One both has and has not qualities, is basic and really includes
the other two. It sounds very much like what we have called the affirma-
tion-negation paradox about the religious ultimate. But some quite distinct
kinds of paradox seem to be confused together in Stace's concept of the
vacuum-plenum paradox. In the first place, it would seem that quiescence
and impersonality are as much "qualities" as activity and personhood are. If so, the second and third forms of the vacuum-plenum paradox are not merely variant versions or special cases of the first, but different paradoxes.

A partial reply to this objection might be that after all Stace thinks of all three forms of his vacuum-plenum paradox as ways of expressing and pointing to a paradoxical quality of the mystical experience itself, a quality which is suggested in another way by the name he gives the paradox. There seem to be in the mystical experience a great sense of emptiness and a great sense of plenitude: emptiness in that all images and distinctions are swept away, plenitude in that nothing is lacking and full pure bliss is enjoyed. The metaphors of darkness and light probably refer directly to the indicated quality of the mystical experience, rather than being a poetic way of expressing the paradox of the One's both having and not having qualities. Consider the reference to "an Eternal Light" in the passage from Ruysbroeck just quoted. Stace takes the reference to light here as "the common metaphor for his (God's) goodness and blessedness," and thus as an expression of the "having qualities" side of the paradox. Yet according to Ruysbroeck the man who finds the "Eternal Light" is "naked and unencumbered with images." The metaphor of pure light implies an imageless and distinctionless state as much as the metaphor of darkness does, though it points more to the bliss, peace, and plenitude of the state while the imagelessness and distinctionlessness of the state are more specifically suggested by the metaphor of darkness.

Thus the "plenitude" of the mystical experience probably ought not to be taken as a plenitude of qualities. Of what is it a plenitude, then? If that question is to be answered at all, the answer would have to be something like "plenitude of being" (or "of consciousness," or "of bliss," to complete the Indian formula). This kind of answer is the next thing to a refusal of the question, since to say "plenitude of being" is to insist on the plenitude while denying that it is a plenitude of any particular thing—or the sum total of all particular things.

Even if the plenitude is taken as a plenitude of particular qualities, as sometimes occurs in mystically-based theologies, the vacuum-plenum paradox is still different from our affirmation-negation paradox and from the personal-impersonal and active-inactive paradoxes. For the affirmative sides of all these paradoxes involve the attribution to the religious (or mystical) ultimate of some particular qualities and not others.

In denying that the vacuum-plenum paradox is to be found in Theravada Buddhism (or Jainism or Yoga), Smart does not distinguish among the kinds of paradox we have found conflated under that title. But R. H. L. Slater has shown the importance in Theravada Buddhism of the affirmation-negation paradox. "In spite of these terms which are connotative, whether positive or negative, Nirvana is also said to defy description. It is inex-
pressible. The state of Nirvana is unfathomable, beyond perception and beyond logic.” How shall we take these assertions of the ineffability of Nirvana? Smart suggests that in some ways saying “Nirvana is ineffable” is like saying “This pain is indescribable.” The indescribability of pains has been in recent years the subject of an enormous amount of philosophical writing, in which large and complex questions are handled. Indeed it has been the subject of so much writing because it has been regarded as a focus or crux for such questions. But the subject of Smart’s comparison is not the man who asserts on philosophical grounds the indescribability of his pain, nor yet the man who answers his doctor’s request to tell him what the pain is like by telling the doctor that he can’t do so. Rather Smart calls our attention to the case of the man who says “This pain is indescribable” as a peculiar way of describing it. The statement indicates that the pain is so intense that none of the available terms denoting degrees of pain will fit. Similarly Nirvana is “bliss unspeakable” in that it is bliss far more intense than any for which we have words. But there are other reasons for saying that Nirvana is indescribable. As we have seen in other connections, the quest for Nirvana involves the extrusion from consciousness of all images, and thus with them of all terms that might be used to describe Nirvana. And the insistence on its ineffability has been a way of fending off profitless speculations about it, speculations in which men have been tempted to seek the enlightenment they can obtain only in following the mystic path.

Nevertheless affirmations are made about Nirvana. It is the goal of life. It can be compared to “the harbour of refuge, the cool cave, the island amidst the floods, the place of bliss . . . the home of ease . . . the further shore.” Of course all these metaphors are regarded as quite inadequate—the negation side of the paradox predominates—and it might even be suggested that they function more as recommendations of Nirvana than as attempted descriptions. Nevertheless not all good things are pressed into service as metaphors for Nirvana, but only a certain class, i.e. those having particularly to do with refuge, peace, calm, etc. Certain metaphors are regarded as more suitable than others for use in recommending Nirvana as the goal men ought to seek: therefore there is at least a weak sense in which some are more adequate than others as predicates of Nirvana.

Does the doctrinal scheme of Theravada Buddhism contain, in addition to the affirmation-negation paradox, other paradoxes in the form of tensions and conflicts among the affirmations made? It would appear so from Slater’s discussion, although he provides us with little information about them and their relation to the affirmation-negation paradox because his discussion suffers from a confusion similar to Stace’s. The confusion is strange, in that it results from his neglecting in his detailed treatment of “the paradox of Buddhism” (ch. 4) a distinction which he himself no-
tices in his introductory remarks on “the paradox of Nirvana” (pp. 3f.).

Herein we have the paradox of Nirvana. On the one hand, Nirvana is denoted in terms which encourage a positive conception. It is the further shore, the harbour of refuge, the cool cave, the matchless island, the holy city; it is peace, rest, supreme happiness. On the other hand we appear to be confronted by curt negation. Nibbana is the Void. It is Cessation.

Thus there are two conceptions of Nirvana, which have suggested two conflicting interpretations to Western scholars at any rate: that Nirvana is extinction, and that it is something much like immortal bliss or the Kingdom of God. Though “there are terms and passages in the Buddhist literature which seem to demand a choice between these rival conceptions, the Buddhist system of thought implies their combination.”21 Slater then goes on to distinguish, in the passage quoted above, this paradox of positive and negative conceptions of Nirvana from the affirmation-negation paradox with respect to statements about Nirvana. But in his later discussion he seems to forget the distinction, interpreting all religious paradoxes as instances of the affirmation-negation paradox. Thus our curiosity as to the ways, if any, in which the latter requires or encourages paradoxes among the affirmations, remains unsatisfied.

Any reader of Otto’s account of the Wholly Other as “mysterium tremendum et fascinans” would expect a doctrinal strand based on the numinous encounter to contain paradoxes. Not only is a form of affirmation-negation paradox suggested by a proper appreciation of the mysterium, but the dipolar character of the numinous feeling finds expression in paradoxical relations among the “ideograms” corresponding respectively to the tremendum and the fascinans poles of the feeling. An “ideogram” might be described as a sort of conceptual symbol enabling us to deal discursively with an element of the numinous feeling. Otto takes “the wrath of God” to be an ideogram for the daunting, overpowering tremendum element, the “love and mercy of God” an ideogram for the thrilling, exalting fascinans element. That there is a tension between these ideas is obvious; if Otto’s description is correct, it reflects a tension within the numinous feeling. Otto would probably not call the tension in ideograms a paradox, since by “paradox” he seems to mean an outright contradiction between purely conceptual statements (i.e. statements in which the predicates are straightforward rational concepts rather than ideograms).22 But by our definition of paradox, the simultaneous attribution of wrath and mercy to God counts as one. Otto’s conception of ideograms might of course provide a way of showing that the paradox is not a contradiction, and his analysis of the dipolar character of the numinous feeling might provide the basis for a general interpretation of religious paradoxes. The requisite clarification of the notion of an “ideogram” is, however, a task outside the scope of the present study.
Not only do paradoxes occur in both numinous and mystical strands separately; Smart’s favorite example, “Brahman is both far and near,” could arise and be interpreted plausibly within either strand.

If Brahman is the Holy One, then “far” could be an ideogram for the 
tremendum aspect of the encounter, in the way Smart has suggested. But “near” could also be an ideogram for the 
fascinans aspect. Otto twice quotes as a particularly powerful expression of the numinous feeling in true worship Tersteegen’s hymn which begins, “God himself is with us.”

For the worshipper, the Holy One is indeed far in the sense of being immeasurably removed from him in worth. But the Holy One is also near in that he impinges vitally upon the worshipper, and in that he graciously imparts his presence, which the worshipper, “fascinated” in Otto’s special sense, seeks as the 
summum bonum.

But if Brahman is both far and near even before identification with Atman, still there is a certain imbalance in the paradox which finds doctrinal expression in the belief that the Holy One is intrinsically far, and remains so even in drawing near, whereas the drawing near is contingent, gracious, and behind a veil.

Atman also is both far and near, even before identification with Brahman. The sense in which the mystical goal is far is suggested by such characterizations of Nirvana as “the other shore.” It is at the end of a long path. Since Atman is, nevertheless, the Self to be sought within, there would seem to be an imbalance in “Atman is both near and far,” favoring “near.”

It is tempting to speculate that paradoxes native to one strand or the other may often have the kind of imbalance suggested above, and that correction of the imbalance may be a motive for bringing another strand into the doctrinal scheme. If a worshipping community has reason to want to say that Brahman is near, yet the sense in which it is near is problematical and qualified, then a strand of discourse which provides additional grounds for saying that Brahman is near might well be welcomed. But this speculation is perhaps oversubtle, in view of the rough character of our evidence for reconstructing the hypothetical weaving process. The main motive for the formation of complex doctrinal schemes is doubtless the desire to have a scheme adequate for the interpretation of diverse types of religious experience.

c.) Complementarity and Complex Schemes. When doctrinal strands are combined into complex schemes, does a complementary relation obtain between models native to the different strands? It will be recalled that in pre-quantum physics the model of wave propagation (with its associated equations, mathematical techniques, rules of correspondence, etc.) was used in the interpretation of one wide range of phenomena, the particle
model in another. The two models were very deeply ingrained in classical physics, and the ranges of phenomena to which they were applied did not overlap. But when phenomena at the atomic level were made available for observation, their interpretation seemed to require a “mixing and juggling” of the two models, and the mixing imposed restrictions on the freedom and precision with which the models could be employed. Specifically, variables such as position and momentum which had hitherto been related to the models in an unambiguous way, now appeared in complementary pairs governed by the indeterminacy relations.

Thus it would seem that in quantum physics two strands of classical discourse were woven together, at some cost in the form of paradox and indeterminacy. A possibly illuminating parallel to Smart’s doctrine of complex schemes suggests itself. But two prima facie grounds for challenging the parallelism must be considered. One has to do with the motives for weaving strands together, the other with the relation of indeterminacy to the weaving process.

In the physical case, the principal motive for combining the strands was the need to interpret perplexing new phenomena. In the religious case as understood by Smart, the principal motive was to provide a comprehensive interpretation of the phenomena already separately interpreted by means of the two strands. In each case, we need to make a qualification; the net effect is to qualify the contrast but not to eliminate it. The quantum theory does provide a unified theory for ranges of (macroscopic) phenomena whose interpretation had previously required distinct theories, though it was not for that purpose that it was conceived. And no doubt when mystical practices are introduced into a worshipping community, or vice versa, phenomena will appear which are subtly different from any which occur within either kind of community separately. But not so different as microphysical phenomena are from macrophysical.

The difference in motive for combining strands need not preclude there being important similarities in the way the strands are combined, and in the ways that the employment of models in each strand is affected by the combination. But the other challenge remains. In quantum physics a certain imprecision (indeterminacy) in the use of concepts is a consequence of the combination; in theology the imprecision of doctrinal concepts is a condition of the possibility of the combination. So stated, the contrast expresses no more than a half-truth; but it directs our attention to a diversity in senses of “imprecision.”

Let us grant that the language of the two strands of classical physics was precise, when applied in the classical domain. But quite apart from any combination of strands, to speak of “waves” and “particles” in the microphysical domain is imprecise, i.e. analogical. Words like “wave” and “particle,” “position” and “momentum” are being used in special extended
senses, as Bohr says. They are being used as models in a new domain, and—still apart from any complementary combination—it remains to be seen what inferences from them will turn out to be sound. Thus they are being used imprecisely, in a sense rather like that of the “imprecision” which for Smart makes the weaving of complex doctrinal schemes possible. Their complementary combination introduces another and distinct sort of imprecision, the quantitative imprecision expressed in the indeterminacy relations. When strands of religious discourse are combined, a further imprecision results besides that already present. It is not, of course, a quantitative imprecision but an equivocation. The sense of a word like “far” is now not only analogical but equivocal as well. When Brahman has been identified with Atman, it is “far” in two distinct analogical senses, namely those previously pertaining to Brahman and to Atman. It is “far” in that it is “wholly other,” and in that it is to be found at the end of a long and arduous path.

How does this equivocation affect the elaboration of doctrinal schemes and their application to the interpretation of experience? To some extent, of course, the strands have independent application, and the terms used within them retain their old analogical senses even after the merger. That is, the merger will be to a degree irrelevant to some of the applications of each strand, rather as when two manufacturing firms which cater to unrelated markets merge, many of the operations of their respective plants go on as before. A term like “far” will continue to bear, in applications to the interpretation of worship, much the same analogical sense that it had borne before; similarly in applications to the interpretation of mystical experience.

But the strands cannot always remain so separate, since “weaving together” amounts to more than this purely formal kind of unification. Smart discusses several points at which doctrinal strands interact to modify each other’s content. We shall concentrate on two which are of particular interest.

Perhaps the point of most direct and unavoidable clash between a mysticism-based and a worship-based doctrinal strand is the mystic’s claim to union with the object of his quest. Where that object has been identified with the Holy One, the mystic’s claim will appear as rank blasphemy, and a theological impossibility. But it is important to him to insist on it, because it expresses the point that when enlightenment is attained all distinctions vanish. Several solutions have been attempted, changing either the entity with which union is claimed, or else the nature of the union claimed. In certain Muslim sects the interpretation is put forward that the mystic achieves union with the spirit of the Prophet. Here the dominance of the numinous over the mystical strand is clear. The idea of union is saved, but this union is not deliverance in the usual mystical sense.

Medieval Christian mystics used the metaphor of marriage to suggest a
kind of union of which one could speak without blasphemy. It is rather surprising that even this metaphor was not objected to more than it was. No doubt the New Testament image of the Church as the Bride of Christ helped, as did the non-egalitarian view of the marriage relation then current. Even so, the numinous strand should probably be said to have predominated in this case also, though more accommodation to the mystical strand was made than in the Muslim case. The image of spiritual marriage had a certain vagueness which was useful in averting a direct clash, in that by stressing some aspects or types of marital relationship the mystic could approximate fairly closely to the stronger doctrine of non-distinction while the orthodox theologian could maintain a fairly satisfactory distance between God and the mystic by stressing other aspects of the marriage relationship.

An especially interesting feature of these examples is that they are non-paradoxical. We might encounter paradoxes if we tried to think out their implications in detail, but they are not meant to be paradoxical and are not so on the surface, at least. The weaving together of strands need not result in paradox at every point, even at points where the clash between strands is most obvious. Perhaps we ought rather to say, since it has not been shown that the compromise formulas could be worked out in detail without paradox, that paradox is not necessarily the first recourse at points where interwoven doctrinal strands clash. The compromise formulas may be uneasy—some Christian mystics have spoken sometimes of spiritual marriage, sometimes rather in ontological-union language, and the relation between the two ways of speaking is not always easy to discern—but they are quite different from a paradoxical insistence that the mystic both does and does not enjoy union with the divine.

It would be interesting to pursue these compromise formulas further, to see in what paradoxes they might eventuate, or by what forms of imprecision paradoxes might be avoided or covered. But similar questions can be pursued, in closer relation to our theme of complementary relations among models, in connection with another point at which the two doctrinal strands come together in a compromise formula: emanationist cosmology.

Evelyn Underhill describes a system of emanationist cosmology as follows:

The Absolute Godhead is conceived as removed by a vast distance from the material world of sense; the last and lowest of that system of dependent worlds or states which, generated by or emanating from the Unity or Central Sun, becomes less in spirituality and splendour, greater in multiplicity, the further they recede from their source. That Source—the Great Countenance of the Godhead—can never, say the Kabalists—be discerned by man.24

Such a cosmological picture can be regarded as an attempt to combine the
principal features of two sets of models for the relation of the religious ultimate and the world: those of the worship strand and those of the mystical strand. Our task will therefore be to determine what those models are, to what extent the emanationist picture preserves the intention of each, and where it appears to fail to do so. We will then be in a position to broach the question whether, in a complex doctrinal scheme employing the emanationist cosmology, the original models would be related in a complementary way. Finally, we will add a brief word on the significance of the emanationist picture in Christian theology.

Smart has done the first part of our job for us. He has pointed out two models that dominate thought in the numinous strand about the relation of the world, the self, and the Holy One; and he has pointed out two other models that dominate thought in the mystical strand about the relation of the world, the “self,” and Nirvana. The dominant models in the worship-oriented strand are the “great gulf fixed” between the Holy One and the world (especially the self) and the “translucent screen.” That is, phenomena in the world are regarded as screens through which something of the glory of the Holy One may shine, while at the same time they prevent direct access to it. As we have seen, the relation of the screen model and the gulf model is somewhat uneasy: the gulf model fits in well with the access-blocking function of the screen, not so well with its translucency.

In the mysticism strand the dominant models are the “path” and the “goal.” Nirvana is the goal, and the mystical discipline is the path leading away from the world toward the goal. Here the relation between the models seems unproblematical, but the “goal” model is problematical in itself. Buddhist teachers point out that one cannot reach Nirvana by striving to reach it. Striving is too much like craving, and must be overcome. The teaching of the Bhagavad-Gita, that one should act without regard to the fruits of action (even when the actions are those which lead toward moksha), is similar. Still, though a man cannot attain Nirvana by striving, he must strive in order to learn not to strive, and there are more or less specific procedures he should follow. This is the justification for the models.

Moreover, Nirvana is not something one can approach step by step, so as to be able to say, “Now I am halfway there, now three quarters,” etc. Over against the models of path and goal must be set the model of enlightenment: attaining Nirvana is like a sudden flood of illumination.

How well does the emanationist picture preserve the main features of the gulf and screen models? The emanationist can approximate to the “great gulf fixed” by stressing the “vast distance” between the “material world of sense” and the “Absolute Godhead.” (The desire for an effective representation of this distance is one motive for the multiplication of named stages and levels that often occurs in emanationist cosmologies.) Phenomena are translucent screens of the Holy One because they lie at the fringe
of light and darkness. (The sensible model underlying the cosmological picture of emanationism is of course a central light source shining out into, and eventually fading out in, the darkness.) Phenomena are translucent because some of the light (some of the "being") of the Source remains in them; they are screens because so little does. The picture of light radiating far out from a source helps to reconcile the translucency of phenomena to the Holy One with the great gulf fixed between them and it.

But there are important emphases of the numinous strand which the picture fails to preserve. Even a great distance between two objects is not a gulf if there is a continuous thread of connection between them, such as is provided by light rays in the emanationist model. The Holy One and the world cannot really be wholly other on the emanationist picture. No doubt that is why the picture has never really won theological acceptance within doctrinal schemes where the worship orientation is strong. There are also, on the emanationist account, difficulties about visualizing phenomena as screens, but these difficulties can be brought out most conveniently after we have discussed the relation of the emanationist picture to the mystical path.

The emanationist picture fits in well enough with the model of the long path, if salvation is conceived gnostically as the soul (spark of light) finding its way back to its Source. It is harder to reconcile with the idea that the quest is directed inward. But the idea of a long path directed inward is already difficult; the emanationist picture does nothing to make the difficulty worse, and in fact probably eases it somewhat. For it allows the identification of the central Source with the essential self, and thus gives some indication of how a man can be separated from his essential self yet preserve some thread of connection with it. The emanationist can thus interpret the mystic quest as the quest for the essential self, and in that sense an inward quest. The process of peeling away layer after layer of the empirical-world onion can be identified with the gnostic's path back through stage after stage of emanations to the One. In one way the model of the goal is preserved only too well: the emanationist picture seems to provide no way of expressing the point that in a sense Nirvana is not a goal, i.e. not something to be gained by striving and not a terminus such that one could say one was halfway there.

In conclusion we wish to suggest and test the hypothesis that the compromise picture of emanationism might be related to the models of the gulf and the path as the compromise picture of the wave packet is related to the models of wave and particle. It will be recalled that a wave packet is formed by the superimposition of waves of different frequencies. It can be made to approximate the characteristics of a particle, in particular sharp localizability, but only at the cost of destroying its resemblance to a single wave. The more it is localized, the more different frequencies of
waves have to be brought in, and the greater is the uncertainty in the frequency to be assigned it if we wish to treat it as a single wave. The greater the precision with which we treat it as a particle, the less the precision with which we can treat it as a wave, and vice versa. Crudely considered, the emanationist compromise seems to work in a rather similar way. The more we stress the great distance between Source and creature, the more usable the emanationist picture becomes for a worship-oriented strand of doctrine. But its usability in this strand requires the suppression or ignoring of a feature which makes it suitable for use in a mysticism-oriented strand, namely the element of continuity between Source and creature which makes it possible for the mystical quest to be thought of as an inward quest. If the emanationist compromise is accepted as a way of reconciling the models of the two strands, then neither model can be pressed to all the conclusions that might be drawn from it alone. The gulf model cannot be pressed to the conclusion that there is no sort of intrinsic relation between Creator and creature, since that would destroy the emanationist picture. Of course, the more we make that picture approximate to the gulf model by stressing the element of distance, the vaguer our conception of the “intrinsic relation” will have to be. On the other side, the more we stress the continuity, the less clearly and plausibly will the element of distance seem an appropriate expression of the kind of otherness of the Holy One and the world upon which the worshipper insists.

Rough at best, the analogy we have suggested becomes very complicated when we bring in the other key models of the two strands, i.e. the model of the screen and the model of enlightenment. If the emanationist picture is to give us a reasonable approximation to the translucent-screen model, we have to be able to visualize phenomena (some of them) as lying between the worshipper and the Source. On the other hand, the mystic’s idea of the inward quest requires that the self (even the separate, individual conscious self in the Western sense, at the outset of its pilgrimage) be located nearer the Source than sensory phenomena are. Thus for the purposes of a worship-oriented strand of thought the emanationist picture has to be developed in a direction opposite to the direction of development required by a mystical strand. If the picture is developed in such a way as to clarify the model of the inward quest, the model of the screen will remain obscure, and vice versa. Thus again we can perhaps say that the adoption of the compromise picture imposes a complementary relation on the screen and quest models. On the other hand, the models of enlightenment and the gulf do not seem to acquire a complementary relation to each other when brought under the emanationist compromise, for they both require stressing the element of distance between Source and sensory phenomena, and minimizing the element of continuity. For the doctrine of moksha as enlightenment requires that sensory phenomena be illusory, and
thus that they not share in the being of the Source. Or at least the extreme
tenuousness of that share must be emphasized.

But our concern is with paradoxes in the major living religious tradi-
tions. Why then should we strain so to see whether complementary rela-
tions are imposed on pairs of models when they are interpreted in terms
of the emanationist cosmology? Is it not a relic of forgotten sects and dis-
credited theosophies? Perhaps so. But it has exerted a considerable subter-
ranean influence on Christian theology, at least, via the Neoplatonist ele-
ment in Augustine and the Neoplatonizing interpretations of the Timaeus
current in the early Middle Ages. No doubt in careful theology it was al-
ways sharply qualified—so much so that it might be called a “broken
myth”—but still it did much to shape the way several doctrines were
formulated. We can thus see a possible line of historical research opening
up. It might be possible to see how some theological paradoxes could be
traced back to the prima facie clash of models from the numinous and mys-
tical strands, models which acquire a complementary relationship when they
are both interpreted in terms of an emanationist picture. This historical
task is clearly formidable, and beyond the scope of the present essay. For
it would involve a good deal of digging beneath the surface of classical
theologians’ discourse to find tacit models directing their thinking, and
this would require a very extensive study of the history of doctrinal thought.

In general, the confluence of the two strands appears usually to be
farther below the surface than in the case of “Brahman is both far and
near.” In none of the familiar paradoxes of Christian theology can we see
how to assign the two sides of the paradox to distinct strands. The strands
are so tightly interwoven (if Smart’s theory is right) that to separate them
out we should have to penetrate well below manifest formulas to models
tacitly guiding thought.

In fact we shall, in the final chapter, make some attempt to isolate
models underlying two of the more prominent Christian paradoxes and to
judge whether they could be said to be related in a complementary way.
But we shall not find them to be derived from separate strands in Smart’s
sense.
CHAPTER V

COMPLEMENTARY MODELS IN THEOLOGY

In preceding chapters we have explored a number of questions which seemed both important in themselves and relevant to the comparison of theological paradoxes with the wave-particle duality. In this concluding chapter we shall focus our attention more specifically on that comparison. The first order of business will be a recapitulation of the line of argument in the foregoing chapters, as it bears particularly on the comparison. Then we shall consider two paradoxes of Christian theology which have sometimes been cited as particularly apt for the comparison. These are the doctrines that Christ is Very God and Very Man, and the description of God as both a severely just Judge and a merciful, loving Father. In each case the problem is to see whether the paradox can be plausibly understood as reflecting a complementary use of models, or whether some other approach to the paradox is more promising. In each case we shall find room for a complementarist approach, lines along which one might be worked out, and indications that it could be fruitful for the understanding of the doctrine in question. But we shall also observe the absence—or at least the difficulty of specifying—an important element, without which it is hard to give the complementarist interpretation the definiteness it needs to be really useful. It appears in each case that a verdict on the usefulness of a complementarist approach would have to wait on a good deal of patient historical investigation.

When these particular cases have been treated, some brief final reflections will be in order.

1. Recapitulation

Philosophers of science disagree as to the significance to be attached to the wave-particle duality. Bohr and his followers have obtained from it a principle—the principle of complementarity—which they believe will govern the future development of physics, and give it a character appreciably different from that which it seemed to possess in its classical phase. Others, like Bohm and Margenau, consider the duality an outmoded relic of a transitional stage in the development of microphysics. We have reported on the controversy, and made some suggestions concerning it, but have not found it necessary to defend either view, or to find an alternative.
Whatever the present status of the duality and the complementarity principle, they guided the thought of physicists in a crucial period, and could suggest a useful way of dealing with (at least some of) the paradoxes of theology.

There is also some obscurity as to how the wave-particle duality and the principle of complementarity are to be understood. The interpretation adopted in this essay is that the duality consists in the complementary use of both these models in the interpretation of the same range of phenomena. “Complementarity” is taken to be a relation whose relata are models and whose distinctive feature is that the joint use of the models imposes restrictions on the freedom and precision with which either can be employed. Thus only models between which there is some incongruity could be related in a complementary way. The restrictions on the deployment of one model are simply those which are required to leave room for the use of the other. In the wave-particle case, the Heisenberg uncertainty relations can be understood as playing the role of the “restrictions” mentioned in our definition of complementarity.

Our concern in this essay is with the relation of complementarity, and possible instances of it, rather than a general principle of complementarity, which would state that the relation is to be found throughout some domain of investigation. (In the extreme case the domain would be, as Bohr thought it was, human knowing generally.)

Our question, then, is whether we can find, underlying paradoxical expressions in theology, models which are being used in a complementary way. Our definition of complementarity could easily be generalized to render this question independent of the question what the uses of models in theology are. For whatever purpose a pair of models is used, if they impose restrictions on the freedom and precision of each other’s employment, they could then be said to stand in the relation of complementarity. However, in this essay we are primarily interested in the use of models in the interpretation of experience. For the focus of our investigation is the comparison of theological paradoxes with the wave-particle duality, wherein models are used for the interpretation of experienced phenomena; and (it will be recalled) in the background of our investigation is the question how far theology can be considered an inquiry seeking understanding of human experience in the world.

Before we set out on a search for complementary models in theology, it seemed prudent to explore some standard alternative approaches to the interpretation of theological paradoxes. If, for instance, it could be shown that the cognitive content of Christian theology could be stated without loss in a paradox-free form, then there would seem to be little reason to search for complementarity. Some paradoxes, such as Luther’s paradox concerning the Christian’s lordship and servanthood, do seem to yield to
dissolution when appropriate distinctions are made as to the senses in which key terms are used. “Dissolution” here means removal of the appearance of contradiction. It might be accomplished in either of two ways. One way is to replace the paradox, or perhaps a more extended passage in which it occurs, with a set of statements of equivalent meaning in which no paradox occurs. This can be done most simply with the aid of appropriate distinctions. The other way of dissolving a paradox is that which Hughes applies to Trinitarian doctrine, i.e. exhibiting formal-logical representations of the paradoxical statements as theorems within consistent formal systems.

There are, however, other paradoxes—such as the two which will come up for special consideration later in this chapter—which resist dissolution. It would be hasty to conclude that they will always resist it, especially since Hughes’s type of formal analysis is a relatively new and untried technique in this field. But the resistance is strong enough to encourage exploration of other approaches to the more deeply-entrenched paradoxes.

Among the alternative approaches are two which take paradox as a permanent and necessary feature of theology. One of these is the approach of such writers as Wheelwright, which we might call the “poetic interpretation” of theological paradox. Here the paradoxes of religious discourse (many, if not all of them) are taken to be like the paradoxes of poetry in that they convey insights through the clash of images, insights which could not be communicated in any other way. Obviously involved here is a not completely uncontroversial doctrine of poetry, as well as a view about the religious uses of model, metaphor, and paradox. On this interpretation, poets and religious writers (at least those who provide the living core of religious traditions, as opposed to its scholastic encrustations) use words and images in ways and for purposes radically unlike those of everyday discourse and scientific inquiry. The poetic interpretation is thus incompatible with a complementarist interpretation of religious paradoxes.

A word should be added about the sense in which the two sorts of interpretation are “incompatible.” Obviously, if either is held to apply to all significant religious paradoxes, then there is no room for the other. But there might be for each approach a distinct set of paradoxes to which it is appropriate. The sets might even overlap, in the sense that there might be a paradox (i.e. a particular pair of incongruous images or models) which was used in a poetic way in some contexts and in a complementary way in other contexts. The images of a loving father and a wrathful judge might be played off against each other for poetic effect on one occasion, and on another occasion used as complementary models in an inquiry after the appropriate theological interpretation of certain historical events. But the two approaches are mutually exclusive as ways of understanding any single instance of a paradox.
Certainly there is religious poetry, and much of it has cognitive significance (that is, it evokes insight as well as stirs feeling). But the claim that all cognitively significant religious discourse is poetic in character is, on the face of it, highly implausible. The implausibility remains if the claim is confined to the portions of religious discourse marked by paradox. It is hard to see the “Athanasian Creed” as a poem. The familiar difficulties that arise when one tries to take theological doctrines as straightforward assertions of what is the case have doubtless enhanced the appeal of the suggestion that, despite appearances, they are really poetry. But the suggestion remains implausible for all that.

A variant on the suggestion merits more consideration. Perhaps theology consists of a poetic core, surrounded by a body of prose commentary. This may be a fruitful idea, but it is important to be clear about the nature of the commentary. It cannot be restricted to the sort of literary criticism which undertakes to show forth what might be called the “architecture” of the poem, and how the poet achieves his effects. Neither the value of this sort of criticism of poetry, nor its potential usefulness in the study of religious discourse, is here denied. The propositions I deny are (1) that the prose portions of theology can be understood as consisting fundamentally of such criticism, and (2) that they should properly be confined to such criticism. The latter proposition says that theology functions to evoke insights which cannot be given prose expression, and to show in a fashion how this is done, but not to develop interpretations of experience and guidance for conduct on the basis of the insights. And these latter do seem to be proper functions of theology.

Often combined with the poetic interpretation, but logically distinct from it, is another approach which takes paradox as a permanent and necessary feature of theology. We have called it the “sui generis interpretation” because according to it the paradoxes of theology are not akin to those which occur elsewhere but rather reflect one master paradox which is distinctive of theology. This “paradox of the religious ultimate” (PRU) states that, on the one hand, some predicates (and not others) are applicable to the religious ultimate, and, on the other hand, no predicates are applicable to it. Instead of “on the one hand” and “on the other hand” one might say “in one sense” and “in another sense.” If we could specify these senses, the paradox would be dissolved. But the specification is very difficult. Whether it can be achieved, or whether on the contrary the PRU will be a permanent feature of theology, is a question we have not tried to settle.

We have, however, denied some inferences which have sometimes been drawn from the PRU. It is sometimes said that because the religious ultimate is a mystery beyond the reach of our minds, there will necessarily be paradoxes (besides the PRU itself) among the things we do manage to
say about it. That is, there must be paradoxes among the acceptable statements which the affirmative side of the PRU allows. But this simply does not follow. The point may be clarified by the following formulation. Call the religious ultimate $G$. Then the affirmative side of the PRU discriminates a set of acceptable statements $G$ is $A_1$, $G$ is $A_2$, etc. from a set of non-acceptable statements $G$ is $N_1$, $G$ is $N_2$, etc. The negative side of the PRU says that none of the statements is acceptable ("ultimately," "in a sense," or the like). The inference we are rejecting is that some of the acceptable statements must conflict with others; on the contrary, there is no reason why the whole set of statements of the form $G$ is $A_i$ could not be consistent.

Another inference sometimes drawn from the PRU is that the acceptable statements must be poetic in character, since poetry rather than prose is the appropriate language for speaking of mystery. But this suggestion depends upon taking "mystery" in a sense less radical than that involved in the PRU. According to the latter, all human expressions are (in one sense) unfit for the religious ultimate.

Finally, it may be suggested that the paradoxes which do seem to occur among the acceptable statements are in fact direct expressions or particularizations of the PRU, particular balancings of affirmation and negation. If this suggestion is correct for a given paradox $P$, then a complementarist interpretation of $P$ is clearly precluded; we have tried to show that there are paradoxes for which the suggestion is not correct. (The argument, which does not lend itself to brief summary, may be found in Chapter III, section 2.)

None of the obvious alternative accounts being fully satisfactory, it is in order to try to formulate a complementarist interpretation of theological paradoxes. A question of strategy now arises. Should the search be carried out piecemeal, paradox by paradox? Or should we try to find a general theory of the logic of theology, which would tell us where to look for complementary models and on what principles they limit each other?

The piecemeal strategy will be tried out in the two succeeding sections of this chapter. The most promising potential basis for the kind of general theory we would need is provided by the work of Ninian Smart, considered in the last chapter. Smart treats the paradoxical expression "Brahman is both far and near" as arising from the conjunction of statements from two different strands of doctrine. A strand is an interrelated set of doctrines based entirely upon some one of the major types of religious experience. In the expression just quoted, "far" originates in a strand based upon the experience of worshipful awe before the numinous, "near" in a strand oriented toward the mystical experience. The conjunction "Brahman is both far and near" lies at the heart of a process which
Smart calls the "weaving together" of the strands into a richer, more complex doctrinal scheme.

It could now be argued that Smart shows us a way of dissolving the paradox "Brahman is both far and near," and quite likely others as well. If "far" and "near" derive their respective meanings from such different contexts of experience, then (the argument runs) their meanings are incommensurable and there is no contradiction. To claim that there is a contradiction here would be like claiming that I contradict myself when I say "John is near" (in the next room) and "John is remote" (stiff, formal, hard to get to know).

This argument would be strong if the paradox were heterocontextual, i.e. if "Brahman is far" occurred in one literary context and "Brahman is near" in another. But this is not the case. The argument neglects the point, that the strands are woven together and in the resultant scheme "Brahman is both far and near" should therefore mean something other than the sum of its component parts in the separate strands. In particular, it is plausible to suppose that the weaving together might impose restrictions on the ways Brahman could be said to be "far," on the inferences that could be drawn from that statement, etc. We begin to see the possibility of a complementarist interpretation of the paradox.

There are difficulties in the way. Smart has little to say about the modifications wrought in the language of one strand, and the restrictions imposed upon its use, when the strand is woven together with another. Moreover it is not clear that the paradox need have arisen from the weaving together of diverse strands at all; we have found indications that it could well arise in either strand separately. Nevertheless, the analysis of complex doctrinal schemes (like those of Hinduism and Christianity) into interwoven strands could be a powerful aid in the search for complementary models in theology. If we could find characteristic models underlying the "numinous" and "mystical" strands of religious discourse as wave and particle models underlay different bodies of classical physical theory, we could inquire into the ways in which these characteristic models limit each other when the strands are woven together, and our search would be well under way. We found some hints as to how all this might be done when we considered the possibilities of emanationist cosmology as a working model for theological doctrines of creation.

But we found little more than hints. It appears that detailed and massive historical investigation would be required to determine whether, for instance, Christian reflection about creation has been governed by complementary models derived from different strands. For the models concerned would be operating well below the surface of theological inquiry; we could expect them to exert their influence more at the level of unconscious assumptions than as consciously-employed tools of inquiry. We could
expect this because (if Smart is right) in Christian and Hindu doctrinal schemes the strands are tightly interwoven, so that it is a delicate task to find the points at which one can begin to conceptually unravel them. The detection of the governing models, and their relations to each other, is thus a task for the historian of religious doctrines—quite possibly a highly rewarding task.

We turn now to a brief trial of the other strategy suggested above for the search for complementary models in theology. Perhaps there are paradoxes, the underlying models of which are nearer the surface, so that we can more easily ascertain whether they stand in a relation of complementarity. Writers who have discussed the applicability of this idea in theology have suggested two points at which it might correctly be applied: the christological paradox and the relation of justice and mercy in God. These suggestions will bear further examination.

2. The Christological Paradox

The Council of Chalcedon set forth the doctrine that

our Lord Jesus Christ is one and the same Son, the Same perfect in Godhead, the Same perfect in manhood, truly God and truly man... One and the same Christ... made known in two natures (which exist) without confusion, without change, without division, without separation, the difference of the natures having been in no wise taken away by reason of the union, but rather the properties of each being preserved, and (both) concurring into one Person and one hypostasis...

Some have suggested that the relation between “Jesus Christ is truly God” and “Jesus Christ is truly man” is one of complementarity.3

We may note first that none of the standard “alternative approaches” seems very successful in elucidating the christological paradox. It is too specifically devoted to saying something unique about Christ to be a simple instantiation of the paradox of the religious ultimate. It does not seem to be a poetic paradox, though poetic use is sometimes made of it, for it originates in efforts to define what man ought to say of Christ, rather than in efforts to evoke insight through the interplay of clashing images. It has resisted dissolution, and indeed the Chalcedonian definition effectively blocks all the more obvious distinctions that might be invoked for this purpose. (The “two natures” doctrine does not provide the basis for a significant distinction between “a sense in which Christ is God” and “a sense in which he is man.” At most it could provide grounds for saying that such senses exist, but this merely restates the paradox and does not help to dissolve it. To dissolve it we would have to have independently specifiable logical subjects—“natures,” “aspects,” or whatever—to which divinity or humanity could then be ascribed. For instance, divinity could be ascribed to the intellect, and humanity to the passions, of Christ. But it is just such distinctions which the Formula resolutely rules out.)
If we are to judge whether complementary models underlie the christological paradox, the first question we must ask is, “What are the models?” The simplest answer would be that “God” and “man” are the models. One could explicate this answer as follows: “In order to understand the things which Jesus Christ has done and does, we must in connection with some of them think of him as God, and in connection with others we must think of him as a man. Moreover, in many cases—e.g. those where the communicatio idiomatum has traditionally been invoked—it is necessary to mix and juggle these descriptions, much as wave and particle models are mixed and juggled in quantum physics.” (See Chapter 11, above, where we found that the particle-model treatment of such things as the photoelectric effect requires use—via the relation $E = hv$—of concepts dependent on the wave model. It is of such situations that the communicatio idiomatum is reminiscent. How deep the resemblance actually goes is an interesting question but a difficult one. And because of the general weakness of the suggestion to treat “God” and “man” as models in christological inquiry, the question is in a sense moot.)

There are powerful objections to this line of attack on the problem. They are not completely unanswerable, but they are strong enough to encourage us to look for more promising candidates for the status of “complementary models underlying the christological paradox.”

In the first place, it seems wrong to treat “God” and “man” as models in this context at all. For this seems to suggest that “Christ” is a being who is neither God nor a man, but whom it is helpful sometimes to think of as one and sometimes as the other—just as an electron is neither a wave nor a particle, though it is helpful in some contexts to represent it as a wave and in others as a particle. And this runs counter to the insistence that he is truly God and truly man.

This objection is simple but powerful. There is a counter to it, which I think might be more intelligible to some contemporary theologians than to the Fathers. This counterargument emphasizes that the figure of Christ forces us to rethink and reevaluate, quite radically, our ideas both of humanity and of deity. When we try to understand him, and our experience in relation to him, we are bound to work with the ideas of humanity and deity which we already have. It is at least a major task of Christian theology to correct these ideas by reference to the figure of Christ. But the task is far from done. In the meantime, what status have these at-best-partially-corrected conceptions of what it is to be God and what it is to be man? It may be that they are the models which we must employ in a complementary way when we attempt to understand the figure of Christ and interpret our experience in relation to him.

But are these “partially corrected ideas of God and man” clear, coherent, and definite enough to serve as models? And if so, are they complemen-
Setting the first question aside for the moment, let us consider the second. It does seem that in some ways the models limit each other. For instance, of the inferences a Christian thinker would normally draw about a given being from the fact that he is a man, many are intimately connected with the fact that he is a sinner. But these inferences cannot be drawn concerning Christ, for he is without sin. The point is that our ordinary conceptions of what it is to be human are inevitably conceptions of what it is to be sinfully human, and so our inferences from Christ's humanity will have to be restricted in view of his divinity and consequent sinlessness. Similarly, there are natural inferences from the divinity of Christ—inferences of omniscience, for example—which must be restricted or modified in view of his humanity. (Just what restrictions and modifications are necessary here is of course a matter of dispute among theologians.)

One reason for the disputes is that there is no formula or "compromise model" like the wave packet to determine how the models must limit each other. This is not to say that there is nothing governing the manner of their mutual limitation. There is the biblical record itself, to which theologians must be faithful in their employment of their models. But it does not indicate, except very indirectly, the ways in which use of one model is limited by the necessity to use the other also. The ways in which the biblical record limits the use of various conceptions of man and of God as models are more like the ways in which the physical phenomena themselves limit the use of wave and particle models. More like, but not just like, for the biblical record plays a double role in christological inquiry. On the one hand it provides data to be interpreted by theologians' christological theories; on the other hand it provides a guide for their interpretation of the subsequent experience of the church. It comprises both data and the beginnings of an interpretation of them, and these beginnings provide principles (to a large extent implicit) for the interpretation of subsequent data. One task of a theologian is to discover these principles, and a sub-task might well be to discover how the picture of Christ which emerges from the biblical record fixes the ways in which models of humanity and of divinity must limit each other.

If we survey the history of christological thought for compromise models comparable to the wave packet, we may be struck by various early conceptions of Christ as an angelic or quasi-divine being. In principle, it seems that such conceptions could, without being taken as true or even as good models in themselves, provide guidance in tracing out the limitations imposed on each other by the primary models. For instance, people who had a clear conception of what angels are like might appeal to it in their attempts to imagine a sinless man, without claiming that Christ is an angel (or even that there are other contexts in which it is useful to think of him as one). Compare the wave packet—too artificial and unstable an entity to
be itself a widely usable model for the electron, yet useful in defining the mutual limitations of the primary models, waves and particles.

However, the suggestion that conceptions of angels and quasi-divine beings might be used as compromise models has two serious drawbacks. So far as contemporary christological thought is concerned, the drawback is that such conceptions have grown unfamiliar and implausible to the point of bizarreness. Their revival, even though only as auxiliary models, would be a highly artificial procedure, even if it could be carried out. (And there is some doubt that it could be carried out, so firmly are the notions of angels and quasi-divine beings embedded in long-unfamiliar and abandoned systems of thought.) The second drawback, for any theologian who wishes to maintain consistency with the dogmatic decisions of the early church, is that all conceptions of Christ as a being intermediate in status between God and man were firmly rejected at the authoritative Councils. Of course, we should be clear about the sense in which they were rejected. They were rejected as true descriptions of the nature of Christ, and as sound guides in general for our thinking about him. They were not rejected in the role, the possibility of which we have been entertaining, because no such role was considered. The issues with which the Fathers were concerned—or at least the terms in which they considered the issues—were very different from those involved in the program of using familiar ideas of God and of man as correctible models in an inquiry into the nature of Christ. On the whole it seems likely that the Fathers of Nicea and Chalcedon would have been suspicious of such a program, and inclined to think that the hazards of introducing (for whatever purpose) “compromise models” of Christ as a quasi-divine being would outweigh any possible benefits.

So far, then, it seems that there are two directions in which we might look for complementarity in connection with the christological paradox, and in both cases we encounter difficulties. We can look for a relationship of complementarity between given ideas of God and man used as models in a continuing process of christological inquiry. Or we can, as a matter of historical interpretation, look for complementary models in the process of reflection which led up to the decisions of Chalcedon. We can, to be sure, look in both directions and try to combine what we see into one picture, since most Christian theologians will want their contemporary reflections to be harmonious with the Chalcedonian definition.

We have seen how it is hard to specify, as definitely as we would like, how a particular conception of God and a particular conception of man limit each other as models in an attempt to understand the nature of Christ. Moreover, one aim of this kind of inquiry is to improve our conceptions of God and man, i.e. to arrive at conceptions which will comport better with the statement that Christ is truly God and truly man. (The im-
proved conceptions might well, but perhaps need not, be such that in view of them that statement will no longer seem a paradox.) In any case, if progress is made in the inquiry, the conceptions will be progressively revised, and this circumstance in itself suggests that they are not being used as models in the inquiry in the same sense that waves and particles are used as models in physical inquiry. For in the latter the conceptions of waves and particles employed do not change; there may be a growth in the sophistication with which they are employed as models for electrons and photons, but one would not say that improved conceptions of what waves and particles are in themselves are thereby obtained.

All these difficulties and more appear if we try to interpret the Chalcedonian formula as the outcome of a process of inquiry in which “God” and “man” (or particular conceptions thereof) appear as complementary models. But the idea of complementarity might still be a useful tool of historical interpretation here, provided we can find a more appropriate pair of models. What models did dominate the early church’s thought about Christ? A great many models were used in various contexts, among them Messiah, Logos, Vine, Shepherd, “man approved of God,” Son of God, Son of Man, Lord, Redeemer, etc. The relationships among these titles in the New Testament and subsequent Christian thought have been the subject of intensive study and debate. Various authors have picked out various titles as the crucial ones to which others are subordinated. It is interesting, though, that the two singled out by philosopher Ian Ramsey as the dominant models which were “used to make possible the emergence of some reliable and consistent large-scale doctrinal discourse” in the biblical period and immediately thereafter, are also the two mentioned by historian Aloys Grillmeier as illustrating the contrasting traditions in New Testament christology from which second-century theologians took their start. These are the titles “Logos” and “Messiah.”

I suggest, as hypotheses worth historical investigation, the following propositions: (1) “Logos” and “Messiah” were dominant models in the early church’s thought about Christ. (2) They were related in a complementary way. (3) The Chalcedonian definition laid down ground rules for the use of each model, so that it would not be developed in such a way as to preclude use of the other. I do not know whether these propositions are true. That is for historians to judge. I doubt that they are the whole truth—that, for example, the decrees of Chalcedon are nothing but a set of ground rules for the complementary use of the Logos and Messiah models. To support the suggestion that the propositions are worth investigating, I offer the following considerations.

That the Logos concept was prominent in christological thought from the New Testament through Chalcedon is too well known to require argu-
The Messiah concept does not seem nearly so prominent in the controversies which led up to Chalcedon. The controversies had to do with the relation of the Logos to the man Jesus and the nature of their unity. The question is, why was it important to understand this relation and this unity? Why, in particular, in the face of strong Docetic and Apollinarian currents, did the Antiochenes and others insist on the real individual humanity of the Savior? “Out of loyalty to the literal text of the New Testament, and mistrust of excessive allegorization,” is one answer. “Because accepted theories of salvation required that the Savior be genuinely a man,” is another. There is a third reason. The Messiah, in Old Testament expectation, is a man. The insistence on Jesus’ genuinely being an individual man was thus necessary if the church was to continue to proclaim him, and think of him as, the Messiah. If, then, the Logos doctrine was to be consistent with such thought and proclamation, it would have to be consistent with the full individual humanity of Jesus. Thus we can see how the continued importance of the Messiah concept would naturally affect the pre-Chalcedonian discussions even though the word “Messiah” does not figure prominently in them.

The importance of the Messiah concept is not the only explanation for the stress of early theologians on the humanity of Christ, but it is a plausible one. Suppose it granted, then, that both “Logos” and “Messiah” were important concepts in the pre-Chalcedonian discussions. What grounds are there for thinking of them as complementary models? Theologians of the period did not, of course, explicitly and self-consciously use them as models, in our sense. They would say that Jesus was the Messiah, not that “Messiah” is a helpful model in thinking of him. But in recognizing that neither “Messiah” nor “Logos” nor “Vine,” etc. is by itself adequate to describe him, and that the senses in which he is all these things transcend their familiar meanings, they were in effect using them as models.

What sort of evidence would show that the models were used in complementary ways? Here it would be important, I think, to look to sermonic and catechetical writings as well as to the more technical and/or controversial writings to which historians have understandably given more attention. For the latter writings, insofar as they sought to define and establish propositions couched in a special terminology (“hypostatis,” “consubstantial,” and the like), would be a step removed from the sort of employment of models in which we are particularly interested. Traces of a complementary use of models could be found in passages where a writer points out that some conclusion which would naturally follow from treating Jesus as the Messiah (for instance) cannot be accepted because it is incompatible with his being the Logos incarnate. (An example might be a repudiation of Jewish-nationalistic implications of the traditional messianic doctrine.) More subtly, one could look for traces of comple-
mentarity in passages where a writer refrains from developing a line of thought (based on one model) in directions which his overall treatment obviously suggests, when such development would clearly lead to conflict with the other model. Also relevant would be passages which speak of the relation between two attributes of Christ, associated with the two models respectively, as a "mystery." Whether such a passage would bespeak a complementary use of models would depend on the sense in which, and the reasons why, the relation is said to be a mystery. "Mystery" here would have to mean a necessary imprecision in the use of each model imposed by the necessity to acknowledge the other. There are of course other and stronger senses of "mystery," and other theological reasons for affirming that something is a mystery.

If Logos and Messiah models were complementary in the centuries before Chalcedon, the complementarity was largely implicit, taking the form of a sort of tact or discretion in the handling of the models. "Compromise models," or other formulas governing the models' reciprocal limitations, were not much in evidence (unless perhaps the tradition of the *communitatio idiomatum* played such a role). The third of the hypotheses I suggested above is that the creed of Chalcedon gave a set of rules for the proper complementary use of the models. Clearly, the rules it provided (if indeed it did provide rules for this purpose) were partial and indirect. In trying to evaluate the hypothesis, an historical theologian should follow his usual procedure in analyzing creeds. The functions of a creed which follows a long period of discussion of the issues it deals with are (1) to isolate and restate the principal sound points which emerged in the discussion, and (2) to call attention to the trends of thought which led into blind alleys and unacceptable conclusions. The historical theologian tries to show how, and how well, the creed performs these functions. In evaluating our hypothesis, he would thus attempt to see (1) whether and how the statement of Chalcedon gives sanction to discourse in which the models are handled with appropriate tact, and (2) whether and how it rules out specific implications of one model that would clash too violently with implications of the other.

The task of evaluating our third hypothesis is obviously an intricate one, involving study both of the relation of the creed to previous controversial writings and, in turn, of the relation of the latter to the homiletic and catechetical writings they were meant to defend and clarify. Fortunately, in pursuing the task one could expect to be able to build on previous historical work. For instance: historians have often analyzed the developments before Chalcedon as a series of interactions between Antiochene and Alexandrian strands of christological thought. They have found the achievement of Chalcedon to be its finding formulas to preserve as fully as possible the most vital points in each strand, while ruling out those tendencies
in each which are flatly incompatible with the vital points in the other. Here obviously is a clue. If (as seems at first sight plausible) we could show that the Logos model dominated Alexandrian thought about Christ and the Messiah model dominated Antiochene thought, then we would have gone some way toward showing that Chalcedon in effect defined a relation of complementarity between these two models.

This still seems a promising program, but there are additional complications to be considered. According to the authoritative work of Grillmeier, the interacting factors were two “theological frameworks,” not to be identified too closely with the Alexandrian and Antiochene schools, which he calls the “Logos-sarx” (Word-flesh) and “Logos-anthropos” (Word-man) frameworks. “The tension between these two ways of interpreting the person of Jesus Christ dominates the history of Christology from Origen to the Council of Ephesus (431).” As the name implies, the Logos-anthropos christology stressed the presence in Christ of the Logos and a complete man (with human body, soul, and mind); its great problem was to explain the nature of their unity. The Logos-sarx framework stressed the union of the Logos with human flesh, and tended to deny, gloss over, or speak weakly and confusedly of the presence of a human soul and mind in Christ.

It appears that both frameworks can be regarded as attempting to do justice to both Logos and Messiah models, though the Logos model is clearly dominant in the Logos-sarx framework. (Also, Grillmeier’s account leaves one with the impression that in the Logos-sarx framework the humanity of Christ was considered more from the point of view of the theory of salvation—“He became as we are so that we might become as he is”—than with reference to his messiahship.) Both models can obviously be more fully accommodated within the Logos-anthropos framework, which was predominant (with the infusion of some ideas from its rival) by the Council of Ephesus. The main problem at Chalcedon, twenty years later, was to find adequate expression within the Logos-anthropos framework for the unity of the person of Christ.

We cannot, then, see Chalcedon as the direct confrontation of a strand of thought dominated by the Logos model and another strand dominated by the Messiah model. If there were such strands, they had been interwoven—in more than one way—well before Chalcedon, and the confrontation there was between different ways of interweaving the strands. The task of evaluating the three hypotheses suggested above is indeed large and intricate. But the investigations it requires promise to be rewarding in themselves, whether the hypotheses are sustained or not, and whether or not the idea of complementarity turns out to be a useful one in the study of the development of christological thought.
3. Love and Justice in God

We saw at the beginning that Bohr thought theologians could make good use of the idea of complementarity in discussing the relation of love and justice in God. Certainly the relation of God's love and mercy to his justice and wrath have been a major problem in theology. (One should perhaps say "a cluster of problems," since the issues raised by the opposition mercy/justice are not quite the same as those raised by the opposition love/wrath, etc. But in our discussion we shall ignore this complication.)

Whether the problem amounts to a paradox is an arguable point. Theologians have tried in a variety of ways to show that there is no contradiction in speaking of God as both just and merciful, both wrathful and loving. In our terms, their efforts can be classified either as attempts to dissolve the paradox or as attempts to show that there is not even the prima facie contradiction necessary to constitute the problem a paradox. One strategy for dissolving the paradox (where a paradox is acknowledged) is to distinguish between the sinner and his sin, and say that God's wrath is directed to the sin, his mercy to the sinner. But it is hard to reconcile this distinction with biblical passages which speak of God's wrath against sinners, or with the fact that justice is done to persons rather than to states or properties of theirs (e.g. sin). Another approach is to argue that there is no necessary incompatibility between the terms of the alleged paradox by citing cases in which the same person has both attitudes simultaneously. A judge may sometimes find a way of exercising mercy to the defendant without compromising the claims of justice. Still another approach is to say that God's attitude is really love, and the sinner in his estrangement misinterprets it as wrath.

These examples are given as illustrations only. We cannot here survey the variety of attempts to deny or dissolve the paradox of love and justice, nor argue their merits. But no one of them has proved persuasive to most theologians. Each has been found to have serious drawbacks. Nor does it seem plausible to regard the relation of love and wrath in God as a poetic paradox, nor as an instantiation of the paradox of the religious ultimate. Let us consider then whether it will bear a complementarist interpretation.

The first step in searching for a complementarist interpretation of a paradox is to look for an appropriate pair of models. In this case the models are easier to find than in the case of the christological paradox. The rigorously just Judge (who may or may not also be regarded as wrathful) and the loving, merciful Father are the models to be considered. Is there a complementary relation between them in theological thought? The theological thought with which we shall concern ourselves here is not (as it was in part of the last section) technical, systematic theology, but rather the effort of religious men to interpret their experience with the aid of theological doctrines and models.
There do seem to be situations in which the one model is much more easily applied than the other. Amos understood the woes of Israel by means of the model of God as a just Judge; if someone had asked him if God were not also he whose property it is to have mercy, Amos would presumably have had to agree that this was true, but this model was hard to apply in the situation at hand. Consider a case on the other side. A man is saved from a disaster in which many perish. His devout friends, interpreting the event by means of the model of a loving heavenly Father, see it as an instance of divine deliverance. But someone asks, Where is the justice in this? Why was he saved while the others perished? The question is hard to answer, the model of the just Judge (or, here, Ruler) hard to apply.

A simple, theologically naive response to these situations would be to say that God is sometimes just and sometimes merciful, or just to some and merciful to others. One might then be tempted to say that the theological models are complementary—but this would depend on the naive misunderstanding of complementarity according to which it means the quite independent use of two different models to interpret two different ranges of behavior of the same thing (e.g. light). (As we have seen, this misunderstanding often crops up in expositions of the wave-particle duality.) This attempt at a complementarist interpretation of the love/justice paradox would be theologically unacceptable as well as misrepresenting the idea of complementarity. For of course it is a basic theological principle that God is always the same—always just, always loving.

Orthodox Christians will insist that both models for God—the rigorous Judge and the merciful Father—are relevant to the interpretation of all their experience. Where a judgment like Amos' is made, the sense in which God can be said to be merciful is very indefinite, and the sense in which he is just is clear and sharp. But not quite perfectly clear and sharp, for there is in the background the conviction that somehow—even if we cannot say how—God is here being merciful as well as just. The freedom and precision with which the model of God the rigorous Judge can be applied are very slightly limited by the background presence of the model of God the merciful Father. Other situations will call for interpretations in which more of an attempt is made to combine the models. For an example we may turn again to the Book of Amos. There are passages (e.g. 9:7-15) which introduce the idea of the remnant, who will be the basis of a purged and restored Israel after the holocaust. Justice will be executed upon Israel, but mercy will be shown to the remnant (and thus to Israel as a nation, if not to most of its inhabitants). It is hard to tell, in Amos and other prophets who speak of the remnant, whether they are spared out of mercy or in recognition of their individual (and atypical) righteousness. At any rate, mercy is shown to Israel as a nation in that some of its people are spared to form
the nucleus of Israel restored.

If the models can be harmoniously integrated they are not complementary. In some cases it may be possible thus to combine them in a non-complementary way. But in many cases the combination seems to be uneasy; the application of neither model can be carried out with full consistency. In the case of the destruction of Israel with the survival and restoration of a remnant, is God's justice strictly satisfied? Or is it qualified by his mercy? And is he being a merciful Father to Israel when he spares a few and destroys the rest? Questions like these often arise when the attempt is made to combine the models. When the combination of the models is thus uneasy, their relation may be said in a genuine but weak sense to be complementary. It is a genuine sense because the models do limit each other. It is a weak sense because the ways in which they limit each other seem to be ad hoc, depending entirely on the particular situation in the interpretation of which they are combined. To obtain a stronger sense we need to find some formula or compromise model which governs in general the reciprocal limitation of the models. We need some specification of how the need to use both models restricts the freedom and precision with which each can be employed. We can hardly ask for mathematical uncertainty relations in theology. But we want some qualitative specification, more definite than the observations (1) that if one model is applied strictly, the application of the other will be quite vague, and (2) that where the models are combined the ways they limit each other will depend on the particular case. Neither of these observations is false, but for a strong sense of complementarity we need something more definite.

If one is looking for a compromise model which will approximate as nearly as possible the properties of both waves and particles, the wave packet is the almost inevitable choice. There does not seem to be any one such obvious compromise between the loving Father and rigorous Judge models. In practice the compromise is effected in a variety of ways, sometimes, for instance, with the aid of the model of the Sovereign—a primary model in its own right rather than an artificial compromise. A particularly interesting model in this connection is the Old Testament picture (prominent also in some forms of Christian thought) of God as the covenant partner. God has established a covenant with Israel, or with the Church, or even (Genesis 9:8-17) with all living creatures, and the idea of his faithfulness to his covenant could provide a principle to govern the ways the models of Judge and Father should be employed. He judges his people because, and as, faithfulness to his covenant requires it; he is merciful because, and as, faithfulness to the covenant requires it.

It is interesting that Eichrodt, for whom the idea of the covenant is the central idea to use in Old Testament interpretation, finds two distinct strands of covenant tradition. For one strand, Israel’s covenant relation
with Yahweh begins at Sinai and the meaning of the relation is largely found in the commands given there. For the other, the relation begins with the call of Abraham, is renewed repeatedly (most importantly at the Exodus and with the establishment of the Davidic monarchy) and has as the core of its meaning Yahweh’s solicitous care for his people. In the latter of these strands of tradition, the model of God as Father is clearly more nearly approximated than is the model of God as Judge, to which the Sinai tradition comes closer.

The strands can be analytically separated, but they are closely intertwined. In such a situation, where the literature he is to interpret includes diverse but closely related uses of a common term, the historian has two potentially profitable procedures open to him. One is to isolate two (or more) strands of tradition and study their interaction. The other is to find a single general interpretation of the common term and study how it is developed in one direction or another in different circumstances. The latter way of studying Old Testament usage of the covenant idea should help us to determine whether in fact it was used to govern the complementary use of Judge and Father models for God. For if we could find a basic understanding of the idea of covenant, which could be made by appropriate emphases to approximate either the relation of Judge and judged or, alternatively, the relation of Father and loved child, then we should have an interesting parallel to the wave packet, which can be made to approximate either a wave or a particle.

There is another important point. In both Jewish and Christian thought the basic understanding of the covenant is determined by certain crucial events: the call of Abraham, the Exodus and the giving of the Law, and David’s monarchy in one case; the life, death, and resurrection of Christ in the other case. These are interpreted events; the idea of the covenant (among others) enters into their characterization; but they serve as touchstones for the understanding of that idea. Indeed they are touchstones for all theological thought in the Jewish and Christian traditions. They are paradigms to which all use of models must conform, e.g. in Christian theology the coming, death, and resurrection of Christ must be the definitive manifestation of both the justice and the mercy of God. Any general formulation of a complementarity relation between two models would therefore have to take account of the role of the key events in limiting the ways that the models can be applied to the interpretation of particular situations. It is the revelatory events which ultimately govern the relation (complementary or otherwise) between the Judge and Father models. Such ideas as that of the covenant can be important as proximate guides in understanding that relation.
4. Concluding Reflections

We have not answered the questions, "Are theological paradoxes like the wave-particle duality? Do complementary models underlie them?" We have found reasons to be skeptical of either a quick "yes" or a quick "no" to these questions. In no case has a clear and strong analogy between the wave-particle duality and a theological paradox been shown, and it seems clear that to show one would be a subtle and intricate task, involving a rather sophisticated study of the ways various models have been used (for the most part implicitly) in religious writings. On the other hand, none of the principal alternative approaches to the interpretation of theological paradoxes seems adequate. For each of these approaches there are paradoxes to which it seems inappropriate, or (if in principle appropriate) has not been successfully applied. Thus there is room for a complementarist interpretation if it can be carried out, and in a variety of contexts we have found lines along which a complementarist interpretation might be constructed.

As John Wisdom likes to remind us, there are questions, and many if not most philosophical questions are among them, which do not really call for a "yes" or "no" answer. The answer consists rather in bringing out as fully as possible the pros and cons of the argument. Wittgenstein's question "Is a tomato a fruit or a vegetable?" is of this sort, as are Wisdom's "Can you unintentionally keep a promise?" and "Did defendant's actions constitute negligence?" The first and last of these questions require a decision, by the taxonomist and the judge respectively. But unless a man has a stake in the decision, or has to make it, he will be more interested in the reasons on each side than in the decision. Our questions are much like this. The appropriate answer to "Are theological paradoxes like the wave-particle duality?" is not "yes" or "no" but a full account of the ways in which they are like and unlike. We have not answered the question in this sense either. But we have begun the process of answering it, by exploring two questions which must be answered before it can be, and whose answers are not in this case obvious: (1) In what ways could they be like or unlike? What are the relevant points of comparison? (2) What sorts of investigation would enable us to discover points of likeness and unlikeness?

In attempting to answer Wittgenstein's question about the tomato, one could be led into botanical investigations of interest in themselves, apart from their bearing on the taxonomist's decision and apart from the project of drawing up the fullest possible list of fruit-like and vegetable-like properties. Something like this has happened with our questions. Our efforts to think through what a complementarist interpretation of theological paradoxes would involve, and what sorts of interpretation would be alterna-
tives to it, have opened up some potentially worthwhile lines of inquiry for philosophers of science, for philosophers of religion, and for historians of religious ideas and doctrines.

The principal contribution to the philosophy of science is a definition of complementarity which links it explicitly with the idea of scientific models. How significant this contribution is depends largely on the importance of the concepts “complementarity” and “model” for the philosophy of science, and on the accuracy of my understanding of the physics involved. All these points are open to dispute, since I am not a physicist and since many philosophers of science think that “complementarity” and “model” are unhelpful concepts. I do not agree, but have not attempted to vindicate their usefulness, since my primary interest was to obtain an understanding of complementarity which would be a useful tool in the study of theological paradoxes.

The main contributions to the philosophy of religion are (1) the points made and suggested in the middle chapters of the essay, and summarized in the first section of this chapter, concerning religious paradoxes and their implications as to the nature of theology, and (2) a point of view for the study of one of the most interesting contemporary philosophers of religion, Ninian Smart.8

Finally, historians of religious doctrines may find the idea of complementary models a useful tool in the analysis of doctrinal developments in which there is conflict or tension among the leading ideas—an alternative, for instance, to the thesis-antithesis-synthesis scheme which has often been employed in such cases. I have attempted, so far as limitations of space and of my competence as an historian would allow, to suggest how such analyses might be conducted.
NOTES TO CHAPTER ONE


5. R. W. Hepburn, *Christianity and Paradox* (London: C. A. Watts, 1958), pp. 16ff. Hepburn’s line of argument starts out with a question which, he suggests, is prior to the one raised above, and develops in such a way that the latter never comes back into the picture. The prior question is whether the theologian can vindicate his claim at least to be talking about something with his paradoxical expressions, as the physicist can by pointing to light. This leads Hepburn to consider in turn various ways in which theologians try to justify said claim. Thus his concern is not with the functions of paradox in theology, but with the general question whether theology can be shown to have a point or use which would warrant a detailed investigation of the functions of its paradoxes, or for the sake of which we might be willing to live with them.


8. Ibid., p. 67.


10. Ibid., p. 48.


13. Ibid., pp. 32, 15.


NOTES TO CHAPTER TWO


3. An associate of Bohr’s writes that Bohr had arrived at the epistemological principle, and found an illustration for it in some rather recondite mathematical relations, well before he began the physical investigations for which he is known. See Aage Petersen, “The Philosophy of Niels Bohr,” Bulletin of the Atomic Scientists, XIX (Sept. 1963), 9ff. Bohr always insisted that complementarity is an epistemological principle for which atomic physics simply provided a vivid illustration. See his Atomic Theory and the Description of Nature (Cambridge: At the University Press, 1961), pp. 96ff.


5. Ibid., p. 315.


8. Ibid., pp. 356ff.


11. The term “pseudo-realistic” is Bohr’s. See his “Discussion with Einstein” in Schilpp, op. cit., pp. 199ff.


14. See note 3, this chapter.


16. This is the so-called “correspondence principle,” which can be taken independently of the complementarity principle, though Bohr associates it closely therewith.


18. Ibid.


NOTES TO CHAPTER THREE

2. Ibid., pp. 59ff.
3. Ibid., p. 84.
6. Hughes, op. cit., pp. 5f.
7. The formula is to be read, “There is one and only one $a$ which has both the properties, that it is almighty and that the Father, Son, and Holy Spirit stand in the constituting relation to it.” As the system stands, the possibility is left open that there might be a different $a$ for each of the monadic predicates. This flaw is easily rectified by an obvious additional postulate.
11. Ibid., p. 366.
14. In the above sketch I have discussed only the “analogy of proportion.” The “analogy of proportionality,” while it must be brought in if the doctrine of analogy is to explain how connected theological discourse is possible, does not seem to affect our point.
15. “Unspecifiable” because the qualification cannot be “written into” the assertions; we cannot reformulate them so as to take it into account. See the last sentence of the paragraph.
16. For a discussion of some important attempts to find one Grundparadox on which the others hinge, see Henning Schröer, *Die Denkform der Paradoxalität* (Göttingen: Vandenhoeck & Ruprecht, 1960).

NOTES TO CHAPTER FOUR

2. Ibid., p. 12.
3. Smart obviously (and acknowledgedly) draws on Rudolf Otto for his characterization of the worship-oriented context of religious experience and its associated strand of discourse. He differs from Otto in regarding the mystic’s quest as providing a different context of religious experience and strand of discourse, one which can be combined with the worship strand in such a way as to modify the force of its

4. Described by Buddhaghosa in the Theravada Buddhist classic The Path of Purity, and redescribed in Reasons and Faiths, pp. 95ff.

5. Reasons and Faiths, p. 81.

6. Ibid., p. 106.

7. Mysticism East and West, op. cit., Appendix VI.

8. "Philosophy, Theology, and the Natural Sciences" (Available from the Publications Officer, the Registry, the University of Birmingham), p. 11.


11. Reasons and Faiths, pp. 79f.

12. Ibid., pp. 46ff.


17. Ibid., p. 94.


21. Slater, op. cit., p. 3.

22. That for Otto "paradox" means "contradiction" is suggested when he speaks of mystics' "exaggerating to the point of paradox" the negative side of what we have called the affirmation-negation paradox. Cf. The Idea of the Holy, p. 29.

23. Ibid., pp. 17, 68. The translation in the text is the one in the English-language hymnbooks. Otto's translator renders it, "God himself is present."


NOTES TO CHAPTER FIVE


2. One distinguished scholar contended that the Creed was a hymn, composed by Ambrose and sung in the streets of Milan. But his colleagues have understandably found his view eccentric. See J. N. D. Kelly, The Athanasian Creed (New York: Harper & Row, 1964), p. 115.


5. Grillmeier, op. cit., p. 175.
