FIRST ORDER PRINCIPLES IN SCIENCE AND RELIGION

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IT IS A common feature of any systematic intellectual discipline or conceptual framework which employs an elaborate system of concepts to contain fundamental propositions which are immune to falsification in the sense that any apparent counter-instance will be countered by qualifications or a reinterpretation. In short, it is the nature of these systematized bodies of knowledge to defend their fundamental principles against contrary instances by qualifying statements and exception-clauses, a procedure which makes these important propositions in fact immune to falsification in the sense that no evidence is ever allowed to count decisively against their applicability or truth. These fundamental principles which are in this manner unfalsifiable and which are necessary for the organizing and structuring of data within the particular conceptual framework—whether it be Newtonian or quantum mechanics, geometrical optics or evolutionary biology, Freudian psychology or theistic Christianity—I shall refer to as "first-order principles," and it is their logical nature which this paper will attempt to disclose.

By "first-order principles" I intend what have been variously termed "framework principles" (Hilary Putnam), "paradigms" (T. S. Kuhn), and "categorial commitments" (Everett Hall):[1] examples of such principles are the Principle of Causality, Newton's Laws, the Principle of the Rectilinear Propagation of Light, the Principle of the Conservation of Energy, some formulation of the biological principle of natural selection,[2] and the theistic principle, "God loves mankind." I shall argue that none of these propositions, as it is employed, is falsifiable: each is a principle *in accordance with which* evidence is construed or interpreted. These principles, then, determine what is allowed to count as evidence within the conceptual framework or body of knowledge. "Knowledge" here is interpreted along Quinean lines as expressed in his "Two Dogmas of Empiricism" when he says that knowledge

[1] See Hilary Putnam, "The Analytic and the Synthetic," in *Minnesota Studies in the philosophy of Science:* Volume III (Minneapolis: U. of Minnesota Press, 1962); T. S. Kuhn, *The Copernican Revolution* (New York: Random House, 1959) and *The Structure of Scientific Revolutions* (Chicago: U. of Chicago Press, 1962); Everett Hall, Philosophical Systems (Chicago: U. of Chicago Press, 1960).

[2] See A. R. Manser, "The Concept of Evolution," *Philosophy*, XL (No. 151, January 1965); A. D. Barker, "An Approach to othe Theory of Natural Selection," *Philoosophy*, XLIV (No. 170, October 1969).

is a man-made fabric which impinges on experience only along the edges. . . . A conflict with experience at the periphery occassions readjustments in the interior of the field. There is much latitude of choice as to what statements to reevaluate in the light of any single contrary experience . . . .

If this view is right, it is misleading to speak of the empirical content of an individual statement—especially if it is a statement at all remote from the experiential periphery of the field. Furthermore, it becomes folly to seek a boundary between synthetic statements, which hold contingently on experience, and analytic statements, which hold come what may. Any statement can be held true come what may, if we make drastic enough adjustments elsewhere in the system.[3]

If this view of the logical structure of systems of knowledge (conceptual frameworks) is correct, there are several important consequences. First, cognitive and factual significance is determinable *only within the conceptual framework.* Second, the verification/falsification principle of factual significance is inapplicable to first-order principles, taken individually. Third, although these principles are immune to falsification and are in this sense "analytic-within-the-conceptual framework," they are nevertheless empirically relevant in that they determine what is taken or allowed to count as *evidence.* A summary of my analysis, then, runs as follows: the conceptual framework determines what is taken as *evidence* by imposing its concepts, categories, and first-order principles upon experience. But as what is taken to be a fact is determined on the basis of evidence, ultimately the conceptual framework with its first-order principles determines what the *facts* are. Finally, since making knowledge claims consists in stating what is taken to be the facts within any conceptual framework, ultimately it is the conceptual framework which determines both cognitive and factual claims (knowledge claims). Thus both cognitivity and factuality or cognitive and factual meaning are determined by the conceptual framework.[4]

I.

In explaining how first-order principles of a conceptual framework

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[3] Willard V. O. Quine, *From A Logical Point of View* (New York: Harper Torchbook, 1963), pp. 42-43.

[4] This analysis seems to me not unlike Carnap's position, according to which there are onlv two sorts of meaningful statements, analytic and empirical: the former follow trivially from the first-order principles or rules of the conceptual framework; the latter are statements whose truth or falsity is determinable by comparing them with experience, according to the manner specified by the analytic principles mentioned above. Meaningful statements, therefore, are (1) true *analytically* by the rules and principles of the conceptual framework or (2) true or false *empirically* when checked against experience in accordance with those rules and principles.

construe, determine, or interpret evidence allowed within that system, I shall employ three specific examples: the Principle of Causality as Uniformity, according to which like causes produce like effects; the Principle of the Conservation of Energy, according to which in any closed system there is never a loss of energy/momentum; and the theistic principle that God loves mankind. From these I shall generalize concerning the logic of all first-order principles.[5]

(a) Causality, that principle which enables us to formulate deterministic theories, is the *conditio sine qua non* of the sciences. Relating phenomena causally assures deterministic descriptions; without these, there would be no scientific explanations or scientific prediction. Unless either strict or statistical[6] determinism is maintained in some sense, science as we have it today would be impossible. Whether it be the physicist Max Planck's admission that physics has developed on the assumption of causality,[7] Professor Ernest Nagel's claim that "the acceptance of the principle of causality as a maxim of inquiry . . . is an *analytic consequence* of what is commonly meant by 'theoretical science,' "[8] or Professor Henry Margenau's statement that "causality has transformed itself into a methodological component of scientific understanding,"[9] few if any scientists would dispute Margenau's claim that "all branches of science that have reached a satisfactory state of precision espouse causality as a principle of their methodology, indeed . . . they employ it in the form of temporal invariability of laws. . . ."[10] Whether it be Newtonian or quantum mechanics or the nonmechanistic field theories such as the Fourier theory concerning heat flow and Einstein's general relativity theory, all scientific theories are *deterministic* in that they manifest what Mill called "the principle of the uniformity of nature," according to which there are parallel cases in nature such that what once happens will, under like or sufficiently similar circumstances, happen again. Or as Professor Nagel points out,

[5] See Ernest Nagel, *The Structure of Science* (New York: Harcourt, Brace, and World, 1960) for an excellent analysis of those first-order principles of Newtonian mechanics; see Stephen Toulmin, *The Philosophy of Sciencc* (New York: Harper Torchbook, 1960) for a thorough analysis of the logic of the first-order principle of geometic optics, the Principle of the Rectilinear Propogation of Light.

[6] It has long been recognized that many statistical theories are deterministic: this is true of radio-active phenomena and the laws pertaining to them, as well as to the law of gas pressure. Nagel writes:

> Although statistical mechanics does not predict the individual mechanical states of the molecules of a gas, it would be a mistake to conclude that statistical mechanics is not a deterministic theory. . . . Statistical-mechanical state-description is defined in terms of *statistical* state-variables, not in terms of the state variables of particle mechanics. With respect to its *own* mode of specifying the state of a system, statistical mechanics is a strictly deterministic theory. (p. 291)

[7] Max Planck, *The Philosophy of Physics* (New York, 1963), p. 53.

[8] Nagel, *op. cit.*, p. 324,

[9] Henry Margenau, *The Nature of Physical Reality* (New York, 1950), p. 408.

[10] *Ibid.*, p. 412.

they all are deterministic in that they meet "the requirement that, when the state of a system is given for some initial time (in whatever manner the state may be defined), the theory for it must determine a unique state of the system for any other time."[11]

The Principle of Causality, according to which like causes produce like effects, is employed in the physical sciences in such a way that it is immune to falsification. When causality (or determinism) is threatened, scientists tacitly employ it (1) to limit what constitutes or is interpreted to be an "event,"[12] (2) to impute states and properties,[13] (3) to establish new rules of correspondence, [14] and (4) to discover (invent) or in some way introduce new concepts and/or entities.[15] The implicit introduction of a general protective qualifying clause, *ceteris paribus,*[16] and the ruling out of persistent objections (for example, in quantum mechanics) as ungrammatical and meaningless[17] are other ways by which scientists insure the validity of their methodological principle, the Principle of Causality.[18]

(b) Like the Principle of Causality, the Principle of the Conservation of Energy is also immune to falsification as it is employed. For example, when it was seriously challenged by the results of experiments on beta-ray decay, the Principle was not abandoned. Instead, "the existence of a new kind of entity (called a 'neutrino') was assumed in order to bring the law into concordance with experimental data."[19] So important is this Principle to our science that its abandonment "would deprive a large part of our physical knowledge of its systematic coherence."[20] Whether in the face of contrary instances laws or principles are retained (such as the two we have just discussed) or abandoned (such as the principle of the conservation of parity in quantum mechanics) depends upon their importance within the conceptual framework and "the greater intellectual havoc that would ensue"[21] from their rejection. A principle which functions logically as a premise *from which* conclusions about data are drawn is more easily

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[11] Nagel, *op. cit.*, p. 320.

[12] Planck, *op. cit.*, p. 53.

[13] See Nagel, *op. cit.*, p. 293 and Margenau, *op. cit.*, p. 392; also Philipp Frank, *Modern Science and Its Philosophy* (Cambridge, 1949), pp. 56-57. 175-176; and Poincaré's *Science and Hypothesis* and *The Value of Science.*

[14] See Heisenberg and Born, and Margenau, *op. cit.*, pp. 418-419.

[15] Planck, *op. cit.*, pp. 64-65.

[16] Authur Pap, "Philosophical Analysis, Translation Schemas, and the Regularity Theory of Causation," *The Journal of Philosophy*, XLIX (October 9, 1952), pp. 657-666.

[17] See Frank, *op. cit.*, p. 163; Nagel, *op. cit.*, pp. 301-303; Planck, *op. cit.*, 63-64; also Moritz Schlick, "Causality in Contemporary Physics," *The British Joural for the Philosophy of Science, XII* (February 1962), pp. 281-298.

[18] For an analysis employing all these examples, see my "Science and Religion: Their Logical Similarity," *Religious Studies,* V (Fall 1969), pp. 49-68.

[19] Nagel, *op. cit.*, p. 65.

[20] *Ibid.*, p. 66.

[21] *Ibid.*

relinquished than one which functions as a principle *in accordance with* which inferences about data are drawn: this latter logical property is characteristic of "first-order principles." The existence and employment of principles of this sort in science has been acknowledged by such scientists and philosophers as Duhem, Poincaré, Frank, Schlick, Margenau, Kuhn, Toulmin, and Nagel, among others.

Margenau has indicated the unusual relationship between the two principles which we have been discussing. He explains that although one of the necessary pre-conditions for causality is "the availability of finite 'closed systems' "[22] which are systems in which energy is conserved, such "completely closed systems, however, are never found in nature."[23] It is, therefore, the function of the Principle of the Conservation of Energy to form idealizations of nature into systems of the necessary sort. In other words, closed systems are assumed in order to apply the Principle of Causality. "Thus Causality, even in the condition which it imposes on physical experience before it makes a positive assertion, implies something that is far from obvious. Its implication is: *There are closed systems*."[24] We therefore discover a circularity in the relationship of the Principle of Causality and the Principle of the Conservation of Energy: the latter is presupposed in many fields for the applicability of the former, and the former is the necessary condition of the latter.

(c) The truth of the proposition "God loves mankind" has been subject to attack since "the problem of evil" was first raised by the atheist. Recently, under the positivistic influence and adoption of the verification/falsification principle of factual significance, the statement has been attacked as cognitively meaningless and factually nonsensical because it is immune to falsification. Let us examine, briefly, the logic of this statement.

It is obvious that the religious believer employs a host of exception-clauses to insure the unfalsifiability of this fundamental principle. Arguments have been offered to show that evil, pain, and suffering are good either as a *means* of bringing about a second-order good or as a necessary condition for God's *testing* us, *training* our characters, and *punishing* us when we fail to live up to His commandments. The very possibility of evil is said to be a necessary condition for the *freedom of the will* and for the subsequent *salvation* through the grace of Christ. Evil has been blamed on Satan and the fallen angels as well as on man's original sin, the Fall of Adam, and our sinful self-regarding selfish natures. Moreover, it has been argued that evil is only *apparent*,

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[22]Margenau, *op. cit.*, p. 398.
[23]*Ibid.*, p. 399.
[24]*Ibid.*

that it is only a *privation* of good, and that it is a *logical correspondent* to good. From Job's humble response in the face of his Creator to St. Paul's claim to be filled with comfort and overflowing with joy in his afflictions, religious believers have offered reasons for maintaining the truth of their belief in the love of God.[25]

Not only is "God loves mankind" defended against all seeming evidence to the contrary, but indeed the very concept of God within the Christian religious framework is inextricably tied to His love of man. Did He not so *love* the world that He sent His Only Begotten Son to redeem it? Furthermore, it is ultimately in this light that the proofs for the existence of God become intelligible. Who other than a *loving* God would (a) *create a world* and give man his exalted place within it, (b) order the world according to laws through whose discovery and employment man would come to control and use nature for his own good, (c) give *moral laws* for the guidance of human conduct, (d) intervene in the lives of men to perform miraculous deeds, and (e) communicate with men through religious experience. Only a belief in a *loving* God gives sense to what the religious believer claims in the cosmological, teleological, moral arguments for the existence of God and the arguments from miracles and religious experience.

II

I have tried to illustrate very briefly the systematic use of three first-order principles within their respective conceptual frameworks. It is now time to examine their logical nature as determined by this use.

First-order principles are unfalsifiable and yet are empirically relevant. They are unfalsifiable in that they are taken as (a) principles in accordance with which evidence is construed and interpreted, (b) *a priori* and analytic-within-the-framework, and (c) implicit imperatives to construe the evidence in accordance with themselves. First-order principles, however, are factually significant in that (a) they determine what counts as *evidence, thereby* (b) determining what propositions may be said to be *factually meaningful.*

First-order Principles are Unfalsifiable

(a) It would be clear from the analysis in Part I that the Principle of Causality, the Principle of the Conservation of Energy, and "God loves mankind" all are principles in accordance with which evidence is construed and as such are unfalsiable. Within physics or Christianity, whenever seeming contrary evidence was forthcoming, it was

[25]Whether any of these replies can be justified or substantiated in the light of criticism is a moot question but not within the scope of this paper.

modified so as to insure the universal application of the first-order principle. Whether this was to add new properties, invent or discover new particles, construct new rules of correspondence, or simply to reinterpret the data in an acceptable manner, the logic remains the same.

(b) Let me attempt to state in what sense first-order principles are analytic-within-the-framework by clarifying the difference between this and analyticity. Two aspects are involved in the difference. "All red things are red" is known by its meaning and form to be definitionally true in any universe of discourse: it is analytic in the usual sense of the term. But this is not the case with those statements which I have labeled "analytic-within-the-framework." First, one must understand the discourse of the conceptual framework in question to understand which statements are *taken as analytic;* and, second, one must understand the *employment* of these statements to discern that they are analytic in this special sense. Let me explain these two aspects separately.

Any statement which is analytic-within-a-system is *treated as though* it were *definitionally true only within the given conceptual framework.* "Parallel lines will never meet," for example, is taken as definitionally true or analytic *only* within *Euclidean* geometry, not within every possible geometry. Similarly, one could conceive of a universe in which like causes did not produce like effects, but this is not the universe depicted by our physical sciences. I suppose that one could conceive of a physics and chemistry in which there was no conservation of energy/momentum, but this is not the physics and chemistry that have actually developed: within our contemporary sciences as we now have them, every closed system *is* a system in which there is conservation of energy/momentum.

The same is true of Christianity. It does not take much examination to conclude that "God loves mankind" is *a priori* true and analytic-within-the-conceptual framework. It is almost as though God were *defined* as "Love." Evil, suffering, and pain may abound; but this merely proves to the believer that God has chosen to absent Himself and that man has forced His eclipse[26] or that He is "dead" in some loose sense. But in eclipse or dead, God still loves and cares for mankind. Clearly, then, if no situation is allowed to count decisively against God's love, if nothing is construed as conclusive evidence against His love for mankind, the statement "God loves mankind"becomes true *a priori* and analytically *within Christianity.*

Similar examples could be cited. If, for example, the eight tennis tournament finalists were paired in the following way (*A* plays *B; C, D; E, F;* and *G* plays *H*), everyone who understands the rules of tennis

[26]See Martin Buber, *Eclipse of God* (New York: Harper Torchbooks, 1965).

tournaments knows that *A* and *B* will not play one another—indeed, they *could not*—in the final match. Now surely this is an empirically relevant statement about players *A* and *B*. But it is something which can be known *a priori* from the way tournaments are now set up, although, of course, not under possible alternative rules for setting up matches. The statement, "*A* will not play *B* in the final match," follows analytically, *given the present rules of tennis tournaments*. Similarly, I submit, given the "rules of our physical sciences," we know that like causes will have (must have) like effects under similar conditions and that in any closed system energy/momentum will be (must be) conserved. For the Principle of Causality and the Principle of the Conservation of Energy are two of those fundamental principles of science which are analytically guaranteed within theoretical science and thus immune to falsification. That this is true, that these principles are analytic-within-science, is known to those who study the logic of science. Thus one must understand the logic of the conceptual framework in question to know which statements are taken as analytic, for it is the conceptual framework which confers this sort of analyticity upon its first-order principles.

The second aspect which makes a statement recognizable as analytic-within-a-system is the manner of its employment. Let me take as an example what looks like a clearly empirical statement within evolutionary biology, namely the claim that changes in the environment cause or produce changes in the population. Upon examining the logic of biology, however, one finds that the only way to determine the *relevant* changes which have occurred in the environment of a given population is to isolate the changes which *affect* that population itself. Thus, what appears to be a fundamental empirical statement in evolutionary biology turns out on closer analysis to be, in some important sense, analytic-within-evolutionary biology. Of course, the statement is not analytic or tautologous in the sense that the meanings involved make the statement definitionally true. Rather it is the procedures used in the verification of the statement which indicate that the statement is taken as analytically true.[27]

I have tried to show in Part I how three first-order principles were employed. If one examines the procedures within physical sciences, he finds that there is never *allowed* or *admitted* to be situations in which under similar conditions like causes do not produce like effects or situations in which a closed system loses energy/momentum. When one turns to Christianity, he discovers a similar phenomenon: never is there allowed to be any situation which conclusively falsifies

[27]For analyses which construe the Principle of Causality and the Principle of the Conservation of energy as tautologies and definitions, see Frank, *op. cit.*, pp. 54-57 and Henry Margenau, "Meaning and Scientific Status of Causality," *Philosophy of Science*, I (April 1934), p. 146.

"God loves mankind." The first-order principles are *procedurally* guaranteed immune to falsification: they are secured *as though they were* tautologies, definitions, or analytic statements, although very important and fundamentally empirical and relevant ones. For it should be clear from this analysis of analyticity-within-a-conceptual framework that a proposition may have this logical property and still be synthetic. In fact, all first-order principles, although employed in a manner which guarantees their truth, are synthetic.

(c) A third characteristic of first-order principles which makes them virtually immune to falsification is their tacit employment as imperatives to construe the evidence in a certain manner. The Principle of Causality, interpreted either as "every event has a cause" or as "like causes produce like effects under similar conditions," has often been analyzed in this manner. There are those who interpret the Principle of Causality as "an imperative, a precept to seek regularity, to describe events by laws,"[28] on the one hand, and as a "heuristic principle,"[29] "a maxim for inquiry,"[30] or a maxim expressing "the general objective of theoretical science to achieve deterministic explanations,"[31] on the other. It is this latter way which Professor Nagel views it:

> The principle of causality so construed is thus a generalized recommendation. It bids us construct theories and find appropriate systems to which those theories can be successfully applied, with no restrictions upon the detailed form of the theories, except for the requirement that, when the state of a system is given for some initial time . . . , the theory for it must determine a unique state of the system for any other time.[32]

Clearly from the explication in Part I it can be seen that first-order principles possess this imperative, regulative, and injunctive aspect. It is as though the physicist were told to interpret his data in such a way that like causes always produce like effects under similar conditions and that in closed systems there is never a loss of energy/momentum. Thus, where he finds "apparent" data to the contrary, the physicist must reinterpret, introduce new entities, make exception-clauses etc. Similarly, the theist employs "God loves mankind" as an implicit operating principle, never allowing anything to falsify God's love. Again, as in science, a careful distinction is drawn between the apparent evidence and the correct interpretation. As the scientist has

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[28]Schlick, *op. cit.*, p. 285.
[29]Plank, *op. cit.*, p. 83.
[30]Nagel, *op. cit.*, p. 320.
[31]*Ibid.*, p. 323.
[32]*Ibid.*, p. 320.

the final "out" of saying that he just hasn't discovered the cause, so the theist has the final option of saying that we cannot know the mind of God. Thus, tacitly those operating within a conceptual framework hold to the truth and employment of their first-order principles as though it were imperative to do so. And, of course, it is.

First-order Principles Are Empirically Relevant

If it is acknowledged that the Principle of Causality is employed to impute properties and states and that it is in accordance with the Principle of the Conservation of Energy that new entities are discovered or imputed, what is the logical status of those statements to the effect that an entity possesses a given imputed property and that certain particles or other entities exist? What, specifically, is the status of "this piece of metal is magnetic" and "the reaction takes place only in the presence of neutrinos"? I think that most scientists, asked what kind of statements these were, would reply that they were factual, empirically significant, and true.

The implication here is clear. It is the first-order principles which determine *what* is to count as evidence and *how* that evidence is to be construed. The behaviour of iron filings, for example, in the presence of a metal and the failure of a reaction to occur when not coupled with another reaction are construed as evidence that there are magnetic states and neutrinos. Of course, the connection between the evidence and the factual claim is a highly complex one necessarily involving reference to the conceptual framework. Consequently, it is by construing certain data as evidence and interpreting it in a particular manner that the first-order principles determine factual significance within a conceptual framework. Briefly, then, first-order principles are empirically relevant because they assign empirical content, interpret or reinterpret evidence; and if we hold that "this metal is magnetic," "this reaction takes places only in the presence of neutrinos," and "God must be testing you" are *factual*, then first-order principles may be said to determine what constitutes the *facts* within a given conceptual framework.

Moreover, if you were to ask a physicist whether like causes *do* produce like effects under similar conditions or whether closed systems *do* conserve energy/momentum, and similarly if you asked a religious believer whether God *does* love mankind, both would answer in the affirmative. Thus within the framework, the first-order principles are *themselves* taken to be factually true. This is also true of less inclusive principles. In geometric optics it is claimed to be true that light travels in rectilinear straight lines; in Newtonian physics it is said that things do tend to remain in constant motion or at rest unless acted upon by some external force; and in evolutionary biology it is held to be true that changes in the environment of a population will cause changes in that population. Thus although they are unfalsifiable because they are employed as principles in accordance with which evidence is interpreted, first- order principles may be said to be empirically relevant because (a) they determine which statements are factual and true and (b) they are said to be themselves factual and true.

Let me make one final important point which is related to our discussion. It seems to me that factual meaning, and meaning generally, may be determined *only with reference to some given conceptual framework.* An example of the failure to understand this point is found in A. J. Ayer's *Language, Truth, and Logic.* Ayer writes: "If . . . a man tells me that the occurrence of thunder is alone both necessary and sufficient to establish the truth that Jehovah is angry, I may conclude that, in his usage of the words, the sentence 'Jehovah is angry' is equivalent to "It is thundering'."[33] But it seems to me that to construe the statement in this way is to miss the point entirely! Suppose one were to make a similar comment to a physicist who, finding a change in the spectrum of an element when looking through a spectroscope, said, "There has been a change in the orbit of electrons." Would a bystander be entitled to claim that the physicist's statement was equivalent to "There have occurred spectral changes." Certainly not! For when the physicist is talking about changes in the orbits of electrons, he is speaking in the context of an entire theoretical framework for which he has rules of correspondence which enable him to identify actually observed spectral changes with "changes in orbits of electrons." To say that the statements are equivalent is to render the entire enterprise of scientific theory-making worthless. Anyone with even a limited knowledge of science and its logic knows the crucial role which theories play in structuring data, organizing observations, and interpreting evidence. Thus, Ayer's statement entirely ignores the important point that many statements are given *meaning* and made subject to *verification* only within the conceptual framework in which they play a significant role, not individually or apart from that system. The point, then, is that the factual meaning of a statement is determined only within a conceptual framework and that statements must be understood within that system to be understood at all.

SUMMARY

I have argued that the examination of the logic of any systematic conceptual framework such as physics, biology, or Christianity will disclose fundamental first-order principles which possess the following

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[33]A J Ayer, *Language, Truth and Logic* (New York, 1946), p 116

logical features: (1) they will be immune to falsification by apparent counter-instances because (a) they will reinterpret the evidence and/or (b) they will introduce qualifying statements and exception-clauses. (c) Employed implicitly as principles which are analytic-within-the-framework as indicated by both their logical relationship to other propositions within the system and their procedural employment, (d) first-order principles also function as implicit imperatives to construe evidence in a certain manner. (2) Although immune to falsification for these reasons, first-order principles are nevertheless empirically significant since they are both (a) statements concerning what is taken to be the case within that framework and also (b) principles which assign empirical content to other statements for which they provide empirical evidence by interpreting data in a particular way. (c) Thus as legislating principles within the framework they determine the *facts* of that system and (d) subsequently determine both cognitive and factual significance. (e) Finally, in the specified sense, they may be considered synthetic *a priori*. This, I submit, is the logical nature of principles in accordance with which evidence is construed: this is the logic of first-order principles, which are common to every conceptual framework, whether scientific or religious.