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Wisdom
is the principal thing;
therefore
get wisdom:
and with all thy getting
get understanding.

(Proverbs 4:7 KJV)

"The fear of the Lord is the beginning of Wisdom." Psalm 111:10

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JOURNAL OF THE AMERICAN SCIENTIFIC AFFILIATION

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TIME FOR A CHANGE

"For everything there is a season and a time for every matter under heaven," says the author of Ecclesiastes. A time for taking on the job of being editor of the *Journal ASA*, and a time for relinquishing that job for whatever else the Lord currently holds in store. Readers will forgive me a little sentimentality in making this decision after 15 very fulfilling and satisfying years as editor. I rejoice that I can pass along the editorship into the capable hands of Dr. Wilbur L. Bullock of the University of New Hampshire, a longtime stalwart contributor to the ASA, and to Ruth A. Herr at the central ASA office in Ipswich where managing editor functions will be carried out.

In one sense at least, it is the end of an era. As the number of published pages per year increased from 136 in 1969 to 256 in 1983, and as the number of subscribers increased from 2100 to 4435 over the same period, it has become clear that the job of editor as originally conceived is a bit much for a part time job. For the past 15 years, with the able and constant help of Book Review Editors, Stephen W. Calhoon Jr. and Bernard J. Piersma, and Consulting Editors whose number has increased from 18 to 25, I have had the fun of serving as editor-in-chief, managing editor, proof reader, copy editor, layout person, photographer, advertising editor, *Journal* correspondent, and general purpose typist. I would like to mention by name those Consulting editors who have served faithfully for the same total 15 years: Dewey K. Carpenter, Gary R. Collins, Walter R. Hearn, Robert D. Knudsen, Gordon R. Lewthwaite, Russell Maatman, Russell L. Mixter, W. Jim Neidhardt, E. Mansell Pattison, and Claude E. Stipe. Of course I am grateful as well to the others who have served for part of that period, and to the constant support of the Executive Office, with Executive Directors H. Harold Hartzler, Bill Sisterson, and Bob Herrmann.

If the ASA has had an identity problem over the 42 years of its existence (professional society, branch of the Church, or what?), the *Journal* has shared in this search for an identity. I am not sure that we have always been successful. The format has remained essentially that of a professional publication with almost all of the contents of any issue consisting of the printed word and being almost completely free of extensive art work or artistic elaboration. Several years back we joined the Evangelical Press Association, who conduct an annual contest among the many publications who are members. We participated in that contest for a number of years, but not in the last few; we were simply "not making it" in the attractiveness and eye-appeal departments to have much of a chance of winning any awards. The contrast between the *Journal ASA* and almost any other Christian publication has deepened over the past decade, as most other publications have almost unanimously adopted styles and devices for catching the eye of the Christian public. This is well and good for a publication directed to the general public, but at least to date it has been our goal to keep the *Journal ASA* as a semi-professional publication with strong scientific and theological integrity.

I frequently tell people that the ASA represents the only

organization in the United States dedicated to the pursuit and interpretation of authentic science *and* authentic biblical theology. If this is true, or even if this is our goal, then what is presented in the pages of the *Journal* should have a professional quality and authenticity about it that is unmistakable. Such quality and authenticity sometimes lead to material that is not easy to read, that must be studied rather than simply browsed over devotionally. There is also the need to cover a wide diversity of material: foundational theory, description of practice, and interaction with the social conscience, to mention just a few. Inevitably this leads some of our readers to feel that papers in the *Journal* are too difficult to read, that we need to tone down the quality level in order to reach a larger audience with the distilled and simplified consequences of the interaction between science and the Christian faith. We have taken the position that a simplified presentation may well be needed, but that it should not be done at the expense of the professional contributions and level of the *Journal*.

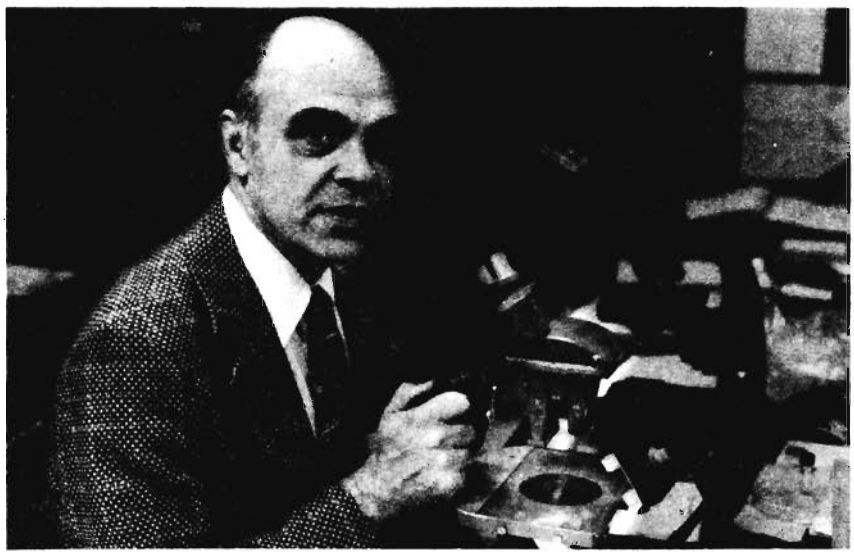
It has sometimes been complained that I have been too much of a writing editor, with the implication that an editor should shuffle the papers but leave the writing to others. I have to plead guilty to the charge. I hope that our readers have not suffered too much. Ever since my mother put a typewriter in front of me at age nine and started me on "a,s,d,f . ." writing has been my avocation. A colleague of mine once said that a blank sheet of paper was an affront to me. The pages of the *Journal* have provided me with marvelous opportunities for which I shall be forever grateful. Hopefully future editors will still be plagued with my manuscripts coming across their desks. I leave you all with my series on "Science and the Whole Person" which concludes with the installment in this issue, and which the ASA has graciously consented to pull together in a special collection that will be available on a special order basis.

Although I have not tried to appeal to the eye with special artwork, I have tried to appeal to the intellect with the stimulation of controversy in the pages of the *Journal*: not controversy, hopefully, for the sake of controversy (or even of subscriptions!), but controversy as a means to elucidating the truth. Only twice in the past 15 years has there been a major uprising with the purpose of demanding my resignation, and in both instances the Executive Office was so supportive of the editor that I suspect almost none of the members were even aware of it. To my way of thinking both of those instances give a positive comment, since a publication on science and Christian faith that provokes no one to stern attack over a 15 year period is probably not doing much to challenge or stimulate its readers' thinking.

Perhaps its been some time since you wrote to the editor with comments, support, criticism, or ideas for the *Journal*. Now would be a good time to do just that. Let Wilbur Bullock and Ruth Herr know that you welcome and support them. And don't forget the Letters department of the *Journal* as a first rate opportunity to share your response with others.

Thank you one and all. It's been a great 15 years. Lord willing, you haven't heard the last from me yet.

RHB



Wilbur L. Bullock

NEW EDITOR: WILBUR L. BULLOCK

Wilbur Lewis Bullock is Professor of Zoology at the University of New Hampshire where he has taught courses in Parasitology and Vertebrate Histology since getting his Ph.D. at the University of Illinois in 1948. More recently he has been teaching a course in the natural history of human disease, a course designed to acquaint non-biological science majors with the global impact of infectious diseases from a geographical, historical, social, and ethical perspective.

Dr. Bullock's research has been mostly in the area of fish parasitology and histology, although he has also published a few papers on medical parasite problems in New England and Costa Rica. He has had grant support from NSF and NIH as well as research sabbaticals in Florida, Texas, and Costa Rica. In 1963 he was an LSU Medical School Fellow in Tropical Medicine and Parasitology in Central America. He has served on the Editorial Boards for the Proceedings of the Helminthological Society of Washington and the Journal of Parasitology.

Dr. Bullock has been a member of ASA since 1950. He was elected Fellow in 1956 and was vice-president in 1958. As a Christian biologist he has written and spoken on some of the issues raised by creation and evolution as well as the environmental problems which concern us all. He has been an active member of several Baptist churches and is currently an elder and coordinator of discipleship for Durham Evangelical Church (Conservative Baptist).

NEW MANAGING EDITOR: RUTH A. HERR

Ruth A. Herr is a graduate of Wheaton College, (Wheaton, Illinois), with a degree in Anthropology. Special emphasis included cross-cultural communication, Bible, and literature. Her husband, David, is preparing for the pastorate. Their interests include concern for healthier American family life, building the church, and missions.

Mathematics as Rhyme

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Using the analogy between the universe and a choral poem, one may view mathematics as the "rhyme" of the universe. In that perspective new light is thrown on the unique subject matter of mathematics, the a priori character of its truths, and the relation of mathematics to other areas of knowledge. A route is thereby opened for richer use of creativity in mathematics.

Mathematics is the rhyme of the universe. Such is the role I would assign to mathematics in our understanding of God's world. This claim makes sense only within a certain framework for understanding the nature of *science*. In two previous articles (Poythress 1983a 1983b) I have argued that it is fruitful to consider that the universe is God's poem. Science exploits some special kind of analogy within the "poem." Now that same framework will serve also as the larger framework for my reflections on mathematics.

Within that framework, I declare that mathematics is the rhyme of the poem. What, then, do I want to suggest by this analogy? Several things. (1) Mathematics has to do with a particular subpart or aspect of the total "poem" of the universe. It cuts across and intersects many other analogies and metaphors within the poem. (2) Mathematics as rhyme is, in a sense, *the* most "primitive" analogy in the poem; it is based on the simple idea of identity and difference. (3) The possibilities of mathematics-rhyme are deeply bound up with the nature of the "language-system" as a whole. The properties are given largely *a priori* by the system, unlike other analogies in the poem that are included in the poem at the discretion of the creator. (4) Mathematics as rhyme functions *in the service of* the poem as a whole. It enhances the main points of the poem, but it is not ultimately intelligible simply in itself. It is far from having a totally independent purpose.

Let me now consider these points in greater detail.

Mathematics as an Aspect of the "Poem"

First of all, then, mathematics has to do with a particular subpart or aspect of the total "poem" that is the universe. I can therefore apply to mathematics some of my general statements about the universe given in the earlier articles. Mathematics is (a) *personally* structured, (b) linguistically structured, (c) shot through with metaphor and analogy, (d) utterly dependent on God, (e) characterized by *development*, (f) surprising in its victory over chaos.

Almost everything that I said earlier about science can be applied and worked out in the area of mathematics. I am not going to proceed straightforwardly to do this working out. But doing so would not be trivial. Philosophies of mathematics have often vigorously denied that mathematics was personal, or dependent on God, or at all characterized by development. Mathematics, people feel, is somehow unique among the sciences. Perhaps, they say, it is better not to classify it as a science at all. Mathematics is "independent of the world." Perhaps the discoveries in physics, chemistry, and biology are a "surprising victory over chaos," because we could imagine it to be otherwise, but mathematics is not surprising because it could not be otherwise.

Mathematics is indeed different from the sciences. I have tried to capture some of this intuitive feeling for the "independence" of mathematics by characterizing mathematics as "rhyme." With this characterization I point to the distinction between mathematics and other sciences. The other sciences are various kinds of analogies and allegories within the total poem. Mathematics is rhyme acting in coherence with these various analogies.

Mathematics as a Distinct Science

I claim that mathematics is a distinct science. It interlocks with all other sciences, much as rhyme interlocks with and reinforces the other aspects of a poem. But mathematics is not reducible to some other science (like psychology), any more than rhyme is reducible to some other aspect of the poem.

Conversely, other sciences are not reducible to mathematics. Physics talks about energies, bodies, and motions in the world, and proposes equations that might have been otherwise. It is not reducible to mathematics, since the equations of mathematics are true in any "world."

I have already talked about the fallacies and illusions of such attempted "reductionisms" elsewhere (Poythress 1976a: 48–54). And before me Dooyeweerd (1969) and others in the cosmonomic school of philosophy engaged in rather extensive explorations and critiques of reductionisms. It suffices for me to affirm two complementary truths. First, viewing the matter more positively, we can say this: reductionisms are plausible, attractive, even useful and fruitful, because of the stimulus they give to exploring and exploiting manifold analogies within the total "poem." Virtually anything, including mathematics, physics, chemistry, or some subdiscipline within these, can be used as a personal "perspective" for integrating the whole poem. The truths of the subdiscipline, by personal choice or preference, serve as a focal point around which to gather by means of analogy all the rest of the poem.

Second, we can view the matter negatively. Reductionisms oversimplify. They wipe out and smash the richness of meaning in the poem, by a monomania for seeing only one meaning. Why? The existence of two irreducible aspects of the poem in harmonious interaction is evidence of a design and a Designer. Because men would rather flee from God and hide that evidence from themselves, they proclaim that an impersonal explanation "reducing" one to the other is sufficient explanation.

Mathematics as *a priori* Truth

My next two points about the nature of mathematics belong together. First, mathematics is the most "primitive" type of analogy in the poem. Second, its structure is bound up with the nature of the "language-system" of the poem. By these aphorisms or analogies I attempt to indicate both the unique subject-matter of mathematics and the unique impression that its truths are *a priori*.

Let us prepare the ground a little by reflecting on rhyme in the literal sense. The possibility of rhyme and the characteristics of rhyme in poetry are bound up with structures of similarity and difference in a language-system. Consider two words like "love" and "dove." They rhyme if (1) the final vowel and any subsequent consonants are exactly the same in the two words; (2) the remaining parts of the two words are *not* identical in sound. By this definition "sight" and "site" are not "rhyming" words but words *identical* in sound (homonyms). Thus the phenomenon of rhyme derives from properties of both identity and difference in the phonemic system or sound system of the language. The potential for rhyme is "primitive" in the sense that it is based on very elementary properties of the phonemic system. The phonemic system in turn is the simplest and most basic of the language systems.

Now let us compare this with mathematics. Mathematics likewise has to do with properties of identity and difference in the universe—in God's macropoem. It focuses on the very most "elementary" properties, the properties of identity and difference, in the universe. This focus on identity and difference determines its unique perspective or subject-matter. Simultaneously, that focus helps to explain the apparently *a priori* character of mathematical truth. Again let us return to poetry. The possibilities for different rhyming syllables, for masculine rhymes, feminine rhymes, imperfect rhymes, and the like, are given *a priori* by the language system, before a poet sets his pen to paper. The monolingual can hardly conceive of rhyme being other than what it is in his system. Similarly, in mathematics we are all, in a sense, monolinguals. We have experience of only one universe. It is difficult to conceive of an alternative mathematics, because our thoughts are thoughts *within* a single created "system." Mathematics is a statement of the fixed properties of the "rhyming" possibilities of that system.

Am I making all of mathematics a matter of contingent rather than necessary truth? I appear to be saying that our inability to imagine things otherwise is a limitation in our created mind and in the creation around us, but not a limitation from God's point of view. Is that so? Not necessarily. I *am* saying that we are finite. *Our* view of possibility must not legislate what might be possible for God under vastly different conditions. But God always acts consistently with his own nature. It is not true that God can do anything at all. He cannot lie, he cannot deny himself, he cannot change, and so on. God does whatever he *wishes* (Ps. 115:3). His wishes are always consistent with who he is.

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Now, this has implications for mathematics. Mathematical regularities are a reflection of the faithfulness of God. Thus it may be that a large portion at least of ordinary low-level mathematics would *necessarily* hold in *any* universe that God might create. Let me again use the analogy of language. There is indeed more than one possible human language; there is more than one language system. But *all* human language systems have some structural properties in common. Within certain bounds, *all* are capable of rhyme. *All* human languages are characterized by certain constraints because of the nature of humanity. Analogously, we might say that all "systems of possibility" within which God speaks (creates) a universe-poem are constrained by the nature of God.

In addition to this, there is also at least some degree of *a posteriori* character in our knowledge of mathematics (cf. Poythress 1976a: 168–172, 1974: 134–138). A poet's particular selection of rhymes is still open to him, within the limits of a particular language. Likewise, even given a "system," God's choice of *what* particular things will be identical and different, in *what* particular ways, is open to him.

The Subject Matter of Mathematics

I have already given a preliminary indication of the subect-matter of mathematics by saying that it has to do with the properties of identity and difference in God's poem. But this is an oversimplification. More is involved in mathematics than simply properties of identity and difference. How are we to set the boundaries to what is mathematics? What is the difference between mathematics and logic? Between mathematics and mathematical physics? Are statistics and game theory properly parts of mathematics? How are we to answer such questions?

It seems to me that such questions about boundaries partly—but only partly—boil down to "semantic" questions. There is *more* than one way of drawing a boundary. The analogy between mathematics and rhyme may once again illustrate. Rhyme in the narrowest sense is closely related to a number of other regularities of pattern in poetry. One thinks of imperfect rhymes (e.g., between "pure" and "fewer"), assonance and alliteration, poetic meters, extended patterns of rhyme (e.g., the sonnet), onomatopoeia, homonymy. We are confronted here with a number of phenomena that can either be included under a single large umbrella term, or carefully distinguished from one another. The fineness of the distinctions depends on the perspective and taste of the observer. Likewise, "mathematics" may be considered as a larger or smaller area of investigation.

"Mathematics" as a term may be used to cover a larger or smaller area. I think that I come somewhere near the ordinary scope of the word "mathematics" when I say that mathematics has to do with three or four interlocking areas of investigation, together with the relations between these areas and their ramifications. These areas are (a) properties of identity and difference, (b) properties of quantities, (c) properties of space, and (d) properties of motion. The study of these areas leads to corresponding academic disciplines: (a) elementary set theory, concerning the properties of aggregates ("agorology"), (b) number theory and elementary algebra, (c) geometry, and (d) kinematics (see Poythress 1976a: 179–180). Kinematics is usually not considered to be part of mathematics, but I judge that the limit concept in calculus depends ultimately on intuitions about motion. Hence it seems to me that there is much in the field of mathematical analysis that interacts directly with a somewhat redefined conception of kinematics.

At any rate, all agree that mathematics has now advanced to an impressive depth and complexity, partly by studying higher-level regularities involved in agorology, number theory, and geometry; partly by studying the regularities in the interactions and interconnections between the three or four fields. It is not my purpose, then, to offer a detailed or definitive classification of higher reaches of mathematics. My intent is to suggest some of the sources for mathematics. Mathematics finds its sources in various types of intuition about primitive properties of the universe: identity, quantity, space, motion.[1]

This bare-bones account of the nature of the subject-matter of mathematics needs to be filled out in two directions: the relation of mathematics to kindred disciplines such as logic, linguistics, and psychology; and more about further subdivisions within mathematics, and the possibilities of "reducing" one subdivision to another.

Classical Reductionistic Explanations of Mathematics: Logicism, Formalism, Intuitionism, and Empiricism

How is mathematics related to logic, to linguistics, and to psychology? Some philosophers of mathematics have gone so far as to claim that mathematics is actually a subdivision of logic (logicism), or of linguistics (formalism), or of psychology (intuitionism). I, on the contrary, have argued above that mathematics has a subject-matter of its own distinct from any of these fields. If I am to justify that claim more thoroughly, I should give some account of the plausibility of these competing claims.

Global Basis for Plausibility of Reductionisms

To give such an account in general terms is not too difficult. Mathematics forms one aspect of the universe-as-poem. From this I have already inferred that mathematics is personally structured and linguistically structured. Since mathematics is linguistically structured, it should be no surprise that formalism in the philosophy of mathematics has tried to reduce mathematics to language pure and simple: "mathematics is the study of formal languages."

Likewise, mathematics is personally structured. For intelligibility, there must be a personal interpreter. Hence, it is not surprising that intuitionism in the philosophy of mathematics has tried to reduce mathematics to a branch of psychology: "mathematics is the study of *mental* mathematical constructions."

To explain the basis of logicism is not quite so easy. We could start with the motif of God as a *person* who is self-consistent in all that he does, or with the motif of

language as a self-consistent organized system, or with the motif of victory over chaos. God's poem is not a chaos. Because of this, we can make inferences and predictions from observations about some aspects of the poem, and have them vindicated by other aspects. Order, regularity, and the possibility of inference pervade the poem. Hence mathematics as a particular aspect of the poem is subject to inference. In fact, mathematics as the study of very "primitive" properties of the "poem" is easier to subject to detailed inferential patterns than are academic disciplines whose subject-matter is less primitive. Hence the plausibility of saying, "Mathematics is a branch of logic."

So far I have said nothing about the fourth of the "classical" positions in philosophy of mathematics: empiricism. Empiricism says that mathematics is a generalization from experience of the physical world. My root metaphor of mathematics as rhyme accounts for this almost automatically. As rhyme occurs in a poem, so mathematics "occurs" or rather "holds true in particular cases" in the world. Is my own position, then, simply a variation on empiricism? Almost, but not quite. Remember that I argued that mathematics, at least from a human point of view, has largely an *a priori* character because of its interest in the "language-system" behind any possible piece of the poem. The old empiricism did not account for this *a priori* element. Nor did it account for the compatibility between the intuitions of the human mind and the empirical facts "out there."

Let us consider mathematical truth not as simply unproblematically "there," but as a victory over chaos, in fact a constantly reasserted victory.

The Usefulness and "Success" of Reductionisms

The attractiveness of reductionisms can be understood even better using the idea of multiple perspectives developed in my earlier article (Poythress 1983b). According to this idea, the same subject-matter can frequently be explained or systematized using more than one point of view. More than one root metaphor, more than one "model," can sometimes be developed. In the course of development, there is a kind of reciprocal interaction between the principal subject (the thing modeled) and the subsidiary subject (the model used). The structure of the subsidiary subject stimulates the investigator to try to extend and deepen the model in certain directions. Contrariwise, the structure of the principal subject causes modifications, tinkerings, closer definitions, and *ad hoc* additions to the model. The modifications of the model enable it to survive when unpalatable evidence shows up. (For a detailed account of this process, see Kuhn (1970), Lakatos (1978).)

The four classical philosophies of mathematics can themselves be considered as instances of this type of development. For all four of them, the works of mathematicians are the subject-matter, the principal subject. But the four use different root-metaphors (cf. Pepper 1970) or subsidiary subjects as models for making intelligible this principal subject. For logicism, the subsidiary subject is logic. For formalism, it is language. For intuitionism, it is the human mind and its psychology. For empiricism, it is certain physical aspects of the nonhuman world. The "success" of the four philosophies simply demonstrates the fruitfulness of considering mathematics from each of the four viewpoints or perspectives. It demonstrates, in other words, the fruitfulness of a certain analogy or correspondence.

In the process, there is a mutual enrichment. On the one hand, the principal subject, mathematics, is better understood as people try to reexpress it in logical terms, in formalist terms, etc. On the other hand, there is also modification of the subsidiary subject. Logic, language, psychology, and physics are each "enlarged" beyond their former boundaries in the attempt to encompass mathematics. For instance, logicism and formalism must each include specifically *mathematical* axioms in their foundations (such as the axiom of infinity and the axiom of reducibility in the Whitehead-Russell system). And the reader must know how to interpret or apply certain theorems in a mathematical sense, if he is to profit from them.

Intuitionism and empiricism have difficulties of a somewhat different kind. In common forms of intuitionism and empiricism, a great deal of classical mathematics must be abandoned or modified because it is nonintuitive or nonempirical. Alternatively, the concepts of mathematical "intuition" and of the "empirical" can be boldly and imaginatively expanded to encompass the full range of what mathematicians do. But then, after this radical expansion, is anything worthwhile left of the original attempt at reduction?

The Failure of Reductionisms to Deal with Multiple Perspectives

Reductionist philosophies of mathematics, then, are stimulating as metaphors, but inadequate as ultimate explanations. I do not intend to review here the criticisms of reductionist philosophies already put forth by rival reductionisms (cf. Benacerraf-Putnam 1964) or by antireductionist philosophies (Dooyeweerd 1969, Vollenhoven 1918, 1936, Strauss 1970,

1971, 1973, Poythress 1974, 1976a, 1976b). Beyond these criticisms, two more points need to be made.

First, philosophy of mathematics needs to account not only for mathematics but for the plurality of plausible philosophies of mathematics! I would argue that nothing short of a multiperspective approach to mathematics will succeed here. As in linguistics (cf. Pike 1967:68–72, 84–92, 1980), so in mathematics, a multiperspective approach is needed to do justice to both the subjective and objective poles at work in the subject-area. On the subjective side, the subject's choice of a perspective, a root-metaphor, or a paradigm as a starting-point for systematizing his understanding is decisive for the final form his theory will take. On the objective side, the fact that the universe as God's poem includes many built-in metaphors forms the basis for successful development of more than *one* explanatory model.

Second, using certain insights from Paul Benacerraf (1965), we can show simultaneously the fruitfulness of multiperspective thinking and the failure of reductionisms. I have in mind an article by Benacerraf entitled "What Numbers Could Not Be." What is the point of Benacerraf's article? In brief, Benacerraf argues that we know for certain that numbers are *not* sets. Rather, there exists, on the basis of a set theory, the possibility of establishing a stipulatory correlation between numbers and certain infinite recursive progressions of sets. There is a correlation (an analogy) rather than a metaphysical identity. The fact that there is more than one way to establish a correlation shows that it is a correlation and not an identity.

Benacerraf's argument is thus an antireductionist argument ("numbers are not sets") based on the use of multiperspectives (multiple possible correlations between sets and numbers). Benacerraf also uses multiple perspectives more positively. By examining which correlations between numbers and sets "do the job," he helps to determine what is "essential" to number. Many different set-theoretic definitions effectively "capture" the usual relevant properties of the natural numbers.[2] What numbers "are" is what is common to all these capturing correspondences.

Thus a capture of this kind, impressive though it may be, is still not a metaphysical identity. It is not a reduction in every sense, since a real *total* reduction would leave us with a triviality, a tautology: $A = A$. And of course we may sometimes find that we did not capture everything we thought we did. Counterintuitive results in axiomatic set theory or analysis show us that we didn't capture everything in our intuition.

Now let us apply a similar technique to the four reductionist philosophies of mathematics. Logicism can be seen to be inadequate, because there is more than one way of embedding mathematics in logic. Numbers can be represented in more than one way by sets, as we have seen. And sets can be represented in more than one way in logical formalism.

Similarly, formalism fails for much the same reason. If formalism tries to include a theory of the relations between formal theories, it can do so only by a regress of metalanguages.

Intuitionism is not so easily criticized in this fashion. The genius of intuitionism is, in fact, to insist that numbers (and perhaps space) are *sui generis*. But multiple perspectives still challenge intuitionism more indirectly. Can intuitionism account for the *existence* of multiple correlations between (say) the number-system-as-intuited and recursive sequences of sets obeying the Peano axioms? Can it deal with the multiplicity of different people's senses of mathematical "intuition," ranging from extreme finitists to formalists who temporarily adopt formalized intuitionist logic?

Empiricism is also subject to criticism using multiple correlations. Straightforward empiricism in mathematics establishes a correlation between numbers and collections of objects. "Four" is a kind of generalization from experiences of collections of four apples, four fingers, etc. But one can establish correlations in a different way. "Four can be applied to collections of abstractions ("second-order collections") as well as collections of "things" ("first-order collections"). {2, 5, 7, 8} is a collection of four numbers; {red, green, blue, brown} is a collection of four colors. Can empiricism account for such a generalization cutting across "types"? There is another problem. "Four" can apply to collections that can be divided in more than one way. Four pairs of shoes are also eight shoes; four limbs are one body. Numbers are not "given" in the world in any simple way. They require the subjective contribution of a personal interpreter making decisions as to what differences and identities are relevant to his interests. Four pairs of shoes can be either an instance of four or an instance of eight, depending on the perspective.

Multiple Correlations in the Subparts of Mathematics

Using Benacerraf's principle of multiple correlations, we can also construct arguments for showing the nonreducibility of various subparts of mathematics to one another. To provide a first set of examples, let us focus on the four subareas of mathematics already distinguished. Mathematics deals with (a) identity and difference, (b) quantity, (c) space, and (d) motion. Can we show that these four are not reducible to one another?

Benacerraf's original argument already shows that numbers cannot be equated with sets. Hence (b) is not reducible to (a). Second, space is not reducible to set theory, since more than one set-theoretic formulation can represent the same geometry. Space is not reducible to number, since there is more than one way of coordinatizing a space. What about the reduction of motion to space or quantity? The same motion can be represented quantitatively in more than one way, depending on the choice of time coordinate. We need to choose both the point of origin for the coordinate and the scale of measurement. Moreover, in order to represent motion in purely spatial terms, quantitative time must be transformed into another *spatial* dimension. Again this can be done in more than one way.

This pattern of argument is in fact capable of demonstrating still further irreducibilities. Ordered pairs are not reducible to sets, since more than one stipulative definition will

work. Nor are functions reducible to sets of ordered pairs. Groups are not reducible to an ordered triple consisting of a set, a binary operation of multiplication, and a unary operation of inverse. For groups can also be defined starting from a set with a single binary operation of multiplication (inverse being defined only later in the group axioms). Or groups can be defined using the single binary operation $f(a, b) \equiv a \cdot b^{-1}$ instead of the binary operation $g(a, b) \equiv a \cdot b$.

Radical Irreducibility

If one approaches every area of mathematics in this way, one is well on the way to a radical extension of the idea of irreducibility. Up to now, I have applied the idea of irreducibility only to broad areas of study. Quantity, space, and motion represent such broad areas. But irreducibility can also be used in narrower cases. From my point of view, nothing is "identical to" or "reducible to" anything else. To take a most outrageous example: the number 12 is not "reducible to" 11 + 1. (It could be defined not *only* as 11 + 1 but as 10 + 2, 9 + 3, 2 × 6, etc. Hence none of these is *the* correct definition from the point of view of logical deduction.)

To be sure, in many cases stipulative definitions are capable of serving as a starting point for deducing all the important properties of the entity so defined (the *definiendum*), For example, the stipulative definition 12 = 11 + 1 can be the starting point, in the context of the Peano axioms, for deducing the properties of 12. But that only shows that there is a detailed *analogy*, not an identity, between *definiendum* (e.g., 12) and *definiens* (structures used to *do* the defining, e.g., 11 + 1 and Peano axioms). Moreover, it should be noted that a definition like 12 = 11 + 1 will work only in the *context* of a surrounding mathematical system—an axiom system or its informal equivalent. Not every such definition would work in every context. Hence we may say that the *definiens* and the *definiendum* are serving respectively as the subsidiary subject and the principal subject of a mathematical "allegory." Stipulatory definitions are the starting points for so many allegories. The surrounding mathematical system furnishes the contextual control for understanding any particular piece of the allegory.

I do not say that this is the only way of looking at mathematical definition. But it is useful for several purposes. I now focus on two of these purposes.

Awakening Wonder

First, I intend by this "allegorical" approach to reawaken our awareness of wonder in mathematics. We know that it is useful to consider functions as ordered pairs, or to coordinatize Euclidean space. This is something to be wondered at. Even the deducibility of properties of 12 from 12 = 11 + 1 is ultimately mysterious (cf. Wittgenstein 1967:13–16). It is something to praise God for. It is not simply a bare identity calling for no reaction, or "So what?" Our response can be wonder, whether or not the truths in question are *a priori* or *a posteriori* from one or another point of view. For in either case they are rooted in the wisdom of God.

Consider by contrast the effect of the pronouncement that "of course it works." The person says, "Of course," because "functions are nothing but ordered pairs in the first place," or "coordinatizability is merely the inevitable consequence of Euclidean axioms," or "12 is nothing but an alternate name for 11 + 1." Even if these statements were truer than they are, they would be an evasion of the ultimately personal character of creation originating in a creator. To repeat what I have said before: let us consider mathematical truth not as simply unproblematically "there," but as a victory over chaos, in fact a constantly reasserted victory.

Awakening Creativity

My second purpose in using an "allegorical" approach is to stir creativity. Once the spell of "ordinariness" is broken, we can let our imaginations play and find alternate "allegories." When we allow ourselves to imagine what it would be like for the original allegory to break down, we are freed to produce creative alternatives. We may find, for example, non-Euclidean geometries, fuzzy functions (cf. Zadeh 1956, Wang-Chang 1980), or alternate number systems.

Singularities

Empty patches in space?
No.
Patches of non-space.
Theoretically possible
Experientially inconceivable
Density so great
Heat so hot
Compression magnified times infinity
Matter collapsed upon itself
Inadherent particles
Dashing, bouncing, smashing
Frenzied dancing
Swallowed by an unseen mouth
Suddenly spat out
Golf ball size
Eight seconds after The Decree
Infinitely dense
But getting cooler
Infinitely hot
But getting bigger
Spreading
Stretching
Expanding
Cooling
Forming new partnerships
New compounds
New things
A new thing
All new.

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Independent of my own thinking on creativity, William J. Gordon (1961) has developed a theory of creativity emphasizing personal involvement, empathy, fantasy, and emotions as useful aids in technological invention and business. He is much more specific about techniques of creativity than I can be here. But we have both emphasized the involvement of the *person* of the investigator in knowledge. I can illustrate how this works by taking as an example the positive integers. How can there be creativity here, since the facts are (apparently) so cut-and-dried? Well, there is of course creativity involved in the discovery of new proofs in number theory. But I want to exercise creativity on a far more basic level.

To do so I personify the integers. I visualize not an infinite series of bare symbols 1, 2, 3, 4, . . . , but a row of people. The successor relation I visualize by having each person lay his hand on the shoulder of the next one, or by having each person throw a ball to the next one. Then I fantasize about the ways in which the number system could break down or behave differently. What could happen? All sorts of things. The people could form themselves into a circle instead of a straight line. We would have modular arithmetic. Or at certain points the line could split in two, and we would have a discrete partial ordering. I could imagine each person juggling many balls instead of just one which he passes to the next. Then we have the beginning of the concept of order pairs. I could imagine running out of persons to continue the line, so that the last person had to keep his ball. This corresponds to the finite universe that Whitehead and Russell had to eliminate with their axiom of infinity.

Mathematical Meaning as Meaning in Relationship

Finally, my "allegorical" approach or "poetic" approach to mathematics also encourages a useful emphasis on the *relational* aspect of mathematical truth and mathematical understanding. What do I mean by relational aspect? To understand and appreciate a truth of mathematics is to understand it *in relation to* many other truths both inside and outside the area of mathematics. (Cf. earlier claims to this effect in Poythress 1976b:172–173.)

In poetry, rhyme finds its significance, its effectiveness, its *raison d'être*, not purely in itself but in its functions in the larger whole. Likewise mathematical truth finds its significance not merely in itself, but in relation to applications and parallels in other areas of mathematics, plus applications in physics, economics, and still other areas. Of course, I want to affirm vigorously that the attempt to "purify" mathematics, to isolate general principles from the specific practical contexts in which they first appeared, has been quite fruitful. But the preference for pure abstraction over concrete embodiment is both one-sided and ineffectual, from a pedagogical as well as a philosophical point of view. Teachers know very well that group theory is best learned when worked-out examples of particular groups are sprinkled in with theorems. Calculus is best learned when examples with particular functions accompany its theorems.

Moreover, the best tests of mathematical knowledge come through applications. For instance, a student who can quote the theorems, explain their meaning, and even repeat the proofs still does not really "know" calculus or group theory unless he can work problems. I would suggest that it is best to treat this pedagogical fact as a fact constitutive for the *nature* of mathematical truth. It is not simply an inconvenient limitation, a falling short of the Platonic ideal, a concession to the limited powers of men of dust. Remember that Plato was against the body and its "messy" corruption of the pure vision of the abstract ideal. Plato was against creation, in fact. But a Christian ought not to be. The pedagogical constraints are not "unfortunate" corruptions, but an aspect of the created structure of mathematical knowledge.

Pedagogically, then, I am in favor of the reintroduction of the writhing dirty masses of applications into mathematical explanation. One can still keep the abstract generalizations with their Apollonian beauty. But the particular examples are not to be "reduced" to the generality. We ought to revive our wonder for the fact that the generality actually *holds* for this case, and for that case, and for this other case. Each discovery of a new application can be seen as a development of mathematical truth, the writing of a new line to the poem.

NOTES

[1]If one is willing to apply a good deal of imagination, one can work out the analogy between mathematics and poetic rhyme even to include this detail. Properties of identity and difference in mathematics correspond to the identity and difference necessary for true rhyme. Properties of quantity correspond to meter in poetry, with its quasiquantitative count of feet. Properties of space correspond to the structural patterns of regular rhyming schemes (e.g., the sonnet).

[2]The term "capture" was suggested to me by Frank R. Bernhart.

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Complementarity and Christian Thought—An Assessment 2. Logical Complementarity

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British scientist-philosopher Donald MacKay is prominent among those who feel that complementarity should be based on logical grounds rather than on experimental considerations in quantum physics. In this account we outline the basic formulation for logical complementarity, provide illustrative applications, and consider some philosophical questions that have emerged. We conclude that MacKay's approach is more effective than that of Bohr for identifying the significance of scientific and biblical statements about particular events, yet there remain substantial questions that cloud the significance of this integrative approach for evangelicals.

In recent years complementarity has emerged as a major way of dealing with scientific and biblical statements or ideas that appear to conflict, and as an argument for the necessity for multiple descriptions of events from different perspectives. The previous paper in this two-part discussion (*Journal ASA* 35, 145 (1983)) noted that the classical complementarian approach, stemming from the work of physicist Niels Bohr, has various scientific and philosophical flaws.[1] Until the early 1970's, American writers on science and Christianity viewed complementarity along the lines developed by Niels Bohr and his associates. At about that time two widely distributed books appeared that opened the American intellectual community to the ideas of Donald MacKay.[2,3]

Although the idea of complementarity can be traced back at least as far as Thomas Aquinas,[4] the modern expression of logical complementarity for issues involving science and Christianity may be found in the work of Charles Coulson,[5] Karl Heim,[6] and (in most detailed form) Donald MacKay. For almost 30 years, MacKay has developed his approach through an extended series of articles in the British philosophical literature. The lack of general availability of MacKay's work has resulted in a lack of appreciation and informed American comment about his ideas until recently. In this discussion we refer primarily to the contributions of MacKay since his work figures prominantly in the ideas of other recent evangelicals who have sought to relate their disciplines and Christian faith.

Logical Complementarity Defined

Basic to MacKay's thought is a concern that the indiscriminate application of scientific methodology to any and all questions may distort or even destroy the object undergoing scrutiny. He has coined the term "nothing buttery" to characterize reductionist approaches that ignore or discount as meaningless other ways of considering a phenomenon, and views a properly conceived and applied complementarian approach as an effective counter to scientism.[7] In developing the concept of complementarity from a logical rather than a physical base he differs sharply with the classical approach of Niels Bohr:

> Complementarity stands not for a physical theory, still less for a mystical doctrine, but rather it stands for a particular kind of logical relation, distinct from and additional to traditional ones like contradiction, synonymy, or independence; it demands to be considered along with others whenever there is doubt as to the connection between two statements . . . vindication of its use in theology, I would argue must proceed quite independently of dubious analogies with current physical theory.[8]

Non-Hierarchic Complementarity

MacKay defines two types of complementarity. The first, called nonhierarchic complementarity stems from "a difference in *standpoint*" such as may be found with a set of architects drawings for a laboratory.

> Some of these were plans, showing us what the floor space would look like to an imaginary observer overhead: others were elevations, from one side or one end; or they were sections, in different directions and at different levels. Some drawings, from their very nature, showed a lot of detail; others showed relatively little; but so far as the architect could make them, each was complete.[9]

In this case each perspective is *blind* to the other; the complementary descriptions are developed at the same level, using concepts of the same kind but in different patterns of relationship.

Hierarchic Complementarity

The second type of complementarity called hierarchic complementarity involves a difference in *viewpoint*. Here, each observer may have the same physical evidence available but his description depends on his background. A hierarchic example is a pair of terms such as English or electrical as used in different descriptions of a telephone signal, or the different ways an artist, poet or musician view a sunset. The observer in each case may be the same person. "What makes the descriptions complementary is the mutual exclusiveness of the respective schemes of explanation, rather than that one person cannot entertain both."[10]

MacKay argues that the relationship Niels Bohr claimed to find in microphysics is nonhierarchic and takes Bohr to task for basing his approach on a specific physical situation rather than a more general logical concept. For MacKay, complementarity in science and religion is hierarchic involving the *viewpoints* of man and God.[11] Furthermore:

> In the context of science and theology, it (complementarity) offers an alternative both to the view that makes all divine activity supplementary to the (presumed incomplete) chain mesh of scientifically describable cause and effect ("God in the gaps"), and to the "watertight compartment" theory that religious and scientific statements are logically independent.[12]

The criteria for complementarity employed in MacKay's approach are contrasted with those of Niels Bohr in Table I.

Harold Oliver has recently developed a complementarian model for relating theology and cosmology. He rejects the notion that the Bohr definition is definitive and opts for the view:

> The thesis of complementarity can be derived deductively from a fundamentally relational metaphysic rather than being pieced together from apologetic (or physical) considerations. It is a thesis of complementarity in that it assumes that theology and cosmology are coordinate perspectives on the same domain, that is, the totality of reality.[13]

Mackay has coined the term "nothing buttery" to characterize reductionist approaches that ignore or discount as meaningless other ways of considering a phenomenon, and views a properly conceived and applied complementarian approach as an effective counter to scientism.

> For some, cosmology represents the most sustained successful attempt to understand reality. For others, theology has no equal in this regard. The position of this relational metaphysic is that they are distinct but complementary perspectives on reality. If ultimacy is assigned to either, the result is unproductive. The-ism in holding god talk as fundamental and world language as derivative is as myopic as Natural-ism which takes world language as fundamental and god talk as emotive, attitudinal, or even obsolete science.[14]

Oliver finds that his approach meets the requirements laid down by MacKay. Evangelicals may have some difficulty with this perspective on theism.

Logical Complementarity Applied

It is important to note that MacKay finds no conflict between science and Holy Scripture if the Bible is seen as establishing the divine significance of an event and science as engaged in developing *causal* links that provide a mechanistic explanation for the same event.

MacKay has applied logical complementarity in a number of situations that often arise in discussions of science and Christian faith. Rather unexpectedly, he does not find the story told by the cosmologist and the theist to be complementarian accounts of creation. The rationale for this comes in differing perspectives on creation. For MacKay [and Mascall][15] creation in the theistic sense is a perspective that embraces all of history and thus the "creative act that gives being to our space time is clearly not itself an isolatable event in our time."[16]

> The concept of a "first event" referred to by some cosmologists as "the creation of the universe" is not the same concept as the theologian's which is referred to by the same name. By the same token the story of evolution (or creation science) is logically neither a rival of nor strictly complementary to, the creation narrative in Genesis 1—any more than the early history of the characters of a novel would be either a rival of or complementary to, a narrative of their conception by its author, although each (in a different sense) answers questions about "origins." It is only

> when we are considering created history as a whole that we can strictly say that the scientific and theistic answers to the question of origins have the same reference and are complementary in the sense of describing different aspects of the situation from mutually exclusive standpoints, though not in fact answering the same question.[17]

MacKay finds many biblical references to particular events to be complementary to the scientific attempt at explanation. The hardening of Pharaoh's heart by the Lord could be "explained" in psychological terms, or the statement "the Lord sent an east wind" could find a meteorological description. The feeding of the fowls of the air by the heavenly Father or, in more general terms, the simple statement of faith that God answered one's prayer in a particular way, represent for MacKay the need to examine the significance of an event from the perspective of the Creator as well as from that of the scientist or historian. "To recognize an event as an answer to prayer is no more antiscientific than to recognize an event in a computer as the solution to the problem being solved in it."[18]

The longstanding problem of predestination may be handled along similar lines.

> It follows that even predestinarian explanations of created events as acts of their creator cannot be reduced to mere translations of libertarian explanations in terms of human actions (such as prayer) within the created history, for it is not the facts asserted in the one explanation which are necessarily different from (though not contradictory of) those asserted in the other."[19]

In viewing the question of miracles, MacKay takes into account "the communicative significance" of the event as well as its unusual (but not necessarily inexplicable) characteristics." He warns that we should not use complementarity to make plausible a simultaneous belief in miracles and universal scientific law or to suggest that "all historical events have been instances of scientific law."[20]

> What distinguishes a miracle from other providential events is its having an alternative rationale to the normal. It makes sense first and foremost as an expression of the Creator's faithfulness to His purpose for the people involved. In terms of this overriding criterion of rationality, its coherence with our scientific expectations based on normal precedent is irrelevant and may therefore be expected to vary from case to case.[21]

The "miracle" of Christian conversion can be appropriately discussed in terms of the hierarchically complementary approaches of the psychologist and theologian.[22] Two recent papers have employed MacKay's ideas. D. Gareth Jones follows MacKay in applying complementarian considerations in dealing with the issue of human responsibility in the context of the brain-mind relationship.[23] David Bruce affirms MacKay's approach in dealing with issues which arise in physiology *vis a vis* man as complex machine and man as person.[24]

Logical Complementarity Evaluated

Our approach in evaluating logical complementarity should endeavor to see if it is an effective integrating tool for science and Christian faith. This should involve a concern for the structure of the concept and overall effects of application. One of the major hazards in such an evaluation is the problem of separating the concept of logical complementarity from the presuppositions and the ways with which people have made application. An idea may have merit even though its formulation or particular applications appear inappropriate. Conversely, a well structured concept may fall short when its broader implications are considered.

I have noted above the enthusiasm with which Harold Oliver embraces logical complementarity. Other writers have recognized the positive aspect of MacKay's contributions. He is considered a leader among those who seek a harmony of biblical and scientific truth. By establishing the roles of science and theology MacKay provides room for each to work without fear of interference from the other. He provides "a point of contact" with the secular community by arguing the necessity for considering the biblical perspective. Significantly, for scientists, he emphasizes the importance of scientific efforts to establish causal explanations for physical events yet stresses the need for the idea of God in order to give meaning for the existence of the created order. However, it is fair to say that not all aspects of MacKay's thought have been accepted.

Need for Paradox

Hugo Bedau has taken a largely negative view toward a complementarian approach to scientific and religious propositions. His major concern stems from the fact that complementarity was originally devised as a means for removing paradoxes in quantum physics and only later to other areas of human thought. He finds no "sense of paradox applicable to genuine difficulties in relating science and religion" or that

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"the complementarist approach has (brought) to light any latent paradoxes hitherto concealed or hidden between science and religion."[25] Bedau considers MacKay's approach to be an improvement on Bohr but still so closely allied as to be tarred with the same brush. In rebuttal Oliver comments: "I personally feel that Bedau goes too far when he concludes that it is simply impossible to wave the requirement that there be some legitimate sense of paradox applicable to genuine difficulties relating science and religion."[26] I, too, would affirm the view that paradox is not an inherent component of complementarity.

Line of Demarcation

Charles Orlebeke has suggested that MacKay may draw too sharp a line of demarcation between science and religion. MacKay believes that science and religion are two separate enterprises, not one, and that when they remain within their separate domains they are effective partners."[27] One must ask whether the scientific and biblical enterprises are so sharply separated that there are no links remaining between the two. Science has provided evidence for some biblical factual claims and expanded our understanding of particular passages. On the other hand, some Christian social scientists[28-30] and natural scientists[31] have seen Scripture as providing models in areas such as psychology, geology and origins. While the net effect of these approaches has usually been dubious, it may be insisting too much to ignore all connection between the statements of science and Scripture. Ronald Burwell, also questions the isolation of science and religion implicit in a complementarian approach. He would see the two as more closely allied. "I would argue that science is as much ideological as it is religious, in the sense of ideology as understood by the sociologist of knowledge. Hence, to the extent to which religion permeates a world view, it must also permeate science."[32] Burwell considers MacKay's methodological separation between science and religion as too severe or artificial.

William Hasker makes much the same point in an exchange with MacKay:

> Agreed, the Bible contains no theories about brain-functioning, mechanistic or otherwise. But the Scripture does view man as a free and responsible agent, and if (as I firmly believe) a thorough-going acceptance of mechanistic brain-theory is incompatible with this, then the Scripture does place some constraints on what is an acceptable theory of brain functioning.[33]

Significance of Multiple Descriptions

One potential difficulty with complementarity may be found in situations where contradictory conclusions may be drawn from complementry pieces of evidence. There appears to be no provision whereby one can get at the truth of the propositions offered by each area. How does one establish the significance of religion even though one is forced to take it into account? Or, when forced (by complementarity) to accept two or more accounts that are true and necessary for their own purposes, how does one respond to questions relating to the situation?

Consider the following case: Cars A and B collide on a highway. The police arrive to find driver B dead at the wheel. Information given by eye witnesses indicates that driver A's car ran into that of B and that driver A was driving erratically prior to the collision. A breath analysis indicates that driver A is "under the influence." With the passage of time driver A is indicted for manslaughter and brought to trial. Numerous witnesses describe the course of events immediately preceding and following the collision from their vantage points near-by (multiple examples of non-hierarchic complementarity). Police experts take the stand and testify to the alcoholic content of driver A's breath and blood, and traffic experts present technical details and conclusions drawn from skid marks, types of damage and the final positions of the vehicles (non-hierarchical complementarity). The prosecution rests. The defense offers one expert witness—the coroner who provides incontrovertible evidence that driver B died of a heart attack moments before the collision. The case is dismissed in the best tradition of Perry Mason (or Agatha Christie). This incident is saturated with complementarity at both levels, yet only one of the witnesses establishes the guilt or innocence of driver A. This suggests a serious limitation in the complementarian approach. We have at best a way of establishing "apparent connections" rather than a means for establishing the truth. The reader may well find this illustration to be defective in applying logical complementarity. Yet, I would suspect that this decision was partly based on the punch line, and that in it's absence one would have been as quick as were the police to bring driver A to trial on the basis of evidence that was complementary but not relevant. The "logical force" that demands that we look at the complementary evidence does not deliver when we come down to the truth of the matter. Complete knowledge does require an exhaustive description on every level, but one seldom if ever is looking for complete knowledge.

A more humorous illustration may be found in a comic page series set in the 14th century: father, mother and son stand gazing at the moon in early phase. The father asks, "What are you thinking about, Hamlet my son?" The son replies, "I'm thinking the moon looks smaller because the shadow of the earth is on it." Father, "Ho-ho . . . the shadow of the earth." Mother, "Don't snicker stupid! Explain the moon to the poor child." The father expounds in the next set of panels: "Let me explain why the moon is sometimes big—sometimes small. The moon is a big melon—and it's always growing! And if nothing stopped it—it would soon be bigger than our whole village! But Rika the night raven loves moon melon and once a month he flies to the moon and eats and eats . . . until he can't hold anymore—then he flies home until the next month . . . and the moon starts to grow again!" Father concludes, "This is called the balance of . ." when mother breaks in, "That's enough dear. A boy's head can only hold so much information at a time."

Cramer and MacKay

J. A. Cramer has questioned MacKay's approach along several lines.[34] He views the argument against "nothing buttery" as invalid because the things compared in science-religion questions are insufficiently similar and, more significantly, that MacKay's electric sign illustration (explanations in terms of electrical circuits or in terms of its message) fails because:

> To the secular mind both explanations of the electric sign are basically mechanistic, although the meaning of the sign supposedly requires a more complicated mechanical explanation than does the mere circuitry. This is after all what "nothing buttery" is all about. It is not admitted that the two explanations of the electric sign are really explanations in two different sets of terms. The example does not support the conclusion then unless "nothing-buttery" is false. The conclusion is assumed in the course of the argument and we find once again a circular argument.[35]

MacKay responded vigorously to these allegations:

> My attack on anti-religious reductionism here is a *reductio ad absurdum*. In order to show that the form of an argument is invalid, it is enough to find one good counter-example in which that form of the argument would lead to an absurd conclusion. This is the purpose of my illustrations of "nothing buttery"—to show that the logical form of the ontological reductionist's argument is unsound, and not to argue by analogy from man's purposes to God's purposes, or anything of the kind.[36]

The alleged success of the *reductio ad absurdum* argument does not, however, carry over to *prove* the case for logical complementarity in terms of the conditions under which it is defined.

Cramer finds MacKays view wanting, ultimately, because:

> His conclusion that multiple and equally valid accounts of the universe are possible amounts to a denial of Occam's razor (the law of parsimony). If a complete explanation of the universe in one set of terms is indeed available, Occam's razor forces us to reject as superfluous any more complicated set of terms that might also comprise a complete explanation.[37]

MacKay responded:

> . . . far from "denying" Occam's principle, these statements presuppose it! They claim that in certain circumstances there is necessity not just for "more complicated terms," but for a whole new level of conceptualization, if we are to do justice to all that is there to be reckoned with. There is here no question of multiplying entities without necessity. The necessity is there to be found empirically, by finding that there is indeed something (or someone) to be reckoned with at the higher level.[38]

If, indeed, MacKay has not violated Occam's razor, he does leave himself open to the need to sort out a never ending variety of statements in terms of their validity *vis a vis* level of conceptualization. A new discipline emerges that deals with standpoint and viewpoint as one tries to decide what is absurd, possible, probable, or merely useful. The decisions according to MacKay are to be made on an empirical basis. The question then comes down to how many of these somethings or someones there are and what they mean. What does he mean by empirical finding? Does man find God by empirical search?

Broader Philosophical Issues

There are ontological and epistemological implications that should be addressed along the lines previously considered for "classical" complementarity.[1] Here we ask what there is in the universe and what can be known about it. The Bohr-Copenhagen response is that only observed events are real and that the truth-determinacy of a statement is conditional on the actual empirical verification of the statement rather than on its verifiability, e.g., there are no properties that exist independent of the standpoint (experimental approach) of

Table 1

Criteria for Complementarity of Science and Religion in Two Major Formulations

Complementarity Based on Bohr's Quantum Physics Approach	*Complementarity Based on MacKay's Logical Approach*
• Complementary statements have a common subject matter or reference.	• Complementary statements have a common reference.
• Complementary statements are equally necessary for a complete understanding of human experience.	• Complementary statements are each exhaustive in the sense that none of the entities or events comprising the common reference need be left unaccounted for.
• Complementary statements share the same logic—at least both can be said to be true (in the same sense of true).	• Complementary statements are different assertions based on the data offered by the situation.
• Complementary statements are not compatible with each other as they stand.	• Complementary statements are mutually exclusive in content.
• The incompatibility of complementary statements is removed by uncovering certain experimental arrangements which alone make possible the application of scientific and religious interpretations to one and the same thing.	• Complementarity arises when different perspectives are brought to bear on the data—standpoint dependence.
• Complementary statements require a domain of application where their applicability relations differ, i.e., the compatibility relations of wave/particle and position/momentum in macrophysics in contrast to microphysics.	• Complementarity may be found at a logical level where concepts of the same kind are used in different patterns of relationship (the two views of light) or where concepts in *one* description differ in logical level from other descriptions (certain theistic and scientific accounts of nature). These forms are called "nonhierarchic" and "hierarchic" complementarity, respectively.
• The domains of complementarity relations in science and religion must be precisely defined (as between beliefs, explanations, descriptions, models, or concepts, etc.).	

the observer; the only world that we can know lies in what we observe. Many Christian thinkers (not all) tend to hold a realist position. They feel that the ordered universe created and sustained by the God of Scripture has being prior to knowing and that the image-bearing relationship to God allows some access to this being. MacKay is difficult to pin down in this connection. He claims that quantum-mechanical complementarity is non-hierarchic, yet:

> Complementarity in microphysics hangs on the empirical relations $E = h\nu$, $p = h/\lambda$ and is not therefore in any sense absolute. If we want to find an area of logically unquestionable complementarity in this area, we must go to the mathematics that underlies it.[39]

> It is the data offered by the situation. . . . that can be perceived in complementary ways. What is needed is not extra information per se but rather a different set of perceptual categories in terms of which to respond to its impact. It is only descriptions or explanations of the same situation that can properly be called complementary. What do we mean by standpoint? It has nothing now to do with a limitation on the evidence physically available. We may assume for the sake of argument that each observer has the same information presented to his eyes.[40]

If these quotations are representative, it appears that MacKay has not directly addressed the epistemological/ontological implications in a systematic manner. It seems that neither an instrumentalist nor a realist position can be drawn from the evidence at hand nor that the instrumentalist position inherent in Bohr's view necessarily follows in logical complementarity. Orlebeke however, suggests that MacKay does not adopt an instrumentalist view of science. Yet at the same time he recognizes that (MacKay) "requires the recognition of diverse aspects of things, to be illuminated respectively by science and religion; but he denies that these aspects are themselves things or even parts of things."[41] It appears that an exposition of the ontological-epistemological status of logical complementarity is needed before a full evaluation of this approach can be made.

Resolution of Paradox

One further concern involves the net effect of the complementarian approach for situations that give rise to paradox. This analysis "explains away" the paradox or apparent conflict by suggesting that the problem arises in the "standpoint" of the observer. In the case of the classical theological problems such as the Trinity, the transcendence and immanence of God, or, the divine and human natures of Christ, to add "standpoint" to the particular statement may relieve some mental stress or apologetic difficulty, yet the necessity for this addition suggests that the original statements are meaningless (or seen only partially) by themselves. It appears that complementarity requires us to view as nonsense the statement "Jesus, the Christ, is both divine and human" until the terms "is divine" and "is human" are relativized to the appropriate logical level. If the Bible is held to be self-interpreting, the use of the complementarian approach to understanding should be clearly demonstrated to occur within the confines of Scripture without the need to refer to external analogies. The use of complementarity to legitimize scientific and scriptural statements falls prey to some of the same types of objections that arise in discussions of the proofs for the existence of God. The "proofs" and complementarity may be of great comfort to the person of faith, yet less than compelling to those outside the kingdom or others within the kingdom who do not hold the "natural theology" of Thomas Aquinas.[42] MacKay and Aquinas both begin with the assumption that Christian theism is all-embracing; others do not.

Conclusion

In developing his philosophical position over the last generation, Donald MacKay has offered the Christian community an imaginative approach that is free from many of the errors that have plagued the efforts of others. His enthusiasm for the scientific enterprise (as well as his accomplishments) and his desire to have Christians think about the practice of science from a theological perspective are of great encouragement to those of us who would follow the same course. In the words of Clifton Orlebeke:

> (MacKay) urges Christians to think christianly about the relation between God and the cosmos, less they are deluded into fear, uncertainty, or confusion by scientific ways of talking about the cosmos. And he addresses non-Christians with simple directness: you don't need the idea of God in scientific explanations, but you (and all of us) need *God* in order to give point to your existence. The priorities, then, are clear: knowing God in Christ is most important, a *sine qua non;* explaining God's creation through scientific activity is important secondarily as a proper service to God.[43]

The path of philosophical discussion is strewn with misunderstanding and misinterpretation. In raising the proceding questions we challenge MacKay and ourselves to clarify, revise and extend our ideas concerning our world and our Creator.

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The Key to Reconcile Modern Science and Religious Thought

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In the view of the late C. P. Snow, the prevailing theory in science of the "big bang" origin of the universe presents the strongest objective argument yet made in support of a theistic creation.[1] The theory holds that all of the "things" of the universe, of whatsoever kind and nature, are re-traceable to a single explosive event of colossal proportions occurring some 16–20 billion years ago.

A strong inference thought to arise from such a theorized specific beginning is that of an incomprehensible organizing intelligence; i.e., a God, capable of designing and setting into motion that concatenation of energy, materials, and associated forces having the inherent potential capacity to produce the remarkable results in observation today. Those countering the inference would assert the lack of necessity of an intelligent cause of it all: that "ordinary" physics and chemistry, in a space-time continuum, sufficiently explain the origin and development of the universe; that life, as we know it, is merely the by-product of random evolution in accordance with modified Darwinian principles.

It is not to be expected that meaningful progress may be made toward the implementation of a reconciliation between religious thought and science simply from an inference arising out of any one major phenomenal event (the "big bang"), or even by calling attention to a broad spectrum of other phenomena in nature that may be argued to infer intelligent design.

Evidence for Design

This is evident in that an acceptable basis for such a reconciliation has not been recognized to date even though very impressive "design-appearing" inferences of an empirical nature have been advanced by gifted writers over the centuries to appeal to the existence of a Designer of the universe. Cumulatively, these inferences are substantial, especially when one takes cognizance of a bewildering growth in what may be claimed as inferential evidence of design arising out of the information explosion we have witnessed over the past quarter-century or more. The following should be included among seemingly countless examples from the past and present:

- the variety and beauty of nature, rather than mere multiplicity and sterility;
- the existence of few basic kinds of self-constructing atomic elements which, when slightly rearranged, can readily transform into widely differing substances of meaningful aggregation in relation to life in general, and to conscious and creative man, in particular;
- the inherent selectivity and "goal-seeking" qualities of both animate and inanimate nature;
- the very existence of life and of fit, diverse, and complex features of living organisms, such as the human brain (with its computer-like qualities), the cognitive nature of the protein molecule, the coded mechanism of DNA, the eye, etc., that in intricacy and character resemble *by analogy* the workings of what we ordinarily attribute from experience to an intelligent cause;

- the coherent fitness and function between inanimate nature in and of the Earth's environment and the needs and abilities of living things in general, and of creative man, in particular;
- the occasion and rarity in our solar system of the properties of an Earth-shielding ozone screen for the protection and survival of life;
- the optimal size of the Earth as to have permitted the escape of hydrogen and retention of a life-sustaining atmosphere;
- the multitude and diversity of mechanized-like systems and operative processes with respect to the surface and within the crust of the Earth to accommodate quite different life-oriented needs and requirements.
- the countless eventful changes in the Earth environment over evolutionary time as in a special and meaningful preparation for the later arrival of conscious man;
- the existence of light to complement the existence of sight in living organisms;
- the unique shape, rotation, and elliptical angle of the Earth in reference to the Sun as to permit, among other things, the change of the seasons;
- the existence of our Sun with its many complex functions and interactions with on-going processes on the Earth, in addition to being the basic source of life-sustaining energy;
- the multiple characteristics of our Moon that are uniquely beneficial to life on Earth, including surface materials that enhance luminosity and reflection, its beneficial effect on the ocean tides, and the existence of soft basins (only on the side permanently facing the Earth) as though designed for landings by space explorers;
- the relative volume and distribution of land and sea on the Earth;
- the amazingly diverse and fit properties of ordinary water as related to the existence and survival of life;
- the existence and distribution of wind, clouds, lakes, rivers, mountains, subterranean waters, minerals, metals, and energy storage supplies in the form of wood, coal, petroleum, and other fuels of nature;
- the wonderous nature and composition of soil on the Earth's surface so as to permit, among many beneficial uses, agriculture by man, and water penetration to roots of plant life;
- the fact that life is reproductive and cyclical rather than being non-reproductive, non-cyclical, or spontaneous (as another alternative), thereby permitting coherence, meaningful adaptive change and survival, and progressive evolution in the context of: (1) the circumstances under which the first life is thought to have arisen on Earth and thereafter continued, (2) the major physico-chemical, geological, and other environmental changes that have been historically associated with the Earth, and (3) the selective processes of biological evolution acting on the qualities of life;
- the half-dozen present-day implications that life may exist elsewhere in the universe, including some hints of a possible system overall for the production of life;
- the so-called "spin," "thermonuclear," and certain other "hang-ups" referred to by Prof. Freeman J. Dyson as being naturally inexplicable, yet apparently essential to the existence and tranquility of life, anywhere in the universe;[2]
- the regulatory-control aspects of gravitation, electromagnetism, and quantum mechanics as to permit a meaningful assemblage of what appears to be an increasingly coherent universe.

To say these results could just as well have occurred through pure randomness, given eons of time in a vast universe, seems to completely ignore an essential precondition that the initiating phenomena at the "beginning" had to be precisely appropriate to such results.

In a dead and accidental universe, there is no reason of course for the existence, much less co-existence, of phenomena of the nature mentioned. Interestingly, only a relatively small portion of the above exampled "design" phenomena bears a casual relationship to biological evolution or selective processes thought to be active in that sphere. Yet it was the publication of the *Origin of Species* (suggesting a "natural" means to account for design in living things) that largely served to discredit on empirical grounds the argument from design and gave impetus to the science-religion debate of the late 19th century.

If one compares the available "design-appearing" inferences of an earlier time with those of today, the results are quite surprising. In the book, *Chance or Design?*,[3] I endeavored to set forth not only a comprehensive overview and up-dating of the indirect evidence, but to show a significant advancement in the inductive proofs, and a progressive trend of significant directionality towards intentional design. This latter effort was aided by our much better understanding today of the processes active in nature, and by developments in the means with which we may perceive "design" as compared to earlier times.

Inferences for "Non-Design" and Their Response

Yet, over the centuries, inferences of "non-design" have been pointed to by critics of design arguments to seek to counterbalance inferences of the nature described. These have included reference to such things as earthquakes, floods, and other catastrophic events, the occurrence of disease and death, the extinction of species, the occurrence of arid desert wastelands, human evil and its consequences, i.e., wars, acts of violence, and so on.

Modern discovery appears to have brought about a marked lessening of the effect of these negative arguments. They are, in any event, to be seen as overwhelmingly disproportionate to the positive inferences. A half-dozen examples may suffice to reflect a reduction in the negative inferences.

1. As expressed by Fred Hoyle, it is quite incorrect to say that earthquakes and vulcanism, despite their sometimes fatal consequences, are the disasters they have been made out to be. He said: "There would otherwise probably be no mineral deposits in the Earth's crust and, without the system of plate movements, the surface of the Earth would almost certainly be far more inhospitable to man if, indeed, the absence of such a system would not leave the continents so eroded that water would completely cover the surface of the Earth."[4] There is also a growing expertise in the area of predictability of catastrophies of this nature.

2. Concerning floods, leading experts in the management of water resources, such as Robert P. Ambroggi, make the point that unusually heavy rainfall is absolutely essential to the recharging of life-beneficial underground reservoirs making up some two-thirds of the Earth's fresh water.[5]

3. Arid desert areas around the Earth are not to be seen as forever wastelands. Not only do they play a role in the global weather machine, but have been found (as in Arizona, Morocco, and Tunesia) to be highly fertile under irrigation, to say nothing of the fact that they frequently turn out to be useful in the sub-surface storage of large quantities of petroleum and mineral supplies.

4. The extinction of species argument is frivolous if indeed man is an evolutionary end-result and shaped in both physical and character values by all that has gone before him; thereby possibly indicating some worthwhile purpose was served by even short-lived admixtures of the genes in the make-up of a finely-crafted human recipe. Perhaps less speculative is the modern theory that species of dinosaurs did not become extinct after all—they largely transformed into birds.

5. Death is not to be seen as an imperfection if one takes note of the very strong argument that living things appear to have been well-designed in the first place to be reproductive and to exist in accord with life cycles, rather than to be non-terminable entities.[6] On disease and the like, and quite apart from the advancements in medicine to either retard or eliminate all sorts of disease, there is a strong implication of design in the yet unexplained reason for the existence of specific antibodies for specific disease strains, particularly noted in the human body.

6. On evil and its consequences—a peculiarity of the unique human condition. This writer has no real difficulty in assigning to it an empirical mark of "design and purpose." It simply stands out too much in enigmatic isolation in what may be otherwise seen as a well-designed world. Further, it is a by-product of the remarkable thought processes and freedom of choice in man, itself inferential of design.

Those who find fault in still other non-exampled "imperfections" in the natural world should be challenged to suggest a superior way to engineer entire Earth systems, forces, construction materials, and the like, for the better existence and maintenance of life; that is, without introducing, at the same time, overall negative or detrimental effects. In general, it may be said that faults do not lie with the environment, but with conscious man himself. An observation of William G. Pollard that man may use his creativity "as a blessing or as a curse"[7] has special meaning here.

Chance and Randomness

The idea that "anything" is possible in the universe or that all results are unpredictable, except perhaps through statistical aggregating probabilities, requires some brief attention here. Whether one relates to the indeterminacy principle or to the theme of the late Jacques Monod in *Chance or Necessity*[8] who perceived a total randomness in the DNA coded mechanism, the observation of the late C.F.A. Pantin is significant in that the rigid limitation of the properties of matter demand that only a limited number of classes of chemical machinery may exist, and that the concept of randomness does not involve by any means the freedom to make anything possible.[9] From a probability standpoint, the statistical alternative should achieve in practical application much the same results in time either under a deterministic or indeterministic concept.[10] If this be so, there is no reason in science, according to William G. Pollard, why a Designer of the universe should not have chosen such a means to an end.[11]

The reader may be aware of the considerable criticism of Monod, such as that of the distinguished biologist, Sir Alister Hardy of England, who calls it a fallacy for Monod to have expressed the view that chance variation of the DNA code really governs the course and direction of evolution: "It is selection that guides the process, and selection is far from random."[12] His point is that the course of evolution is selectivity guided by external environmental factors, including behavioral selection in his view and that of a growing number of biologists, and acts upon a range of variations provided by the shuffling processes through apparently random DNA mutations and re-combinations of the genes. The genes determine the potentialities or limits of variability of the characters. The basic job of the genes of DNA according to C. H. Waddington, "is to remain as stable as possible, with as little change as may be, while they are passed on from cell to cell, or from individual to individual, through many generations."[13] This view is consistent with the relatively new discovery of George Pieczenik that there are certain constraints in the genetic message of DNA in that the sequences seem to exist to protect themselves and their coded information from recoding.[14]

Hints to Intelligence Design

It may be that the time has come to challenge (on threshold empirical grounds) the view held by some that events transpiring in the universe have been the mere consequence of statistical probabilities. The *end-results* of atomic and genetic behavior in evidence today are far too remarkable, appropriate, and tend to fortify (in my view) Albert Einstein's belief that concepts of pure randomness arising under the uncertainty principle could be the product of our own ignorance; that, somehow, cosmic nature acts in accordance with a

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certain order. This seems to be in accord with what increasingly reflects a "wonderful" programmed complexity of things at the molecular level in living organisms[15] and at the atomic and even sub-atomic levels in inanimate nature. The universe itself, as our limited knowledge increases, is beginning to display in various ways the kind of hints to intelligent design that is reminiscent of primitive hints to intelligent design in the limited background knowledge of design arguments of many centuries ago pertaining alone to the Earth environment.

From an empirical threshold standpoint, albeit speculative, there are some interesting clues today that the atoms, in their aggregating combinations, may have been pre-programmed in advance to respond to the conscious activation of creative intelligence: in effect, a mental or *atomis mentis* (rather than a random statistical) degree of selectivity over time, engaging an initiating creative power, the elements and forces, and the ultimate end-products in nature. Such a speculation may be reasonable due to increasing evidence of precisely coordinated and meaningful end-results in both animate and inanimate nature, as well as to other hints arising from other concepts suggesting a mental order in near proximity to the atomic level of things. In Hardy's view, a creative element must be linked with the mental or psychic side of life and "playing its part within the Darwinian system of evolution."[16] Both J.B.S. Haldane and Sewell Wright speculated that an element of mind may be universally present in atoms, elementary particles, and the like.[17] Empirically, in addition to the remarkable end-results of themselves implying a sense of direction, Hardy and others point to a kind of consciousness or "awareness" in animal behavior (identifiable at higher levels but possibly re-traceable someday to more basic levels of existence) having a steering effect in achieving remarkably fit results from selection in biological evolution. Apart from the reasons given by them, this may be supported by a relatively recent discovery (mentioned above) that the genes in DNA seem to be self-protective in a sense which might infer an "awareness" activity only slightly removed from the atomic level. Even parapsychological phenomena may suggest, if believable, the possibility of a connecting linkage between the mental and the material world and, hence, falling within the broad scope of the speculation. As this writer has previously noted, if we are to contend that the universe was intelligently designed from the beginning, it best appeals to our common sense that there would be a continuing linkage between the initiating creative intelligence, the elements and forces, and the ultimate creations.[18]

Such is the posture of the design argument as it should be seen today. Nevertheless, for reasons to be mentioned later on, it still fails to convince many in philosophy and science. Even theologians, as with F. R. Tennant some years ago, have been apologetic in reference to design arguments unless advanced in combination with still other arguments based on religious experience, revelation and faith, or on the basis of ontological and cosmological arguments that appeal primarily to logic and pure reason.

There are many who look upon any sort of thought with a religious connotation as being simply a matter of pure subjective "belief." This view, however, is inapplicable to the general composition of design arguments that are grounded in actual observation through reasonably developed facts, hypotheses, and theories of science. To an extent, it is a question of the degree of separation today between reason and a "leap of faith." It is more a question of the extent to which we may place trust in science and its methods, as related to both established "facts" from direct observation and to natural phenomena that have been the object of continued investigation. Even the critical philosophers like David Hume and Immanuel Kant, had great respect for the argument from design because of its observational character, even though challenging the then sufficiency of inferential evidence and the reliability and logical conclusiveness of the argument. Our present-day observation of the phenomena of nature is surely not fool-proof or conclusive in a final sense of meaning any more than present "well-established" theories in science so qualify, but we do know there are degrees of reliability and trustworthiness of the evidence in support of most theories. It is an acknowledged weakness in inductive reasoning processes where one is seeking to provide evidence for an "unseen" cause from observation of effects. In this, the philosophers are correct in the logic which holds that to establish that "B" is caused by "A," one needs to actually observe both "A" and "B" in conjunction,[19] and there are few persons around who would claim they have actually seen God.

Yet, for reasons to be considered below, design arguments are entitled to great new importance and influence in the evidence for causation—contrary to present criticism and modern philosophical thought on the subject. We are, in my view, closing in on the "loose-ends" and one of the aims of this essay is to show that science, by virtue of its own method, rather than being viewed as contributing little or nothing to religious conviction, vis á vis the design argument, should be seen as having moved significantly closer to a convergence with religious thought in this late 20th Century.

The philosophical criticisms seem to be equally applicable to both the scientists and theologicans in their common quest for truth. Both have found it appropriate to their respective undertakings to rely upon inductive reasoning processes in the search for ultimate causation in the absence of direct and actual observation. The scientist, however, is not normally prepared to rely entirely on hypotheses or theories as having any lasting validity, and the pure objectivity sought in scientific method to verify cause from effect in establishing a theory is seldom realistically achieved.

A Common Ground for Science and Religion

We are here searching for a common ground between modern science and religious thought. It is not as elusive as many would have us believe. The design argument, being based on empirical observation, more closely identifies with the process of scientific method than other appeals on which religious conviction is based, but there seem to be several steps required of any undertaking to bridge the long-standing chasm between the two processes of thought: (1) a satisfactory accommodation is required by which the theories of science are once again to be seen in a generally religious context; that is, a context in which there exists a mutual respect or recognition of one for the other; (2) the erroneous view that any sort of religious conviction is a matter of pure

"belief," non-objective, and with no means of verification comparable to the scientific method in the formulation of a theory must be overcome; and (3) as a critical step to a reconciliation, one needs to accept that the design-appearing inferences (in the nature of the examples described above) must not only be regarded as essentially empirical in nature, but to also fit into a better mold—one allowing for a reasonable verification of "cause" extrapolated from differing bases or kinds of observational reference, and under circumstances reflecting a reliable pattern. In other words, a model with which scientists are familiar in fashioning an acceptable theory on the basis of observation.

If, therefore, a credible model may be constructed on which both scientists and theologians alike could agree, considerable progress could be made in the direction of a meaningful convergence of science and religious thought.

This is not merely a possibility for the future—it is now very much at hand. This is a well-supportable proposition not merely due to developments in the means with which we may now perceive "design," nor in the differing ways in which both the new and past cumulative evidence may be seen to point unilaterally to an intelligently designed universe, but in the method of cross-verification derived from differing kinds of empirical observational bases.

"Design-appearing" inferences are substantial, especially when one takes cognizance of a bewildering growth in what may be claimed as inferential evidence of design arising out of the information explosion of the past quarter-century.

Three Empirical Pathways

There now appear to be three differing pathways of an empirical nature in the evidence of a designing God of the universe, each arising from the design argument and each verifying the others with such regularity over the course of informational events and theory that scientists, philosophers, and theologians alike should take cognizance of the developments. It is now reasonable to present a design argument in which the overall inferential evidence may be divided into three distinct groups of cross-confirming observations. Only two discriminating classifications were sufficiently evident as to be prominently noted in the literature of the early and middle part of this century with some degree of emphasis, enough to be generally termed a "re-structuring" of the old argument from design. While both of these were much in evidence in an even more distant time, they were far less complete than they are today in terms of available descriptive references.

These related groupings separately comprise identifiable lines of indirect evidence to show intentional design by way of (1) analogies to intelligence from the appearance of things, (2) the remarkable "fitness" of the environment to permit the existence and support of life as we know it, and (3) the encompassing evidence of the past quarter-century of a unique and special relationship between man, his mind and conscious creative thought, and the environment. It is by and through man that the whole of inanimate nature, at least in our small domain in the universe, comes together into a workable system.

It is unfortunate if we fail to sense the individual and combined significance of all three dimensions that may now be clearly discerned in an empirical way. While there is some commonality or overlap between them, they are each separately oriented in differing contexts of actual observation. The inferences in respect to each are to be seen as directional in the sense that they suggest to our reason and experience an origin of intelligent design rather than that of "non-design." Such a claim is reasonable if one gives serious thought to the list of examples set forth above. If there were only a handful of examples attributable to each of the differing bases of evidence, less of an impression would be made, as with the scientist who draws a conclusion on the basis of very scant observation in the formulation of a theory from three differing bases of empirical observation. We now have available, however, an almost countless number of descriptive references to attribute to each of the categories of evidence as mentioned.

Analogies to Intelligence

As concerns analogies (group (1) above), a main element in the reference phenomena used in the earlier arguments from design was to demonstrate from *analogy* that nature required an intelligent Designer. To appreciate the extent of our progression simply from the use of analogies as a primary kind of evidence, we should first focus our attention on the precise nature of this kind of argument.

By reference to the workings of human intelligence and its creations, phenomena in nature that give the appearance of intelligent design provide the basis for analogy. The eye of a living being, for instance, so resembles in complexity and utility a machine of human construction, that an intelligence must have been (by analogy) the cause of its origin and existence. It is interesting that analogies to intelligence formed the major backbone of design arguments in pre-Darwin times, and these referred in large measure to the biology of living things, or parts or functions of living things, thereby suggesting a Designer. A number of books were written on design that included one analogy after another. These included the significant work in the late 17th Century

of John Ray,[20] and that of William Paley,[21] in the early 19th Century, and the volumes comprising the so-called Bridgewater Treatises published in 1936,[22] written by some of the leading British scientists of the day. Since then, a number of other writings—too numerous to mention here—have carried forward the appeal to analogy, but more in combination with other appeals to design.

Fitness of the Environment

An important empirical step-forward beyond analogies (group (2) above), came forth in a book published in 1913 by the distinguished biochemist, L. J. Henderson, entitled, *Fitness of the Environment*.[23] Its basic theme arose out of an enlarged comprehension of inanimate nature from what had been envisaged in the earlier design arguments. Many of the so-called "restructured" design arguments of the present century, as by F. R. Tennant for example, were inspired to fresh new thought on the subject by Henderson's work. This is not to say that earlier arguments to design had overlooked many points of the then-known linkages between animate (including man) and the world of inanimate nature, but that post-Darwin materialistic thought went far afield in condemning the old arguments from design simply because of processes active only with respect to animate nature. Henderson observed that biologists since Darwin had been "in the habit" of considering only adaptations of living things to the environment. "Yet," he said, "fitness in the environment must be as fit as the organism" for the existence and survival of life. He argued that the real and unique fitness of the environment is only one part of a reciprocal relationship indivisibly linked with the process of cosmic evolution and that, "one fitness is not less important than the other." Of this unique animate to inanimate appearance of design, the late C.F.A. Pantin, commented as follows

> Can we discern design in the properties of the units which make a living organism possible? These properties of the units are not the result of selection in any Darwinian sense.[24]

Henderson's contribution to this line of argument related primarily to the physico-chemical characteristics of three chemical elements, i.e., carbon, hydrogen, and oxygen, and of the compounds water and carbonic acid. He said:

> . . . they constitute an ensemble of fitness among all possible chemical substances, for a living organism, which must be complex, regulated, and engaged in active metabolism; that there are no other compounds which share more than a small part of the qualities of fitness of water and carbonic acid, and no other elements which share those of carbon, hydrogen, and oxygen.[25]

Modern critics of Henderson, such as Sagan, Matson, and Lack, point to "other possible worlds" based on different possible biochemistries. Perhaps this may be so, but of little significance in terms of the real scope of the "fitness" that is apparent today between the environment overall and the existence and maintenance of life, particularly as its theme applies to almost countless inter-related animate to inanimate phenomena. This observation applies as well to a related criticism to the effect that we cannot say this world is designed if we do not know what "other" worlds are like. Yet, the opportunities for design elsewhere should serve to upgrade the view of design in the whole of the universe, as well as in our part of it. In a purely random universe, there would be no need for elemental conditions that would so remarkably portray design here or anywhere else.

While earlier design arguments, in addition to expressing analogies, had enumerated the known fit and suitable interrelationships between animate nature and the surrounding environment of inanimate nature, Henderson may be seen today as having brought home the point that the unity, harmony, or "fitness" of animate to cosmic phenomena was something quite different from the argument to intelligent cause through analogies. Phenomena or things that fit together and are appropriate to each other more often than not fall outside, or beyond usual description by analogous appeal to intelligence. While many analogies used in design arguments may involve a "fitness' aspect, it is clear that phenomena or things showing a harmonious suitability aspect to other phenomena or things have a distinct and independent basis of their own on which to separately appeal as an entire grouping of inferential evidence to an intelligent cause. For one simple example, we think in terms of the suitability and fitness of nature, rather than analogy, if we contemplate design in the potential for man's space exploration. In an accidental universe, the probability of having a suitable set of environmental and other conditions for man's venture into space against gravity would be next to nothing: hence, an inference to intelligent design not grounded in analogy merely from the appearance of things.

Man and the Environment

As concerns group (3) above, relating to the special relationship between inanimate nature on the whole and man's creative thought in the manifestation of a well-designed and completely workable system, this is an important and relatively new empirical dimension to design arguments. While broadly extending the "fitness" grouping as considered above, it stands distinctly on its own in comprising a separate chain of seemingly endless observational facts which, by scope in subject matter and descriptive reference, closes old gaps, reflects a positive directional aspect in nature, and extends the picture of design full circle in relation to the physical aspect of our planetary environment, and perhaps beyond. Note should be made of the fact that the "fitness" argument of Henderson related the environment of inanimate nature to the existence and survival of life (including man), rather than to the prime speciality of man, his mind and consciousness, to the environment. While the uniqueness of man to his environment has been recognized in various examples interspersed throughout design arguments, both before and after Henderson, it has only been in recent times and in consequence of modern discovery, that we can now picture his existence in a very special manner apart from all other known phenomena.

If we have learned anything in recent years, it is that there exists a complete harmony between man, his mind and conscious activity, and the environment on the whole. Through discoveries into the very nature of things, man has opened up an entire new spectrum to the picture of a well-designed world. We may now observe that the very

intrinsic nature of things, in and of the environment, reveal a mutual reciprocity that goes exceedingly far beyond mere compatibility in the usual evolutionary sense of adaption, as with other life forms. In whatever course or direction man's creative thought and ingenuity chooses to carry him, the world is a complementary and well-prepared "stage" for his uses and purposes in a truly progressive sense, having not yet been found wanting in the provision of a physical environment containing all of the necessary elements, forces, and conditions—severally and in combination—to the attainment of his ever-enlarging objectives. The potential for this most meaningful and unique mind-matter relationship, it should be emphasized, was latent in material substance, forces, and other phenomena before the advent of man.

These observations are quite separate and apart from the question of "how" man is to maintain his environment—"as a blessing or as a curse," or "what" the future may hold for him in relation to the finite character of the environment. Present and future events could well affect the long-range results.

It could be wrong to equate the uniqueness of man's special relationship to the Earth's environment as a singularly isolated phenomenon. One of the most respected of the hypotheses of modern science is that the potential for such a reciprocity is latent elsewhere in the wide expanse of the universe, that is, wherever suitable environmental conditions may coincide with consciousness and intelligence.

Examples of this special relationship abound. In *Chance or Design?*, the following summary is set forth:

> In the early days following his arrival on the scene, man's needs were met at first from nature with the more simple and basic raw materials for his development that were roughly attuned to his then limited, yet developing knowledge. His progressive anthropological story reflects the use or availability of materials for fire and shelter, tools for hunting, soil for agriculture, cooking and storage devices, textiles, beasts of burden for transportation, and so on . . .
>
> A seemingly endless stream of new and different inter-relationships has come to be revealed in step with man's creative advancement. These new linkages have enabled man, for example, to: (1) move about on sea, land, and in the air with great facility thus bringing the Earth, the solar system, the galaxy, and indeed perhaps distant galaxies much closer together in present or projected meaningful ways, (2) communicate, as well as to see, at great distances incredibly far beyond normal range of ordinary hearing and sight, (3) escape gravity with yet untold promising future consequences, (4) harness a host of diverse energy sources to a variety of needed and purposeful uses, including the power and energy of the Sun, the atom, fossil fuels, wind, water, geothermal steam, etc., (5) transform elemental matter into an almost countless and "bewildering" array of useful materials and substances, (6) convert, increasingly, so-called inhospitable areas of the Earth, such as deserts, jungles, polar areas, and the like, to present and potential use—an exercise of man's dominion not unlike that over plant and animal matter, (7) modify life processes in the physical and chemical sense, and (8) make almost countless practical and useful applications of discoveries arising from a great many of the applied fields of science. The latter would certainly include such things as the creation of artificial light and the harnessing of tremendous energy in the form of laser beams, as well as to use the mysterious substance of light in a variety of other beneficial ways; the penetration of opaque objects through the discovery of X-rays and other more recent and sophisticated scanning mechanisms; the preservation of food through the use of refrigeration and the stimulation of food production by use of fertilizers and by other means; the development of technologies to survey the Earth's potential for new resources, including agricultural, mineral and the like, as well as to locate soils of adequate fertility, the existence of crop diseases, etc.; the enlargement of the scope of mental retention capacities through computerized mechanisms, the modification of climatic temperature ranges as related to immediate environmental conditions; and such a variety of additional and useful discoveries that are actually quite overwhelming.[25]

The many analogies to intelligence and the innumerable examples of remarkable inter-relationships in nature to further the origin, existence, and survival of life, as set forth in design arguments of the past, fell short of explaining a great deal which still appeared to be random, disordered, and non-designed. It required the creative thought and activity of man, his mind and consciousness, to tie it all together and to demonstrate that what may ostensibly appear to reflect disorder, irregularity, and imperfection is not that at all *intrinsically*, at least in the Earth's environment. The function, utility, fitness, and accommodation of inanimate and related phenomena in relation to life in general and to man, his mind and consciousness, in particular, has changed most of this around to now present a more total picture of design. There is little indeed that was formerly non-descriptive of design that may not now qualify as inferential evidence of intended design—all of which reflects on the significance of man and his intelligence as a special object of creation.

Those who would argue that all of this is simply a manifestation of our subjective and collective point of view or that we have ourselves "ordered up" the appearance of design, fail to face the fact that what shows design today, when applied to our unique mentality, exists quite independently of it.

Even though we have much yet to understand of nature and some of what we believe to be understood may be illusory or unreal, yet, on the record as a whole, a panoramic view of an intended and well-engineered creation is much closer in observation than ever before, just as work on a jigsaw puzzle reaches a certain point toward completion where the picture becomes recognizable. This may be achieved even though a great deal of the "unknown" remains beyond our present-day understanding.

The multiplicity of different evidences should serve to weaken the long-standing influence of philosophical criticisms. While certainly one may not quarrel with the basic logic of criticisms arising from an absence of direct observation, yet Hume, Kant, Voltaire, and their progeny, were never confronted with a triad of differing kinds of probability bases from which to "triangulate" the identity of an unseen "source." In this, the general fitness inferences so grouped serve to confirm the innumerable analogies to an intelligence, and the special relation of man to the environment to produce a workable system, confirm the other two and they, in turn, support the latter, all in a way of cross-verification of intelligent design. We can thus relate to human experience in an objective way of verification to demonstrate "cause from effect" with a much higher level of reliability than ever before. It is doubtful whether any present-day theory of science, predicated upon inductive reasoning, whether it be that of biological evolution, black holes, or sub-atomic particle theory, is so well under-pinned by confirmatory and observed phenomena as that which points to a Creator of the universe.

Conclusion

I conclude this essay by returning to its initial theme—that a basis now exists for a timely reconciliation between modern science and religious thought. The key to this rests firmly upon the common empirical ground I have described. While it is quite true that scientists themselves question and do not uniformly accept even "well-accepted" theories out of hand, they do tend to go forward and build new discoveries upon a standing theory unless and until some replacement should come along. Why not this one, especially since an alertness to "design" may well aid in the making of future discoveries?

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Despite the new rhetoric and the fact that the world has managed to survive for several decades with nuclear weapons, the danger of a global conflagration remains a very real possibility. A clash between the superpowers would cause so much horror that there is no issue which could be solved in this way. If another worldwide conflict should occur, the earth would be in such horrible shape that it would have been better not to fight. It would seem that at this point the just war tradition would simply fade away. Yet the teaching continues among many Christians. . . . . In the minds of some individuals who might call theirs a just war position, the present military policies are absolutely necessary for self-defense. . . . A heroic defeat is better than a disgraceful surrender, and the lands which have defended right are likened to martyrs whose influence continues through the centuries. The basic weakness of such arguments is that if thermonuclear war is allowed to occur there may not be any future generations to appreciate the present attempts to preserve Western "civilized" values.

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The Scientific Basis of Whole Person Medicine

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The object of medical science's study, man, is somatic only in part. Two-thirds of his person is psychological and spiritual, abstract qualities not measurable by physical science tools but rather with social science methods. Social science design strives to capture an abstract concept with concrete instruments such as surveys and questionnaires. The three critical criteria of good social science design are: is the study (1) comprehensive, (2) inclusive and (3) balanced? Academic medical science suffers from lack of comprehensivity and balance in how it operationally defines the health of the whole man. New social scientific evidence supports the importance to full health of the spiritual side of man, and new psychoanalytic theory provides the theoretic base for many of the new practice paradigms of whole person medicine. The scientifically-describable nature and effectiveness of several of these modern whole person medicine models is systematically scrutinized.

As objective medical scientists, we must view the object of our scientific study, man, within the best of full scientific principle. Most of us have spent the large part of our professional lives specializing in the somatic side of man's health, and understand the methods and principles of biochemical and physiologic science. But the two-thirds of man's nature that is not somatic, the psyche and spirit, cannot be approached by physical science tools, rather must be studied by social scientific methods. Research design in the social sciences strives to capture an abstract principle with concrete test-instruments such as questionnaires and surveys. The three cardinal hallmarks of a sufficient social science research design are: Is the study (1) Comprehensive, (2) Inclusive, and (3) Balanced?[1] As medical scientists charged with describing and upbuilding the health of the whole organism *Man*, we must ask ourselves have we truly viewed (and instructed in) the full human health potential of man in a comprehensive, inclusive and balanced way?

What is a comprehensive, balanced, inclusive view of man's nature? What are the fullest dimensions of whole man? Platonic theory considers man's nature in three discrete but interrelated units, *pneuma*, *psyche* and *soma* (spirit, mind-emotions, and body) where spirit is the chief governor of The whole. Hebraic theory sees man as a gestalt, a whole, with all the individual parts critically interdependent on the rest; central to the Hebraic perspective, man's entire earthly being must be critically-centered in a metaphysical presence (or God).[2] "Shalom," the word that defines health, is the peace of God-centered human wholeness.

We consider the spiritual (*pneuma*) aspect of man for this paper generically, as that aspect of every man concerned with meaning, purpose and values.

What is the modern social science evidence that the spiritual side of man is important to health and well-being? Does the operational balance in the way modern medicine is practiced in the 1980's, reflect the magnitude of the scientifically observed importance of the spiritual side of man on health and health-promoting behavior? If not, why not?

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Scientific Evidence For The Importance To Health Of The Spiritual Aspect Of Man

Sociology has abundantly demonstrated through the work of Moberg,[3] Levine,[4] Greeley,[5] Jackson,[6] and Garrett,[7] that religion and spiritual values are one of the most critical factors in perception of "quality of life" at all ages and in motivating major health-promoting life-style changes. Caplow[8] in the most recent evaluation of Middletown, USA has shown that religion is increasing, not decreasing, as one of the most important aspects of American life.

Social scientists, in other disciplines such as population science, social psychology and survey-research have recently affirmed this also. Their studies show that the majority of American people in the 1980's are religious, and polls such as Gallup and Harris show this religious element markedly affects health seeking behaviors and tendency toward health-promoting lifestyles. Greeley and McCreadie[5] at NORC, Chicago, in their survey of "the Ultimate Values of the American People," (1978) demonstrated the importance of religious affiliation to moral decision-making. Most recently Connecticut Mutual Life Insurance[9] in their survey of the values of the American people in the 1980's showed the single most important variable in health promoting lifestyles was religious affiliation.

So the spiritual aspect of man, that aspect of man concerned with meaning, purpose and values, has been demonstrated recently by several social science disciplines to be key to thinking and motivation for health behavior and quality of life. Why has this aspect of man been ignored in explicit medical science in the last 50 years? Why if it is considered at all in medical schools, is it taught only in forms that are either anecdotal or a single case history, as part of the art of medicine, but not rigorously approached as a generic field in the science of medicine? If we evaluate ourselves objectively as medical scientists, that is scientists of man's whole health, we are immediately faced with the evidence of our imbalance and noncomprehensivity in considering the whole health of whole man. In medical schools, we have not undertaken major social science effort to measure the effects of the idealism, ultimate values, meaning and purpose in a man's life, on his specific health-seeking and health-promoting behaviors and on his responses to illness.

At least three factors can be cited for the development of the present imbalance in the way medical science approaches the whole health of man.

1. Modern Americans in general, including highly biomedically, technically competent physicians, are unskilled and underencouraged in philosophic thinking and confronting the larger meanings in life.
2. Only recently, in the last two decades, has social science technology attained the capacity to measure significant effects of the spiritual side of man on health behaviors and illness response.
3. The major popular USA educational media (TV, magazines and newspapers) selectively emphasize the somatic and emotional aspects of man. This imbalance in perspective on man by the popular media education was also supported in the past by the more vocal of professional psychological opinion. It appeared that some aspects of psychiatry and psychology in a rather glib way operationally rejected the spiritual and values side of man's nature in their search to uncover his most authentic emotions, forgetting that values themselves are generative of some of man's most sublime feelings.

Faulty Psychological Premises Affected Past Perspectives

Because this third factor blocking our scientific comprehensivity in dealing with man's whole health originated with the medical profession, it is important that we look in more depth at the faulty premise and assumption on which this psychological neglect of the effect on human health of the spiritual side of man was based. At the turn of the century, Freud, a man most interested in religion, offered seven neurotic reasons why people might seek faith in God. In the blush of his new analytic understandings, with no empiric data, he conceptualized the possibility that man created God himself and no God, external to man, necessarily needed to exist. Freud firmly believed, however, that every man had an internal God-image as part of psychological development. But he then made the enormous philosophical assumption that in adulthood, "The non-believer was . . . normal." No explanation was made for what the non-believer did with his God-representation. Freud did not deal with the fact that the non-believer needs an explanation for his lack of belief in his God-representation as much as the believer does for belief.[10] About Freud's incomplete rigor in considering this aspect of child to adult development, one modern analyst states,

> a child whose parents forbid him to have a God may have to resort to a secret belief . . . As long as men can follow their notion of causality to its very end . . every human will have some precarious God representation . . . God will remain at least in the unconscious. We need our objects from beginning to end . . . as Mahler says. It is the paradox of being human. Freud's ideal of a man without illusions will have to await a new breed of human.[11]

Of course the metaphysical question as to the actual *external* existence, or not, of God, is beyond the discipline of psychoanalysis to answer; it has been a source of wonderment for the philosophic and theologic disciplines for millenia. Following in his analytic discipline, Freud's major dissenters, including Jung, Adler, Putnam, Rank, and Biswanger,[12] responded to his special emphasis that Freud's reductionist view of man was mechanistic, and did not take into account the capacity of man for transcendence. To man's transcendent dimension they gave several names: Adler called it "soul," Putnam called it "spirit" and the "imago dei," Rank describes it as "beyond psychology" and as "soul" or "spirit." Jung and Biswanger similarly refer to this dimension as "spirit." Unfortunately these analysts' views and statements on the spiritual dimension of man rarely, in the past, have been explicitly instructed in psychiatry departments at USA Medical Schools. Yet recently the spiritual side of man has become an increasing focus of modern analytic thinking.[10,12,13,14] William R. Rogers of Harvard, in his University of Louvain lecture series (1977)[13] mirrored Freud's original list of seven neurotic causes for belief, with seven neurotic causes for modern man's *unbelief*. Recent analytic and object relations theorists in Boston,[10] New Haven,[15] and Durham[14] accept as Freud did that every individual whether religiously

affiliated or not has an "Imago dei," which is formed as a critical transitional object in human psychological development, but they further suggest that only when the individual can consciously examine and healthily bond with his unique fullest "Imago Dei," does he reach maximum human potential and wholeness. Giargos specifically expanded basic Freudian drive theory to state that every individual has a basic human-metaphysical drive (missed by Freud,) i.e., man not only has the drive for intra-human relationship (or human object bonding) but man also has an innate drive for metaphysical relationship (for bonding with the transcendent). Further, Rizzuto's analytic clinical research studies on 20 subjects[10] offer strong empiric support to these recent advances in analytic thinking. So we see that superficial thinking and slurred development of premise, has contributed to the avoidance for nearly 50 years by the psychological medical sciences, of the importance of the spiritual side of man to his full health.

Modern Definition of Mento-Spiritual Health

Chastised for imbalance in the way the medical profession has operationally viewed and described the health of modern man, and collectively remorseful for the faulty premise and slurred understanding of the limits of the psychological disciplines to answer eternal metaphysical questions, while simultaneously neglecting their responsibility to observe the effect of the spiritual side of man on health, we can now correct our error by inspecting some modern definitions of health for the whole man that explicitly address his fullest possible dimensions. To find these definitions, we turn to the theologic, philosophic and behavioral science disciplines. Systematic definitional analyses of three great thinkers of mento-spiritual health are reviewed by Sandborn in his book *Models of Mento-Spiritual Health: an analysis of Hiltner, Boisen and Clinebell:* 1978.[16] Tillich[17] as well as Gordon Allport[18] and Roberts[19] have also offered excellent theses. All suggest that mental health is critically dependent on spiritual health and conversely fullest spiritual health is not obtained without sound and robust mental health; a balanced interdependency between mental and spiritual health is critical for the health of the Whole man. Their theses urge full, balanced implementation of the World Health Organization's definition of health care: the three processes of healing of disease, prevention of sickness and promoting fullest health, in the three dimensions of man: body, psyche and spirit.[20]

So where do we go from these more explicitly inclusive definitions of whole person health? In federal Washington, four indicators test the possibilities of new programs: It is (1) acceptable to the powers? (2) appealing to the people? (3) actualizable by the Congress? (and most critically) (4) after all that, truly implementable? The fullest definition of man's health (cited above) is philosophically acceptable. Whole person medical care, adding respect and concern for man's spiritual dignity to the best in traditional medical care of his body and emotions, is highly appealing to the 1980's consumer. This leaves the question: Is a Whole Person medical scientific approach to man's spiritual health care actualizable and implementable?

Practice and Professional Paradigms

What are the practice and professional paradigms for integrating mental and spiritual health care? In the past two decades, concern for the clinical implementation of integrated mental-spiritual care has escalated in all levels of mental health professionals, best conceptualized by John Hoffman's book, "*Importance of Ethical Confrontation in Counseling*" (1978),[21] and that of Peck (Connecticut psychiatrist), in which actualized spiritual growth is considered a *sine qua non* of full mental health.[15] Analysts; MD-psychiatrists; Family, Marriage and Child Counselors; and MSW—all levels of mental health credentialed practitioners—have subgroups that practice spiritually-integrated counseling, known as Judaeo—or Christian—or combined Judaeo-Christian Psychotherapy.

Over the last three decades a new special health professional with theological credentials as an ordained pastor (rabbi or minister) and a Ph.D. in clinical psychological counseling, generally known as a *Pastoral Psychotherapist,* has burgeoned: they have a credentialing board, and in their professional society, The American Pastoral Counselors Association alone, are now listed 1500 certified Ph.D. members. The CAPS, an ASP sub-organization of Christian Counselors, has more than 4000 members. Additionally, the hospital chaplain, who in the early part of this century performed virtually only as sacrament administrator, now in the last two

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decades, with greatly increased medical training standards, has grown to be a vital link in the health professional team as a counselor and clinical researcher, in *Hospice*, general wards and in outpatient clinics. The average certified and accredited medical chaplain now not only must have ordination as a spiritual scholar, but also one year hospital internship and over two years of on-site hospital training in physical and psychological disciplines; as a mental health specialist, he is licensable at the MSW level. The Pastoral Psychotherapy literature has exploded in the last two decades after the popularization of Clinebell, Oates, and Wise and other former affiliates of Union Theological and Columbia Education Schools such as Rollo May and Carl Rogers.[22,23] These burgeoning descriptions and refinements in the theory of the clinical integration of mento-spiritual health care daily increase the accountability, and, hence the accessibility, of such practice. One would expect that medical schools interested in care of the Whole Person would soon seek and be enriched by the enormous literature and recent clinical work of these new pastorally-integrated disciplines.

Clinical Models

What are some of the new clinical settings where we can scientifically observe the effectiveness of the clinically integrated mento-spiritual health care?

1. *Hospices*, the whole person health care centers for the nation's 400,000 dying of cancer each year, are mainly modeled after St. Christopher's in London, where the medical chaplain is the major health deliverer. Since the first USA Hospice at Yale, in eight years over 800 hospices have started in the USA.[24]

2. As stated in the Pellegrino 1982 National Endowment for the Humanities report, in the last five years 126 of the nation's 128 *medical schools have started medical ethics or humanistic medicine divisions;* the quality and refinement of how ethics is conceived and taught in these programs has increased with longevity. There is still room for further refinement in this discipline of the theological sciences, as the British, who have experienced similar burgeonings of such departments in the last five years, so clearly report.[25]

3. *Pastoral Psychotherapy Counseling Centers* and *Christian (or Jewish) Mental Health Service Centers* have burgeoned, at a time psychiatry divisions in general hospitals (and even at the Boston medical schools) are contracting or dissipating because of lack of clientele and sufficient support. "Life Enrichment," "Family health promotion," and "Marriage Enrichment" courses are often taught as group health education from such centers. Using the local churches, as well as the families, of their clients as extra therapeutic-hour support groups, these mental-spiritual health specialists often appear to have faster, more lasting improvements in their clientele's problems than those of other mental health approaches (Gordon report: USA Mental Health Commission, 1978.[26]

4. Finally, perhaps the most interesting to a group of sophisticated internists, is the whole person medical practice model, known as *Wholistic*, (spelled with a *W*,) *Health Clinics, Inc.* Generally these clinics offer care to the physical, emotional and spiritual parts of man through a health team composed of a family practitioner or somatic medical specialist, a pastoral psychotherapist or counselor, and a health-educator nurse. Presently these clinics are based in three general sites.

(a) The first site is *in churches*. The 12-year old Granger Westberg Wholistic Health Clinics, Inc. management group based in the Chicago area and supported by the Kellogg Foundation, has affiliated fifteen such clinics across the USA, and founded or consulted on at least 100 others. The church building, used Monday through Friday, is desirable because of its low overhead and easy accessibility and because of the symbol it provides to the patient that his spiritual side will be cared for also. These clinics, in addition to a standard medical checkup, evaluate with a short written instrument, a (10 minutes) Holmes' stress events scale with a five spiritual question addendum. At the second visit, they provide the client with their unique health planning conference. At this conference, chaired by the Pastoral Counselor, all three health professionals and the client agree on a plan of action to promote the client's fullest health, which is based on needs identified in his Holmes' scale profile and his checkup. (For example, the health promotion plan might include a stop smoking group, a diet-exercise group, pastoral counseling to enrich marriage and teen communications, and to consider the developmental possibilities in spiritual prioritizing that may improve and facilitate former perceptions and responses to stress-provoking events.) Such conferences have reduced hospitalization days in these clients to 30–50% that of matched controls according to a 1978 University of Illinois evaluation study. In 1981, a repeat study of 3 WHC clinics showed 200–500 hospital days per 1000 people versus 500–700 for HMO's and 1200–1400 for National Health statistics. Aetna with WHC, Inc. started a Wholistic Health Center Board in Hartford for the New England region two years ago.[27-30]

(b) A second site for Whole Person Clinics is in *a general building in a special-need community*. Examples of this kind are the Klingberg Family Clinics, Connecticut, the Life Enhancement Clinics in North Carolina, Total Life Clinics in West Virginia, and the South Central Mississippi Health Board—Voice of Calvary Health Center chain of John Perkins, which is now a national model of self-help whole person medical care by the poor that has demonstrated itself to be remarkably cost-effective. This Mississippi product is now replicated in Boston, in the 100 churches membering "the Christians for Urban Justice Wholistic Health project," and in other programs in Charlotte, North Carolina and Santa Ana, California.

(c) The third site for Whole Person Medicine Clinics is as a *triage clinic in the Community Medicine—Family Practice section of State university medical schools*. Granger Westberg has recently cloned his three person health teams in state medical school family practice teaching units at the Universities of Arizona (Tucson) and Washington (Seattle).

New Integration of Academic Scholars

Beyond the clinical research and program evaluation research possibilities offered by these new clinical models

offering explicit health care to the spiritual side of man, greater depth of theoretical research, scholarship and clinical research in the philosophic, theological science and pastoral psychotherapy-behavioral science disciplines are being brought to the tertiary care centers and to academic medicine. Four national Whole Person Medicine Research Institutes have started in the last year. They include, in Jackson, Mississippi, the Ford Foundation *International Studies Unit* of the John Perkins' Health Centers, funded to do survey evaluation studies on the effectiveness of this self-help, "affirm man's dignity" model of whole person health care to the urban poor. The Claremont Theology School in Pasadena under the direction of Howard Clinebell has started a *Whole Person Medicine Institute for Basic Theoretical Research* and a library of 130,000 references on the subject. The *Granger Westberg Whole Person Research Institute* with Kellogg, Aetna and Blue Cross funding opened in Chicago May 8, 1982 to fund survey and delivery evaluation research for Whole Person health clinics serving the middle and upper class in stress reduction and health promotion. Martin Marty, the University of Chicago Theological School, Rush Presbyterian Hospital, and the University of Illinois Medical School are cooperating in *Project Ten, a basic whole person medicine research institute*, housed at Lutheran General Hospital with an anticipated library of 150,000 volumes. Other theology schools such as Gordon-Conwell, part of the nine school Boston Theological Institute, and Union Theological Seminary in New York City are moving into their communities by offering theoretic and theological scholarship to Whole Person Medicine Delivery models, thus providing for the substance and spiritual accountability of such models.

The spiritual aspect of man, that aspect of man concerned with meaning, purpose and values, has been demonstrated recently by several social science disciplines to be key to thinking and motivation for health behavior and quality of life.

So far in this discusion, we have surveyed the modern theory and clinical models of Whole Person Medicine. We have seen that this acceptable and appealing medical concept is, in fact, implementable, thus fulfilling the four USA government criteria to start a new program. But now, not just as policy-setters, but as scientists, we must consider a fifth criterion: Is such a program effective for improving the health and well-being of the consumer?

Is Whole Person Medicine Effective?

Of major current interest to the USA government, Whole Person Health Care is highly cost-effective. The University of Illinois surveys (1978/1981) demonstrated that the health planning conference approach used in the Granger Westburg Wholistic Health Clinics, Inc., reduced hospital days to 35–50% those of matched controls (1978).[29] The John Perkins' South Central Mississippi Health Board Wholistic Clinics have delivered health care to the urban poor so effectively that they were cited by the Regional Atlanta Public Health Service Office (Dr. Reich) as a national model and compete favorably with other care models in primary care delivery to the poor federal grants. Addressing disease prevention and health promotion cost-effectiveness aspects only, the major USA public health problems in the 1980's are not physical disease as seen in underdeveloped countries but spiritually- and stress-related illnesses predominate in many age-specific categories. In USA teenagers, and in young adults, the greatest morbidities are drug-abuse and unwanted pregnancy; the highest mortalities, in order of frequency, alcohol-related auto accidents, suicide and homicide. Among middle year groups, cardiovascular disease related to hypertension and arteriosclerotic disease (both of which have been shown to be related in part to stress response and lifestyles) is the major killer. Among the elderly, depression, loss of life-meaning and interest, severely affects full functional health. And across all age categories ambulatory mental health disorders have been increasing annually and now newly affect 6-12% of the USA population per year with an ongoing prevalence of 20% of the USA suffering symptomatic mental distress annually.[31] The great bulk (>75%) of these ambulatory mental disorders are cared for in primary care medical facilities; only a quarter (25%) by mental health specialists.[31] Much of this non-psychotic mental distress is related to life priorities, meanings and values, i.e., the spiritual side of the individual has a major affect both on illness and for the health of the emotional side. Studies of Kaiser HMO[32,34,35] show that 60–80% of first visits to the internal medicine outpatient clinics are not primarily physical or psychiatric, but rather problems of meaning, purpose and value, and existential ennui, all sometimes described under the umbrella term "Anxiety of Wellness" or "the Worried Well."[32] Kaiser refers out these clients to local Whole Person mentospiritual integrated counseling centers for specific care (e.g., Church of the Highland's San Bruno Counseling Center). Health promotion programs in the pilot Santa Teresa Kaiser model, that utilize specific referrals for spiritual counseling, have reduced annual outpatient visits for illness-care to 40% the Kaiser HMO control average.[33]

How effective is Whole Person Health Concern on a major USA physical disease such as hypertension/coronary artery disease? Workers have demonstrated the importance of the ways in which we allow ourselves to perceive apparently-negative events. If we are insecure spiritually, we may respond to such events with stressful reactions and the chemistry which, in the long term, impairs both mental and physical health [LeShan,[36] Lazarus,[37] Freidman,[38] Simonton,[39] Eisenberg,[40] Catlin,[41] and Herbert Benson[42]]. Other workers have demonstrated the importance of social environment

(Nerem et al)[43] and physical affection in the prevention of artherosclerosis.[43] Two major national studies, Comstock's at Johns Hopkins[44] and in Alameda County[45] show weekly church attendance (and we assume the lifestyles frequently attendant thereto in such communities) is associated with a *reduction in the incidence of hypertension, increased longevity* and *increased host resistance to infection*. Recent articles since December 1981 in the *American Journal of Public Health* describe decrease in hypertension and increased longevity (beyond that attributable to non-smoking) in both Seventh Day Adventists[46] and members of the Missouri synod offshoot of the Mormon Church.[47] Further, in low income areas of Baltimore, Johns Hopkins reports churches have been very successfully used as high-blood pressure detection centers.[48] More experimentally-designed studies are needed that evaluate the effectiveness of spiritual counseling for effecting lifestyle changes that favorably affect the incidence of hypertension and coronary artery disease; the data so far, from the University of Illinois surveys of wholistic health clinics are extremely positive.

On the major teenage USA Public Health morbidity, adolescent pregnancy, a whole person values-oriented sexuality curriculum experimentally-administered to poor urban Baltimore blacks by the Joseph P. Kennedy Foundation working with Jewish, Muslim, Catholic and Protestant theologians and the Johns Hopkins Pediatrics Department, show an 80% drop in teen pregnancies as a result of the transdenominational generic values instruction in human relations between the sexes, taught by the curriculum.[49] Several Transdenominational Whole Person drug and alcohol-abuse centers for teens such as "Valley of Hope" in Kansas and "Touch" in San Antonio have shown higher rates of effectiveness than non-whole person programs.

Among the dying, the Hospice and Whole Person Care delivery has been shown to increase "Spiritual Well-being" defined at the 1971 White House Conference on Aging as "the ability to deal with negative reality with hope and competence"[3] and facilitate the best response of the dying to their new realities.[3,6,50–52]

Among the elderly, Moberg,[3] Jackson,[6,53] and Rosow[57] have shown that spiritual counseling and support produce measurable positive effects on health and health promoting behavior, as well as a sense of well-being.

Among many disorders seen characteristically in specific medical specialties, when research has been done, the effectiveness of the systematically-administered whole person approach, which includes values concern and spiritual counseling, has been demonstrated.[55–57] For example, in a University of Virginia study,[57] in age- and type of injury-matched orthopedic patients, the random assignment of a medical chaplain to visit daily was the independent variable associated with a decrease in days of hospitalization, amount of pain medicine ordered (to one-third the matched control group) and of unnecessary use of ward-based professional personnel time.

New Taxonomy, Social Science Tools and Spiritual Core Curricula

Obviously, the medical science of spiritual health care in the medical schools must continue to broaden its scientific base and increase its depth of experimental scientific studies to more adequately inform the medical community. In 1978, the 3rd National Conference on Classification of Nursing Diagnosis adopted a spiritual disorder classification for the RN taxonomy. In 1982 at Duke University, the first national symposium for a medical taxonomy of patient spiritual disorders and resources completed an initial proposed medical spiritual disorders taxonomy that has been published under Duke University Press.[58] Modern social science measures of the spiritual profile and well-being of clients from such well-regarded social scientists as Moberg,[59] Ellison,[60] Spilka,[61] Allport,[62] Kohlberg,[63] Rest,[64] Fowler,[65] and Holmes[66] are available to augment the new clinical diagnostic assessments with those of objective instrumentation.

Clinical research experimental designs on the effect of the spiritual component of health are ongoing at many schools and general hospitals. At UCSF, one of the leading research medical schools in the country, this year a generic spiritual component was added to the six core curricula already integrated with the George Engel Bio-Psycho-Social Model.[67] Faculty participating with the students in the UCSF course design included psychiatrists, psychologists from levels of consciousness and developmental disciplines, a Rabbi-Ph.D. psychotherapist, chaplains and somatic medicine specialists with a deep background or credentials in theological sciences or social science research on the spiritual side of man.[68–75] Theology schools are now providing adjunct and full-time faculty to medical schools for in-depth scholarship strength in theological sciences, pastoral psychotherapy and behavioral sciences to offer a more accountable medical science in the area of spiritual health care to the practicing medical world. Conversely, medical and public health schools, such as that at Loma Linda, are offering behavioral science and health education MPH degrees to ordained pastors to return them to their pastorate as more effective whole person health educators in helping to promote stress-reducing lifestyles in their groups.

So we see that the specialized scholarship and trained health professional manpower needed to broadly initiate Whole Person Medical Clinics and teaching is already imaginatively deploying itself to medical schools. Fortuitously the extra-medical graduate schools for the behavioral science of the spiritual side of man have been preparing specialist research scholars for over 20 years, and this talent can be moved, en block, to medical schools, to rapidly fill the specific health manpower need that such an imbalance in the operational definition of health has represented. Thus although as medical scientists we in the 1980's USA have been seriously incomplete and imbalanced in how we viewed the health of the whole man, we are uniquely fortunate in such a major health care deficiency to have an extra-medical bank of faculty level health professional behavioral scientists to move into medical schools, to rapidly build up specialty departments for the teaching, clinical care and research of the health effects of the spiritual side of man.

Summary

Whole Person Medicine is a scientifically, conceptually sound way to view the full nature of man, the object of medical science's study. From a sufficiently broad definition of the domains of man's health, we are able to appreciate that the integration of care for man's spirit as well as his psyche is now being described and measured explicitly by the social and pastoral sciences. This moves spiritual health care, from a previous assignment in the realm of the intuitive art of medicine, to an accountable, describable, scientifically disciplined practice of medicine for this specific aspect of the human personality. Mento-spiritual integrated health practice models are burgeoning in USA medical schools and elsewhere in the last decade, employing health deliverers specially-trained to explicitly care for this dimension of human health. Discovering that most of the major Public Health morbidities and mortalities in the USA in the 1980's (in youth and early and mid-adult age-specific categories) are not primarily of physical origin, as in underdeveloped nations, but rather have their roots in psychospiritual and values-developmental problems, we saw how spiritual interventions on individual and collective levels can enhance health and increase both longevity and life quality. Finally, addressing the future of Whole Person medical teaching as a scientific, (not just an art), discipline in medical schools, we saw how (a) faculty from theology and pastoral psychotherapy graduate schools could enrich the theoretical depth of departments in medical schools and (b) how modern social science instruments that describe and measure the outcome functions of various types of spiritual development in man, can be used now in experimental (randomly-assigned) clinical research in academic medical settings. It appears that for health promotional, as well as disease preventive reasons, and, in general, for the overall good of American Public Health, serious medical science consideration of the effect of health of the spiritual side of man, is a most fruitful area for future scientific research.

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The law of the Lord is perfect,
reviving the soul;
the testimony of the Lord is sure,
making wise the simple;
the precepts of the Lord are right,
rejoicing the heart;
the commandment of the Lord is pure,
enlightening the eyes;

the fear of the Lord is clean,
enduring for ever;
the ordinances of the Lord are true,
and righteous altogether.
More to be desired are they than gold,
even much fine gold;
sweeter also than honey
and drippings of the honeycomb.

(Psalm 19:7–10)

Notes on "Science and the Whole Person"—
A Personal Integration of Scientific and Biblical Perspectives

Part 22 (Conclusion)

Response to Evil: A Christian Dilemma

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In previous installments we have considered a number of ethical issues, difficult issues in which inputs from both science and biblical revelation are needed in order to arrive at a responsible Christian plan of action. What is the appropriate way to bring such a series to an end? What is the ultimate Christian ethical issue? Where is the greatest paradox, the greatest dilemma to be found?

An appealing way to conclude a series on science and the whole person is to look to the future and present a discussion of the interaction between science and eschatology. I have already considered these specific issues[1] and shall not repeat them here. It is sufficient to realize that the Christian faces the future neither as one who drops out of a conflict that does not concern him, nor as one who plans to win the conflict before the return of Christ, but rather as one who walks into the darkness hand in hand with Christ, striving in faith to remain faithful no matter what comes. And as the Christian seeks to do this in today's and tomorrow's world, he runs directly into the fundamental question: "What is the Christian response to evil in the world, specifically the evil of other people?"

This question poses the dilemma that is perhaps the most critical and the most difficult for the actual everyday living out of the Christian life. Christians are widely split on its answer. The attitude toward science and the applications of science depend crucially on its answer. It goes to the very heart of the Christian Gospel and to the meaning of that Gospel in the Christian life. It probes the authenticity of the Christian message and demands that we put even our lives on the line.

What is the nature of this dilemma? It is simply this. On the one hand we have the clear New Testament teaching that the role of the disciple of Christ is to be the role of love, embracing not only friend and family, but extending even to the enemy. The reason for this is fundamental: love is the *only* authentic and practical way to overcome evil in this world. Such love may require personal sacrifice, even the laying down of our lives. Jesus faced the evil of the world in exactly this way as our example: the only way in which He could break the power of evil and lay open the road to forgiveness and restoration of fellowship with God was to lay down His life out of love. If He had done anything short of this, God's

plan of salvation would not have been achieved.

On the other hand we have the clear biblical teaching that the role of the disciple of Christ is to be the protector of the helpless, the defender of the oppressed: the one who in the presence of the evil of the world demonstrates the love of God by being willing to defend the defenseless against the evil of other people (even if this means choosing the lesser of two evils?). A Christian may be willing to sacrifice him/herself rather than respond violently to the perpetration of evil, but does he/she have the right (the duty) to sacrifice the lives of others as well, even those who do not share in the Christian commitment?

This issue is so involved that we cannot get a grasp on it without first realizing the many questions that must be answered. To begin, therefore, let us simply list what seem to be the most crucial questions.

A Few Fundamental Questions

1. What is the relationship between the Old Testament divine approval of warfare and the New Testament ethic of love and non-resistance?

2. Is a life lived in response to the New Testament ethic of love necessarily a life of non-violence?

3. Is the life of love described by Jesus intended for an "ideal world" or for this very sinful world in which we live?

4. In the final analysis can evil ultimately be overcome through any other means than longsuffering and active love?

5. Is the life of love described by Jesus intended only for individuals, or for collections of individuals in family, community, state, and national entity?

6. What *is* the general relationship between Christian ethics for individuals and Christian ethics (if there are such) for national entities?

7. How is the life of love described by Jesus to be reconciled with self-defense or the defense of suffering others?

8. If a person who faces evil with no other weapon than love that is willing to suffer, dies or is killed in the attempt, does this demonstrate that such suffering love is a failure?

9. How do we summarize the responsibility of the Christian toward those who need help, who are being afflicted by others, or who are threatened with affliction by others?

10. What constraints are there on the actions a Christian can take to aid those needing help? Is "Just War Theory" an adequate Christian position?

11. Is a "just war" possible in a real evil world?

12. Is an unjust war justified in an unjust world?

13. Can a "Just War" be fought in a nuclear age?

14. Can a Christian plan to fight a nuclear war?

15. Can a Christian pretend to plan to fight a nuclear war? What does he do if his bluff is called?

This list could probably be extended to a much longer one without exhausting the issues involved in all their nuances. Question 4 appears to be the most fundamental one for the Christian to answer, although all of the issues appear to be intensified many times over by the reality of nuclear warfare.

The Uniqueness of the Christian Response

It is absolutely essential that it be realized at the very outset that we seek here *the Christian response* to these questions. This means that we ask only a single question: What is the significance of the teaching and life of Jesus Christ for these issues? Or, alternatively, how do we expect Jesus Christ Himself to respond if placed in the situations that Christians find themselves today?

It may seem at first that this approach is inadequate. We may prefer to ask other questions instead. Does this make sense? Will it work? Will it achieve the goals that we desire? Will it prevent suffering? Is it a practical approach? If we follow it, will we probably lose our desires, our freedom, and perhaps even our lives? If we are to be faithful to our goal, however, we must ask none of these questions—at least not in such a way that they dictate the answers that we give.

We are assuming that the Christian is called to follow in the steps of Christ here and now. If we conclude, even for a moment, that this life is not going to work—what are we saying about the authenticity of Jesus as the Christ, the Son of God? If we say that this life is foolish and incapable of being responsibly followed—what are we saying about the trustworthiness of the One whom we proclaim to accept as Lord and Savior? We need to regard these implications with utmost seriousness.

The Words of Jesus

We seek the Christian response to our question in three fundamental sources: (1) the words of Jesus, (2) the teaching of the New Testament writers, and (3) the example of Jesus.

The words of Jesus related to our question are found primarily in the fifth chapter of Matthew, together with the parallel section in Luke 6:27–36.

The seventh beatitude in Matthew 5:9 proclaims the basic truth, "Blessed are the peacemakers, for they shall be called sons of God." To be a peacemaker is therefore classed along with hungering and thirsting for righteousness, being merciful, being pure in heart, and being persecuted and reviled for righteousness and Jesus' sake.

Later in the Sermon on the Mount we find the second section in Matthew 5:38–48. Formerly it was thought appropriate to exact retribution in the form of an eye for an eye, or a tooth for a tooth; Jesus calls upon us not to exact retribution,

but to go so far in the opposite direction that we actually open ourselves up to second slaps, and respond to law suits with double the amount asked.

Formerly it was thought appropriate to love one's friends but to hate one's enemies. Jesus again pushes to the extreme and tells us that we must love our enemies and pray for them who persecute us. Why? So that we may really live as the children of our Father. Loving those who love us is no real test of our Christian commitment; the real test comes when Jesus calls us to love those who desire our harm.

passages supposed to present contrary views.

One of these is concerned with Jesus' cleansing of the temple (Matthew 21:12, 13; Mark 11:15–17; Luke 19:45, 46; John 2:13–17). We need not be concerned here with whether the cleansing referred to in John is the same or an earlier cleansing from that referred to in the synoptic gospels. The argument is often made that these passages show Jesus in violent action, driving out the moneychangers from the temple with a whip. Actually, however, the whip is not mentioned at all in the synoptic gospels, and the authors do not tell us what means Jesus used to drive the moneychangers out. They certainly give no evidence that Jesus used physical violence against human beings in this effort. John does mention the "whip," which is probably a lash made out of rushes, but only in the context of using it to drive out the sheep and cattle. John does not mention Jesus' driving out the moneychangers themselves explicitly at all, and certainly gives no indication that He drove them out with physical violence. These passages do show that Jesus' apparent commitment to the way of love and non-violence does not mean that He therefore does not oppose injustice or misunderstanding in a sinful world, of which we shall have more to say later.

We seek here the Christian response to these questions. This means that we ask only a single question: What is the significance of the teaching and life of Jesus Christ for these issues?

Several other words of Jesus are found in the Gospel of John that bear on this same question, although less directly. In John 15:19, 17:16 and 18:36, Jesus emphasizes the difference between His Kingdom and the kingdoms of this world. He tells the Christian that he has been chosen out of this world to live according to the constitution of another heavenly Kingdom. In this world the servants of the king fight on his behalf, but in Jesus' Kingdom His servants do not fight.

Possible Contrary Passages

In his consideration of this issue Dombrowski[2] has given a concise summary of some of the objections viewed against a simple interpretation of these words of Jesus because of other

It is true that Jesus spoke of wars continuing to the end of this age. In Luke 21:9, for example, he said, "And when you hear of wars and tumults, do not be terrified; for this must first take place, but the end will not be at once." Jesus' speaking prophetically in this way of wars in the future certainly does not imply that such wars are legitimate, or that Christians are called upon to participate in them. In the following section of Luke 21:10–19, for example, Jesus does say what is expected of Christians when nation rises against nation, and when they are persecuted: "This will be a time for you to bear testimony."

In Luke 22:35–38, the author records the somewhat puzzling words of Jesus, "And let him who has no sword sell his mantle and buy one." When His disciples replied, "Look, Lord, here are two swords," Jesus replied, "It is enough." Should these words be taken literally as advice for martial preparation in spite of Jesus' other teachings? Many commentators join Leon Morris[3] in concluding that these words of Jesus are figurative, His "graphic way of bringing it home that the disciples face a situation of grave peril." The disciples did not understand this, and speaking in terms of material arms, indicated that they could come up with only two swords. Jesus' words, "It is enough," are not an acceptance of

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the two swords, suggests Morris, but rather a dismissal of the whole subject that the disciples had so badly misunderstood. Any other interpretation seems out of context indeed in view of Jesus' immediate response to Peter's use of one of these swords shortly thereafter, "Put your sword back into its place; for all who take the sword will perish by the sword." (Matt. 26:52) And, having healed the ear of the slave of the high priest, Jesus said, "No more of this!" (Luke 22:51) Are these words Jesus' message to each of use who would use earthly violence to defend Him and His people?

Finally there are those who would argue that Jesus' advice to pay tribute to Caesar from what is Caesar's (Matt. 22:15–22; Mark 12:13–17; Luke 20:20–26) is His condoning of a Christian's participation in violence and warfare on behalf on the state. But such an argument must assume that it is the state's prerogative to demand that a Christian be involved in violence and warfare—and this is precisely the issue often at stake. Jesus is willing to offer a coin to Caesar, but the text does not indicate that he allowed Himself to be tricked into giving any more than that.

Understanding of the New Testament Writers

The New Testament writers elaborate further on this theme presented in the teaching of Jesus in such a way as to bring home more clearly its meaning and application for Christians. The two central passages are to be found in Romans 12 and 1 Peter 2, although several other supporting passages may also be adduced.

It is significant that Romans 12 immediately precedes the passage most often cited to support Christian participation in warfare in Romans 13. In Romans 12:2 Paul calls for the Christian to be transformed and not conformed to this world, so that the will of God may be understood and followed. Practical expression of this transformation is given in Romans 12:14–21. The words of Jesus are echoed in Rom. 12:14, "Bless those who persecute you; bless and do not curse them." Then in Rom. 12:17, "Repay no one evil for evil;" in Rom. 12:19, "Beloved, never avenge yourselves, but leave it to the wrath of God." Finally Paul quotes Proverbs 25:21, 22, "If your enemy is hungry, feed him; if he is thirsty, give him drink; for by so doing you will heap burning coals upon his head." To this Paul adds, "Do not be overcome by evil, but overcome evil with good." We consider the connection between Romans 12 and 13 a little further on in this paper.

This same theme is developed also in I Peter 2:19–24. "But if when you do right and suffer for it you take it patiently, you have God's approval. For to this you have been called, because Christ also suffered for you, leaving you an example, that you should follow in his steps . . . when he suffered, he did not threaten; but he trusted to him who judgest justly. He himself bore our sins in his body on the tree, that we might die to sin and live to righteousness."

The theme of the duties of citizenship in His Kingdom is also echoed by the New Testament writers. In II Corinthians 10:3, 4, Paul points out that Christians are not engaged in a worldly war nor with the weapons of a worldly war. Constrasted to those who have "minds set on earthly things," are the Christians for whom ". . . our commonwealth is in heaven, and from it we await a Savior, the Lord Jesus Christ." (Philippians 3:19, 20) Our citizenship has been changed so that we are citizens of "the kingdom of his beloved Son." (Colossians 2:13)

I John 2:5, 6 reminds us of the foundational truth that the assurance of our salvation is connected with our following Christ: "he who says he abides in him ought to walk in the same way in which he walked."

The Incredible Biblical Teaching

If we put all of this biblical teaching together, we have one of the most incredible claims ever made: that ultimate victory over evil even in this most sinful world can be achieved only through longsuffering and active love. It is not that we should love only those who are part of our family, community or nation—we should, of course, but our enemies as well. It is not that we should exercise love as long as we can without suffering as a consequence—but without end. It is not that love will carry us only so far in a sinful world and that after that we must resort to force and violence—but that if we seek genuine victory in Christ we must persevere in love far beyond the boundaries of human reason and "common sense" that has not come into fellowship with Christ.

Incredible to the earthly mind? Of course! Who would dare to be a peacemaker in the midst of a warring world that looks at peacemakers with contempt? Who would willingly suffer abuse and persecution for the sake of Christ when it could be avoided by violent resistance? Who would presume to attempt to love one's enemies without making some kind of semantic switch so that "love" really means "destroy"? Who would be so bold as to live in this world while holding fast to citizenship in another? Who can bring oneself to bless one's persecutors? To bring food to one who desires your destruction, or to offer drink to one who works for your abuse? Who could be so naive as to attempt to offer good in response to the evil poured upon one? Who would willingly forego his "rights" and suffer for someone unjustly? Who?

The Example of Jesus

In view of the obvious idealistic character of the above claims, it is often argued that Jesus did not mean what He said, at least not in the way that we might think He meant it. His teaching should be considered as applicable in the everyday situations of local personal interactions—unless, of course, even here the offense is too great—but not in the larger environment of government or international affairs. To follow His teaching literally is to open the doors to all kinds of injustice and suffering, for evil people will interpret a loving response to evil as an invitation to perpetrate more evil without penalty. Bullies understand only force, not nonviolence. Unless we stand up for our rights with whatever violence may be needed, we can be sure that we will be walked over. In the words of Christian author, Harold O. J. Brown, "In a fallen world where man's heart is inclined to evil, the counsel of peace at any price is a recipe for subjugation."[4] In an earlier publication (which I now bring into question) I have myself sided with Brown when he says,

"But some provocations are too great to ignore," and have recommended a violent response to terrorists.[5] Any other response seems too impractical, too visionary, too unrealistic, too irresponsible. And so we are forced back to the Christian response, and the example of Jesus Christ Himself. What we see is the overwhelming evidence that the central fact of the Christian faith itself speaks to us unambiguously of Jesus' total conformity between teaching and action.

In an insightful treatment of this subject, Dale Aukerman[6] draws our attention to Matthew 26:31, "You will all fall away because of me this night," or in the King James Version, "All ye shall be offended because of me this night." In the Greek the verb here translated "fall away" or "be offended" is the verb *skandalizō*, which means to put a stumbling block in the way of, to cause to stumble, or to set a trap for. A simple transliteration would read, "You will all be scandalized because of me this night." Why were they to be scandalized that night? It was to these words of Jesus that Peter replied, "Even if all shall be scandalized because of you, I will never be scandalized." What was the scandal here referred to? It is the scandal of the cross, of the defenselessness of Jesus and the defenselessness of His disciples. Peter would have preferred to go down fighting; he was not at all prepared to continue without fighting.

> His coming was God's ultimate exposure, defenselessness, vulnerability. Reconciliation between God and his adversaries could come, not through his annihilating them, not by his overpowering and coercing them, not by his keeping them at a safe distance or his maintaining a shield to hold off their mad attacks. Reconciliation could be brought about only as he has drawn near to the enemy, met them, spoken with them, showed them himself. It could come only through defenselessness, vulnerability, the cross. God did not defend himself. The Father did not defend the Son. Jesus drew near his enemies; he met them. He was wounded, smitten, pierced, done away with by human beings. When we had done our worst, God came back with his best.[6]

It is of interest to note that it is exactly at this point that Islam rejects the Christian record; the Koran tells us that Jesus did not die but was rescued by the Father.[7] So also Christ crucified was a stumbling block (*skandalon*) to the Jews (I Corinthians 1:23).

Jesus came to give the final answer to evil, not just in words but also in living example and achievement. His final answer—the very basis of the entire Christian Gospel—was that He was willing to suffer and die in order to achieve the purpose of God in salvation. As a human being, Christ lost—He was put to death. As a practical politician, Christ failed—His movement was threatened, His leadership removed, and His voice silenced. Every practical instinct of His followers told them that the last thing they should do is let Him go to His death. Peter protested (Matt. 16:23) and then later tried to fight to prevent it. Jesus' counsel was steadfast: this was not the path He had come to walk; this was not the way of His Kingdom. As far as the world was concerned, it seemed that evil triumphed on Calvary; all the instincts of human beings to attempt to live responsibly cry out against it. Yet nothing is clearer in the biblical revelation than that this day, this event, this death was part of the eternal plan of God to raise up a people to Himself, forgiven and newly created in Christ—who would have to become a scandal in order to achieve His purpose.

And it is we who are called to "follow in his steps" and "to walk in the same way in which he walked."

Christian Responsibility for Others

Although Christians may be willing to accept, at least in principle, defenselessness for themselves as they follow Christ (although this is often the crucial problem), it does not seem responsible on their part to demand defenselessness of others. Thus the question arises: What is the Christian response to the suffering of others? Does not at least this responsibility open the door to justification of physical violence in defense of others?

Jesus faced such choices when He was tempted by Satan in the wilderness, and turned His back on what was offered as the easy road in order to follow the road to obedience.

Aukerman[6] goes on in his discussion of Jesus as *skandalon* to remind us that this *skandalon* concerned not only the defenselessness of Jesus, but also the defenselessness of His disciples. If it was a scandal and a stumbling-block that Jesus should die, it was a continuing scandal that Jesus should appear to leave His disciples without protection. One by one, and many hundreds and thousands with them, fell to the sword and the beast, to persecution, imprisonment, torture and privation (Hebrews 11:35–38). But in not providing physical and violent protection against the evils of the world, Jesus did not leave His disciples alone. In their hour of greatest need Jesus prayed for them (Luke 22:31, 32), not as the second best that He could do, but as the best. And it was out of concern for the basic welfare of His disciples, that He did not turn aside from the way of the cross; rather He defended them through obedience to the Father and the way of the cross. When Christians resort to physical violence to protect others in need, how much violence do they do to the ultimate cause and witness of Christ, how many are lost forever because of this misguided attempt to secure safety at the expense of disobedience?

A Christian commitment to physical non-violence should never be interpreted to mean that Christians are to passively endure injustice, evil, and unrighteousness around them. We do not serve as salt and light unless we are spicy and illuminating. The way of Jesus does not lead to withdrawal from the world or adoption of the world's methods. We are called to exercise all the creativity we can muster in order to transform evil into good. The Gospels record many confrontations that Jesus was involved in, often at the risk of His life. What did He do when he was present as a group of accusers were about to stone a woman to death? (John 8:2–11) Did He call down fire from heaven, or rally His disciples to fight off the accusers so that the woman could be delivered? Instead He used the resources at His disposal and won a temporary victory, a victory that really resulted in the direction of the accusers' anger against Him rather than the woman. So also Jesus defended His disciples in Gethsemane by drawing the attack to Himself rather than to them (John 18:8). Aukerman concludes,

> There is in all of us an inclination to see the use of tangible weapons to fend off physical attack as more real, substantial, and practical than the spiritual warfare described in Ephesians 6. But the most decisive battle in history was the one between Jesus and the powers of darkness; his was the

> supreme defending of us all. If in biblical perspective we truly see that and the relative indecisiveness of all military battles, we have basis for discerning what for us and those dearest to us is the critically needed defense: "They have triumphed over him (Satan) by the blood of the Lamb and by the witness of their martyrdom, because even in the face of death they would not cling to life" (Revelation 12:11).[6]

Taylor and Sider[8] emphasize the active role that Christians are to play in this world.

> Just as the commitment to justice carries Christians into struggles to defend the rights of the poor and the oppressed, so our commitment to justice should express itself in strong resistance to aggression, invasion, or occupation . . . Christians are called to be reconcilers, but also to actively resist injustice, evil, and oppression.

If we put all of this biblical teaching together, we have one of the most incredible claims ever made: that ultimate victory over evil even in this most sinful world can be achieved only through longsuffering and active love.

They suggest that guides to how Christians can meet these calls can be found in the life of the early church in which Christians lived in a region occupied by a foreign invader who used military force to guarantee its power. In spite of all the horrors of persecution in this environment, Christians actively resisted and struggled against the imposition of evil; many of them paid for it with their lives. Chrysostom, a church leader of the fourth century, said,

> What, then, ought we not to resist an evil? Indeed we ought; but not by retaliation. Christ has commanded us to give up ourselves to suffering wrongfully, for thus we shall prevail over evil. For one fire is not quenched by another fire, but fire by water.[9]

To all such suggestions comes a common answer, But will it work? Is it not just foolish to expect such behavior to do anything in an evil and unjust world except lead to greater injustice and oppression?

Was Jesus Wrong?

And so we are driven of necessity to the fundamental question: *Was Jesus wrong?* Is self-giving love the only truly redemptive response to evil to which every Christian is called? Is the use of physical violence to respond to evil only the progenitor of further violence and greater evil? Should we love, feed, and give drink to our enemy—or should we harm, maim, and kill our enemy?

There is no lack of evidence in the world that testifies to the conclusion that Jesus was indeed wrong. He died on the cross for peace and love, but the world is as full of sin and hatred as before He died. For two thousand years the way of Christ has had a chance to solve the world's problems, and it might seem to have failed miserably; today the world seems as untouched by self-giving love as in the days of Jesus Himself.

Nor need one reach out into international affairs or even national interactions to come up with evidence that Jesus was wrong. It is a fundamental experience of our daily lives in personal interactions that failing to meet a bully with physical force invites only our own abuse. When I was a youngster (not then a Christian), a neighbor boy took great delight in tormenting me. He would draw a line and dare me to cross it. I faced the dilemma of not crossing it and suffering the humility of cowardice, or of crossing it and getting beat up. Over the passage of a few years I grew bigger than he, and one night I faced him with the fury of flailing fists as my Mother cheered me on. The whole experience was cathartic; it was clear—or so it might seem—that Jesus was wrong. After that show of physical force, he did not bully me again. Had violence triumphed where love would have failed?

Many have felt the challenge of the totally unendurable and turned to violence as a kind of last resort *in extremum*. Dietrich Bonhoeffer lived a life of ardent pacifism until he came to the point where he felt compelled to join the plot to assassinate Hitler and replace him with a responsible head of state. As Bonhoeffer himself said, Is it the duty of the Church only to apply band-aids to the injured when a madman comes down the street swinging an axe, or is it the duty of the Church to stop the madman with whatever means are necessary? Jesus also faced a madman and called out the demons within him (Luke 8:26–33). But, we protest, He did it because He could exercise the power of God—and we cannot. Perhaps that is our problem.

This is no minor question. There have been some who denied that Jesus could be the Son of God because they believed Him to be mistaken about the future course of the world and His own return. But if we say by our lives that Jesus was wrong about the central message He brought and lived concerning the interaction between God and evil, do we have any Christianity left at all? If the Resurrection was not the vindication in time of the ultimate power of self-giving love over the forces of evil, what was it?

Christian Perspectives on War

Consideration of these issues through the years has resulted in the crystallization of several different Christian perspectives on war. An excellent overview of four principal approaches is given in *War: Four Christian Views*.[10] This book also lists a bibliography of over a hundred major references to the topic of Christianity and war. The four perspectives treated are: (1) Biblical Nonresistance (from a dispensational perspective), (2) Christian Pacifism, (3) Just War theory, and (4) the Crusade or Preventive War. One of the strengths of the book is that it presents the position in the words of the advocates of each of these position, and then allows advocates of the competing positions to offer critiques.

We can present only the briefest of overviews here.

Herman Hoyt presents the position of Biblical Nonresistance from the viewpoint of a dispensational theology. He finds that nonresistance is only for Christians and not for the nations of the world or human government during this age. God permits human governments to engage in war, but He limits Christian in this respect. Thus Christians can serve a war effort, but only through noncombatant roles.

Myron Augsburger follows a position for Christian Pacifism much like that outlined in the earlier portions of this installment. In contrast to humanity's choice of force for the settlement of disputes, Jesus calls us to a better way. He also makes a point I have reflected on in the past:[11] can a Christian responsibly participate in a war in which he is called upon to take the life of another Christian, two individuals for whom Christ died living out between them the very antithesis of what He died for?

Arthur Holmes presents the Just War theory. He recognizes that war is an evil, but argues that all evil cannot be avoided. If unjust violence and aggression exist and we do nothing about it, then we are implicated in its consequences. The concept of Just War theory is an ideal for all people. It seeks to set bounds to this form of evil. It is based on seven major requirements: (1) just cause, (2) just intention, (3) last resort, (4) formal declaration, (5) limited objectives, (6) proportionate means, and (7) noncombatant immunity. He seeks to interpret John 18:1–11 and Matt. 5:38–48 in terms of Romans 13, providing a general basis for the government's use of force.

Harold Brown develops the idea of Preventive War as "a war that is begun not in response to an act of aggression, but in *anticipation* of it," and a Crusade as "a war that is begun not in response to a present act of aggression, but as the atttempt to set right a past act." He presents a defense of war under limited situations as the lesser of two evils, as the only practical way of living responsibly in a sinful world.

If for the moment we neglect all the details, however important they may be, these four perspectives come down to just two: (1) Christians should follow the express teaching and example of Jesus Christ, even though every worldly estimate of the immediate practical success of such an approach is debatable at best; (2) the teachings and example of Jesus Christ are ideals toward which Christians should strive, but in the real sinful world in which we live, true Christian responsibility requires us to engage in the lesser of two evils. Hoyt and Augsburger expound what they believe the biblical teaching to be; Holmes and Brown expound why practical and responsible living must be guided by other considerations as well. If Augsburger says of Brown's position, "The cross shows that we do not have to win or succeed (as the world speaks of success), but rather that we must simply be faithful," Brown in return replies, "My disagreement with Augsburger is with his contention that in this present evil, fallen world God expects and requires pacifism. This contention is, it seems to me, utopian, and not biblical."

And so again—was Jesus wrong? Or have we misunderstood the message of His words, His life, His death and His Resurrection? Can we avoid a choice between these two unwelcome options?

"If We Can Justify the Police, We Can Justify the Army"[12]

We return now to Romans 13, that keystone passage of government authority and the use of force to punish the evildoer. No single passage bears more weight in the development of alternative interpretations of Jesus' words and example than this chapter. We remember that it follows Romans 12:19, with its injunction, "Vengeance is mine, I will repay, says the Lord." It seems clear that Romans 13:4 ties in with this, "for he (the ruler) is God's servant for your good. But if you do wrong, be afraid, for he does not bear the sword in vain; he is the servant of God to execute his wrath on the wrongdoer." In a similar vein Peter writes, "Be subject . . . to governors as sent by him to punish those who do wrong and to praise those who do right." (I Peter 2:14)

We recognize first that these passages deal specifically with "police" action within a country, and not with armies and warfare between countries. Hence the argument that titles this section: if it is possible to justify the police, then it is possible to justify an army. Or, in a reverse argument *ad absurdum*, if physical violence is always forbidden, then the government is forbidden to have a police force, and this violates both common sense and Scripture; therefore an army is justified. We must look carefully both at the context of the passages in Romans and I Peter, and then at the claim that to be content with police action within a country necessarily leads one to be content with warfare between countries.

In both contexts above the biblical author is exhorting Christians to live in such a way that they may be without blame. With a new sense of freedom in Christ, Christians might well be tempted to throw off all the symbols of authority of the culture in which they lived. Having Christ as King, they might be tempted to renounce or disregard all human government. Not only would this be displeasing to God in its own right, but it would be a very dangerous argument to place in the hands of Christianity's enemies. Women might be tempted to disregard their husbands, taxpayers might be tempted to withhold taxes, citizens might be tempted to ignore laws, servants might be tempted to challenge masters, and in many other ways Christians might antagonize and provide poor witness to the society in which they lived. By acting in these ways, Christians would be providing ammunition for the enemies of Christ who tried to portray them as an antisocial movement. They sought in many ways to charge Christians with being disloyal citizens and an enemy of the powers that be. Paul and Peter urge Christians not to fall victim to this temptation, but instead to retain a sense of God's action through the authorities in power. They were to recognize that God did act to punish evildoers through the authorities in power and to respect that authority. It is clear that in the context two groups are in mind: there are the Christians and their attitude toward the authorities, and there are the authorities who punish evildoers. The text does not give us the input we need to cross over and ask what is the proper activity of Christians if they

themselves are the authorities. Peter makes clear the purpose of these remarks, when he says, "For it is God's will that by doing right you should put to silence the ignorance of foolish men. Live as free men, yet without using your freedom as a pretext for evil; but live as servants of God." (I Peter 2:15)

As a matter of record, there is no evidence of a Christian soldier after New Testament times until about 170 AD. There is no record of believers in positions of authority under the Roman government until about 250 AD. There is no acceptance of the holy Christian warrior engaged in sacred Crusades until the 11th century.[13] The intent of these passages cannot be stretched beyond their application, therefore, to infallibly lead to guidance on some of the questions under consideration here.

We can, I believe, grant without great debate the essential necessity for a "police" action with human society corrupted by evil and sinfulness. We likewise grant the appropriateness of the *restraint* of evil within carefully defined guidelines. We can also, I believe, grant the possibility of Christians serving in such police capacities. But we cannot grant in any way the fallacious argument that acceptance of a police force logically ties us to the acceptance of an army. There are critical differences between a police force and an army, and these must not be forgotten.

Examination of the conditions of Just War theory shows that they will be satisfied by any responsible police force operating today (which does not overlook the fact that many so-called "police forces" around the world today are nothing more than internal armies and hence subject to the critique against armies rather than against police per se). On the contrary, it is doubtful whether any war ever fought with armies satisfied one-half of the Just War theory requirements, certainly no war fought in recent years nor likely to be fought in the future.

The difference between a police force and an army is nowhere more clearly seen than in the attitude toward "noncombatants." Any authentic police force today is based on the commitment to bring no harm to innocent bystanders; in fact, if this happens by accident, a lengthy investigation is involved to be sure that the harm could not have been avoided. Warfare, certainly in recent years, is totally unconcerned about the distinction between "combatants" and "noncombatants"—what pillaging and raping armies did not accomplish in the past, saturation bombing and the possibility of nuclear bombing make intrinsic to the future.

Police action is limited by desire and administration to "appropriate means," and the use of force beyond that judged necessary for the specific restraint of lawbreakers is quick to receive criticism and responsive action. In modern warfare there are no "proportionate means;" total destruction, unconditional surrender, and complete collapse of the enemy have become the goals. If any army attempts to practice anything less, it is sure to meet with severe criticism.

Police forces are specifically under civilian control; although armies pretend to be under civilian control, this pretense is seldom tested and military matters are run by military people to satisfy a military perspective.

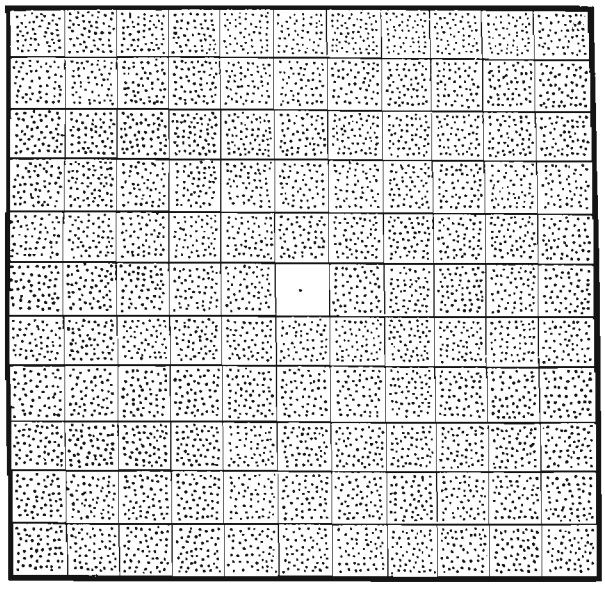
If there were to be any correlation at all between Christian acceptance of an authentic police force and Christian acceptance of a military force, it would have to be limited to a military force designed and committed only for the restraint of evil without the infliction of physical violence on other persons. Whether such a military force could be considered viable in anything except a near-utopian world is another question that must be faced.

How the Nuclear Age Makes Other Arguments Superfluous

When we add to this discussion and all the inputs of the previous sections the fact that we live in the nuclear age, when any war may lead to an all out nuclear holocaust, we are brought to several well defined conclusions. Even advocates of a Just War approach take pause and begin to speak about "nuclear pacifism."[14,15]

The facts of nuclear war bring home to us as never before the fundamental truths of Jesus' teaching and example: attempts to deal with evil by the use of evil can produce only evil. In the past, we may have had the appearances of a better world as the consequence of warfare. The nuclear age shows this to be the illusion it has always been.

We no longer are faced with the choice between responding to human aggression and suffering by the physical violence of war, or the apparent standing by while human



The dot in the center square above represents all of the firepower of World War II: three megatons. The other dots represent the number of World War II equivalents that now exist in nuclear weapons. This is 18,000 megatons or the firepower of 6,000 World War IIs. The United States and the Soviets share this firepower with approximately equal destructive capability. Just two squares on the chart (300 megatons) represent enough firepower to destroy all the large and medium size cities in the world. (Physics and Society, *12*, No. 4, 12, October 1983.)

beings suffered oppression and injustice. If today's choices appear to be suffering without nuclear war or suffering as the result of nuclear war, they make more plain to us the road of negotiation and understanding in attempts to alleviate the causes of war.

Perhaps the most subtle of all modern dilemmas is the argument for deterrence in the nuclear age. If "our enemy" (note the tacit assumption that we should deal with millions of human beings as "our enemies") builds up a nuclear arsenal, then we must build up a larger nuclear arsenal in response so that our enemy will be deterred from using his weapons against us out of fear of reprisal. Such deterrence may indeed appear to work for a while as a matter of practical politics, as long as it is a chosen policy to oppose armed force only by greater armed force, ignoring all creative and positive approaches to reducing international tension. But note the fundamental dilemma for the Christian. The most important feature of a "deterrent" is that it be believed with certainty that it will be used if necessary; "the enemy" must be deterred from acting against us by the knowledge that if he does so, he will certainly be deluged with nuclear weapons.

Now there are several possiblities. The first possibility is that the threat of deterrence is genuine. If our enemy should launch a first strike attack against us, we would promptly push the button that would send our answering strike against him. Can we really maintain that it would be an act of consistent Christian responsibility to push the button that releases a torrent of nuclear destruction upon another country's people so that they may suffer the same fate as we are about to? Knowing that decimation of our own nation is a certainty, is it then conceivable that an act of Christian motivation would exact vengeance by pushing the fatal button? At this point deterrence has become irrelevant. There will be no future need for deterrence at all. Can anyone imagine Jesus responding by pushing the button in this case?

A second possibility is that we say that we are building up a deterrent force but make it perfectly clear that if push comes to shove our own ethical principles will make it impossible for us to push the button. This, of course, is no deterrence at all. To possess a nuclear arsenal while declaring that we will never use it is a foolish exercise.

A third possibility is for us to build up a deterrent nuclear arsenal with no intention of ever using it for ethical reasons, but we *pretend* that we will use it if we have to. We are bluffing, and we hope that our bluff will not be called. We exonerate ourselves ethically because we never intend to use the nuclear weapons we are stockpiling, and if we can gain deterrence by pretending to have plans for their use, who is hurt? But such a bluff stands little chance of being undetected, and what kind of a witness do we bear by pretending to do something that we will not ultimately do because we believe it to be evil?

Such dilemmas as these, however, are really only exercises in sophistry. In each case we have supposed that an extensive nuclear arsenal will be built up, and that the goal will be to have at least as large, and if possible a larger arsenal than "our enemy." The very existence of such an arsenal represents a potential evil. Our dealing with the sophistry of the above dilemmas is based on the assumption that we will maintain control of this arsenal after we have built it up, that we will be and remain in charge of its ultimate disposition for as long as it exists.

A Christian commitment to non-violence should never be interpreted to mean that Christians are passively to endure injustice, evil, and unrighteousness around them.

Finally we must reckon with what is not stored up because the nuclear arsenal is prepared. We must consider the waste in human genius, human creativity, human resources, and scientific and technological know-how. How many people were not fed? How many children died or led lives psychologically twisted and damaged? How much energy research, or medical research was never done? How many people, gifted with the ability to tackle a wide range of problems essential to the welfare of humanity, have had their abilities aborted by a lifelong career in the development, testing, and stockpiling of nuclear weapons?

Summary

Christians uniformly claim that longsuffering and active love is the only ultimate response to evil in this world, the only truly redemptive and life–changing response, the response that is given to us in the teachings and example of Jesus Himself. And yet many, if not most, Christians are able to hold to some view of war that enables them to justify participation by Christians in war and support of war by Christians. This internal contradiction in the lives of God's people constitutes one of the most challenging of all ethical dilemmas.

It appears that there are only three responses to the life, death and resurrection of Jesus Christ as far as a Christian's response to evil through physical violence is concerned. One is that Jesus was simply wrong about this, as He is supposed to be wrong about other things as well (e.g., the events of the future and the time of His own return), and that His ideals can be treated with respect but cannot be responsibly put into practice here and now. A second is that we misunderstand

Jesus if we argue that His teachings and example demand Christians to refrain from physical violence in response to evil; what He taught and did were unique examples of ideals that we should strive to put into practice but to expect them to actually work in a sinful world is foolish utopianism, not worthy of responsible Christian living. Instead of taking Jesus' teaching and example at face value, we must interpret them in the light of other passages such as Romans 13 which justify the use of physical violence by organized society and hence by Christians as participants in that organized society. The third is that Jesus was right, that He said what He meant, that He lived what He said, and that our difficulty is that His life and example are so incredible we cannot bring ourselves to accept their simplicity—much as we have difficulty with the simplicity of the Gospel of salvation by grace since it so completely appears to contradict our everyday experience.

To accept this third option does not mean that a Christian, in commitment to physical non-violence, is passive and ineffective in a sinful world. Quite the contrary, the Christian is called to exercise the power of God in confronting every manifestation of evil with divine creativity, including being willing to suffer in defense of others, once again using Jesus' example in Gethsemane and Calvary as our examples.

It is not true that one who rejects Christian participation in an army—or the rightful place of warfare in a sinful world, must logically also reject the activity of a police force. There is scriptural support for the existence and respect of a police force in Romans 13 and I Peter 2, although neither these passages nor the historical record give us unambiguous guidance as to the propriety for Christian participation. The latter must once again be decided on whether the police force acts to restrain evildoers with a minimum of physical violence. Some situations may permit Christian participation while others may not.

The conditions of Just War theory are beneficial in that they do set limits to how far any Christian might legitimately stretch the teachings of Jesus to justify a violent response to evil. The burden of deciding is certainly not easy and crucial crises of the spirit may well be expected in the future as they have been encountered in the past. What is clear, however, is that no war fought in recent years or likely to be fought in the future satisfies the criteria of Just War theory. The realization that we live in a nuclear age only emphasizes this further and removes any claim that physical violence involving nuclear war could ever be construed as living out the teachings and example of Jesus.

The issue is a fundamental and serious one. Every aspect of the central Christian message testifies to the fact that a physically violent response to evil (and I do not overlook the fact or the danger of other kinds of violence as well) can only compound evil in the world and not overcome it. Jesus died defenseless and alone on the cross in order that the good news of His Gospel might be preached and lived. When His disciples sought to fight to defend Him, He forbade them. The victory of the Resurrection was the open proclamation that longsuffering love had triumphed over evil. To deny this central core of the Gospel runs the danger of calling into the question the very integrity of Jesus Christ and of the whole set of relationships and truths that Christians treasure in Him.

> *For to this you have been called, because Christ also suffered for you, leaving you an example, that you should follow in his steps. He committed no sin; no guile was found on his lips. When he was reviled, he did not revile in return; when he suffered, he did not threaten; but he trusted to him who judges justly. He himself bore our sins in his body on the tree, that we might die to sin and live to righteousness. (I Peter 2:21-24)*

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Revolutionizing Our Worldview

The Western philosophical paradigm is in radical decay; but out of the rubble springs a new philosophy of civilization beyond Christian theism and beyond materialism. We now face a turning point that we cannot afford to avoid. So argues a powerful new book by Fritjof Capra entitled *The Turning Point: Science, Society, and the Rising Culture* (New York: Simon and Schuster, 1982).

Capra sets the stage for his theses by quoting from the ancient Chinese book of changes, *The I Ching*.

> After a time of decay comes the turning point. The powerful light that has been banished returns. . . . The old is discarded and the new is introduced. Both measures accord with time; therefore no harm results.

In his earlier popular work *The Tao of Physics* (1975), Capra attempted to synthesize modern physics with Eastern mysticism and in so doing hinted at the profundity and radicalness of this turning point. Now Professor Capra, a physicist at UC Berkeley, has outlined a comprehensive application of a worldview whose time he believes has come.

For Capra, Western civilization faces a "crisis of ideas"—the modern mind is muddled by a rationalistic and materialistic *Weltanschuuang* which is both woefully inadequate to meet modern problems and obviously incongruous with modern scientific discoveries. Descartes and Newton are the central philosophical villains, having helped to establish an atomistic, linear, and mechanical view of nature. Capra maintains that "reality can no longer be understood in terms of these concepts" (p. 16). The modern Western paradigm is collapsing. The strange discoveries of quantum physics, along with the intuitions of the mystics, reveal a different world: a universe intimately interconnected, interpenetrating, interdependent, and unified—more an organism than a mechanism. And for Capra it is precisely the perpetuation of this outmoded worldview that is behind the major economic, ecological, political, military, health, and spiritual crises of our age. This cognitive catastrophe threatens to trigger a cultural catastrophe unless this worldview is revolutionized.

Capra applies this thesis to a broad range of affairs, calling for conceptual reform and renewal across the board. But how did the now disintegrating worldview develop in the first place, and what is to replace it?

The genius of Descartes, Newton, Bacon, and others unlocked the mysteries of creation through mathematics: physical laws could be discovered and applied. Forces such as gravity could be understood and natural law could be harnessed through technology. By the Enlightenment, many likened the world to a giant clock whose mechanical intricacies awaited the analysis and manipulation of the new breed of scientific and technological watchsmiths.

The Cartesian-Newtonian paradigm permeated all of subsequent culture. In the West, medicine broke up the human organism into isolated bits and pieces; psychology, through the influence of both Freud and the behaviorists, siphoned the spirit from the psyche and reduced man to the material and mechanical; modern economics, stemming from Adam Smith and others, saw the cosmic mechanism as self-replenishing and boundless in blessing. The ecological entailment was that humanity was ripped from its environmental continuity with nature, leaving nature to be exploited as a disconnected other. Furthermore, Capra indicts the Christian God as being an overbearing male ruler who impels an exploitive and sexist ethic. The awful upshot of all this is that we encounter a time of unprecedented upheaval and crisis.

Having made his case that "the old must be discarded," Capra sees to it that "the new is introduced."

The new physics jolts our conceptual complacencies and catapults us into a new age. Capra, himself a physicist, chronicles the unnerving discoveries made in high-energy physics early in this century by men such as Einstein, Bohr, Heisenberg, Schrödinger, and Planck. These men were bedeviled by enigmas at the very heart of matter.

Heisenberg discovered that an observer necessarily affects what is observed. Because of this, the exact location of subatomic particles at any given time is indeterminate. This led him to the "indeterminacy principle." Bohr formulated the notion of "complementarity" in response to his paradoxical findings that light was both a wave and a particle. Things weren't as mechanically simple as we thought. Einstein further complicated the cosmos with the theory of relativity.

The world could not be reduced to atomistic individuations isolated from the larger, unified context. Capra says:

> Subatomic particles . . . are not "things" but are interconnections between "things," and these "things," in turn, are interconnections between other "things," and so on. In quantum theory you never end with "things": you always deal with the interconnection. This is how modern physics reveals the basic oneness of the universe. (pp. 81, 82)

Observer and observed, as shown by Heisenberg, are "one"; "complementarity," as shown by Bohr, demonstrates the "unity" of opposites. Capra is arguing for a scientifically supported version of monism—all is one. To this end he also enlists the speculations of more modern physicists like David Bohm and others. He summarizes by saying,

> In modern physics, the image of the universe as a machine has been transcended by a view of it as one of indivisible whole whose parts are essentially interrelated and can be understood only as patterns of a cosmic process. (p. 92)

Capra further elaborates on and attempts to establish his view through a discussion of general systems theory. Moving from the microscopic world of energy particles to the macroscopic landscape, systems theory views nature as an interlocking system of various subsystems made up of cyclical feedback loops. It sees the linear and mechanistic picture of sequential cause and effect as too narrow. The full holistic mosaic must be held in view. From this perspective the

earth itself becomes a living being: "Mother Earth." The various subsystems are self-organizing" and imbued with an immanent consciousness of their own. Capra draws on Jantsch, Bateson, and other systems thinkers in arguing for a panoramic, panpsychic worldview in which all is one (monism) and all is alive (panpsychism).

The systems view is a sophisticated cosmology that finds the whole greater than the parts without ignoring the parts; rather, they are placed into a more comprehensive picture. Consciousness itself is not strictly localized or individuated in living beings; it extends, in varying degrees of intensity, across the universe.

Given this holistic metaphysic, Capra endorses a "transpersonal" psychology, in which normal and paranormal consciousness both fit into the total spectrum of human experience. Capra follows the human potential movement (Maslow, Rogers, et.) in asserting "the farther limits of human nature" (Maslow) as ever evolving toward higher consciousness. Here, in one grand synthesis, systems theory, mystical experience, modern physics, and adventuresome psychology all synergistically fuse into a "rising culture" whose time has finally come. A transformation is imperative. The evidence is in; civilization must turn from its error.

To grasp the significance of this turning toward a rising culture we must penetrate to the heart of what is prompting this alluring worldview.

The Turning Point is no less than a comprehensive credo for a widespread cultural movement called by many "the new consciousness movement" or the "new age movement," whose roots are in the 60s.

The counter-culture of the 60s produced more than short-lived communes, love beads, acid rock, and peace demonstrations. It persuasively challenged a host of moribund elements in Western society. Theodore Roszak, in particular, charted the counter-culture's rejection of the materialist or secular humanist worldview that demystifies both humanity and nature by reducing them to material components. Poet William Blake called this the "single vision": the material eclipses the spiritual as the empirical-reductionist hammer nails shut the windows of the soul.

But no culture will long tolerate such suffocating presuppositions; the conceptual straitjacket will not hold. The 60s saw an explosion of the spiritual (in the Jesus movement), the pseudo-spiritual, and the occult. Myriads were gasping for spiritual refreshment of any kind.

The counter-cultural rejection of this sterile world-view went far beyond chanting Krishnas, eschatologically intoxicated sects, and psychedelic experimentation. It meant to offer a serious alternative to a bankrupt philosophy. Though obviously not a completely homogeneous movement, a "new consciousness" developed in this receptive period. The spirituality of the East Hinduism, Buddhism, Taoism) was imported and adjusted to the West, following the lead of the Beat generation in the 50s. The world was pantheistically "resacralized" (Roszak) and reanimated with mystic fervor. One New Consciousness intellectual, William Irwin Thompson, went so far as to call for a return to animism: better to have spirits, nymphs, and fairies than lifeless molecules in random collision. To reject mechanistic materialism also meant to search for a new unifying metaphysic. Many looked backwards to premodern, pre-industrialized societies and even to pagan mysteries in addition to Eastern disciplines. Now, ironically, many are looking toward the frontiers of science to break up the old scientism (reductionism) and to legitimize its mysticism (see Capra's *The Tao of Physics*). The seed of the counter-culture's rejection of materialism has now matured into the systematic metaphysical expression of *The Turning Point*. The "rising culture" replaces the "counter-culture."

While much of Capra's historical analysis of Western society should be challenged (especially his discussion of Marx as an ecological thinker!), *The Turning Point* is a compelling plea for renewal. In many ways, the New Consciousness has never looked better.

Those in the Reformed tradition will agree with Capra that one's world-and-life view necessarily shapes the thoughts and actions of individuals and entire cultures. Christians also uniformly agree that materialism is both bankrupt and poisonous, no matter what the Asimovs and Sagans may do to try to revive it.

Capra is on target in exposing the limitations of the "Cartesian-Newtonian world-machine." Though sown in Christian soil, modern science gradually severed its roots and built its impressive edifice on the sands of materialism. Yet Capra never seriously considers Christianity as capable of integrating modern discoveries or of answering modern needs.

How then must Christians meet Capra's pressing challenge? We need to proclaim a Christian alternative vision that both adequately integrates the findings of science and remains biblically faithful.

The contribution of modern physics must not be ignored. Although much of Capra's thought on the unity of the cosmos (monism) is speculative, and despite the fact that the data of modern physics are capable of diverse interpretation, it seems that a profound interconnectedness has been discovered. Atomistic cosmologies don't seem to fit.

A Scriptural cosmology does little to encourage the "Cartesian-Newtonian world-machine." The God of biblical faith is not a Deistic clockmaker isolated from his creation; neither is creation mere clockwork totally comprehended by a narrow rationalism. Rather the universe is created and unified by the Logos (Word) of God who personally directs and coordinates the multifaceted richness of the cosmic plenum (John 1:1; Heb. 1:3; Col. 1:15–20; etc.). The Word made flesh is also the Word or logic of creation. The mechanistic model, though valid in certain spheres, often suffers from a conceptual squint that loses sight of the larger picture and mystery. The enigmas of modern science reopen the world of mystery and throw us back upon the inescapable reality of our finitude in knowing God's creation. Just as God is incomprehensible in his essential being, so, analogously, God's creation resists our complete comprehension. Finite minds, though enlightened by the Logos, are barred from the infinite understanding needed to untie every epistemological knot. We see in a mirror dimly, and the glory of God manifested in his works stubbornly wrestles out from under our scientific saddles.

We should thank Capra for prodding us in this direction. Yet his formulations are impaled on the sword of his own presuppositions. The same conceptual criticism that dissected the inadequacies of an outmoded paradigm turn back on the New Consciousness itself.

Unlike Christianity, Capra is not concerned with any Creator-creature distinction. Nature, Humanity, and "God" are all basically continuous and interchangeable. God is but "the self-organizing dynamics of the entire cosmos" (p. 292). Therefore, Capra's metaphysic provides little support for comprehensible ontological categories. Without a personal, sovereign Creator-God, meaningful distinctions between created particulars tend to dissolve in the cosmic flux. Without a genuinely transcendent and personal God, an immanentist metaphysic will eventually collapse into a rubble of relativism and scepticism because it is without a valid transcendent and absolute reference point. The denial of the Creator is the worship of the creature (Romans 1:18ff). Capra leaves us with an ambiguous combination of chance and necessity laboring overtime to

uphold an indeterminate eschatology which invests hope only in an undefined "evolution of consciousness."

From this dizzying metaphysic come also distressing ethical ramifications. Although Capra ignores the problem, monistic worldviews tend to blur the distinction between good and evil. If unity and oneness are ultimate, then all ethical dichotomies dissolve. As the (monist) Zen-master Yun-man said, "The conflict between right and wrong is sickness of the mind." And even if ethics is salvageable, Capra is left with the dilemma of relativism: since we have no unchanging source of truth or special revelation, morality is not based on absolutes. The bothersome questions then become these: What ethics are applicable at what time? How could we ever know this if our only revelation is from the ever-changing theories of science and the varying reports of the mystics? A general holistic worldview alone will not ground us in a livable ethic.

For Capra our present problem is rooted in a false worldview. Change the worldview and you begin to solve the problem. Proper moral action (whatever that may be) will follow proper understanding. Here Capra echoes the human-potential movement's optimism for a self-actualized humanity. The New Consciousness in this sense is not so new; it is repeating the Socratic notion of sin—wrongdoing is basically ignorance, not willful rebelliousness.

But this just doesn't square with reality. Even if we agree with Capra's basic outlook, we must insist that right knowledge does not guarantee right action. As the Apostle Paul says in Romans 7, the good we know we don't do. A holistic worldview will not regenerate a hellish heart. A new paradigm may be necessary for personal and societal rebuilding, but it is not sufficient. As one reviewer put it: "Human ingenuity in creating untold misery did not wait for the development of a mechanical world-view." And neither will it vanish with a holistic one.

Yet, Capra seeks redemption in consciousness; an enlightened understanding of the unity and harmony of all things and of our participation in the cosmic drama will quicken our minds and engage our wills. Consciousness itself can be our savior if resurrected from the mechanistic tomb. Then we may fully experience not only our oneness with nature, but our participation with deity itself, our democracy with God. But just as Capra's worldview is ontologically and ethically insecure, so is his mysticism without life—it is bloodless, apart from the cross.

Capra's New Consciousness mysticism also permits, even encourages, a variety of occult and paranormal experiences while remaining intolerant of the Christian God. Although Capra is far less explicitly occult than many New Consciousness prophets, it is precisely his rejection of Christian spiritual discernment that opens the doors to the occult.

The Western mechanistic paradigm may have tended to suppress the spiritual entirely, but it also, along with powerful Christian influences, fumigated much of the pagan superstition, animism, spiritism, and general religious barbarism that infested the pre-Christian West. Capra would have us pry open a Pandora's box of paranormal poisons once sealed off by Christian caution. We should remember that the sophisticated panpsychism of systems theory is a close cousin to (if not identical twin of) animism—and how demons love semantic respectability! The shaman returns in scientific guise. What is touted as *New* Consciounsess is better seen as the attempted return of a vanquished pagan orthodoxy.

Biblical orthodoxy calls us to subdue the earth as God's stewards, not to exploit it or view it as mere stuff separate from ourselves. As G. K. Chesterton said, nature is our sister, though not our mother. The interrelated unity of creation is upheld by the Logos of God and is to be respected as God's redeemable property. In light of this, any view such as Capra's that confuses God with creation, denies the written revelation of God, neglects the awful reality of human sinfulness, and rejects the saving work of the Word made flesh, will never meet the need of the age nor turn hearts of stone into hearts of flesh.

Still Capra should deeply challenge the Christian community in several areas.

First, the New Consciousness movement cannot be dismissed as warmed over esotericism or eccentric mysticism. It is taking root as it taps into America's long latent pantheistic-monistic subculture (as seen in the Transcendentalists, the Mind-science sects, and through to the Beat movement and counter-culture). It is gaining a momentum of respectability and influence.

Second, Christian thinkers need to develop an informed ecological theology and cosmology that is conversant with modern physics and systems theory but which compromises neither the immanence nor the transcendence of God.

Third, Christians must explore the area of consciousness research in order to develop a biblical perspective on the spectrum of human consciousness and the meaning of biblical mysticism in relation to its counterfeits.

However strongly we may disagree with Capra, Christians should be gripped by his sheer ambition. *The Turning Point* is over 400 pages of encyclopedic effort. We need nothing less than a Christian philosophy of civilization effectively to counter his venture. After all, as Abraham Kuyper said, there is not one inch of creation of which Christ doesn't say "Mine." We do face a crisis of ideas, and Christian answers are desperately needed. If Christians are silent, others will not be. This is a clear summons for Christian critics to compassionately and intelligently respond, so that another "rising culture" may more fully permeate a fallen world.

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The Christian's Role in Medical Teaching and Research

Text of an address presented to the Federation of Christian Fellowship, FASEB, April 12, 1983.

I deeply appreciate the sharing of these moments, since we hold much more in common than scientific doctorates, or mutual interests in teaching and research. When your chairman called, I was struggling with the Physiological Society's proper role in combating the onslaughts of the animal rights groups, President Reagan and his Administration's severe curtailment of education and research dollars, the progressively increasing divergence of approved and funded research applications, and the apparent dearth of truly bright students applying for graduate study in Physiology. Tonight I will

present a few isolated vignettes in light of our commitments, both as Christians, and as scientists.

Thanks For Your Prayers

Before exploring these concerns, I would like to share some personal reflections during the six weeks or so that I dropped out of the daily round of research and teaching for aortocoronary bypass surgery just one year ago. God has given me an additional year, and I want all that I say to be understood in that light and to His Glory.

I had presented a seminar before our Cardiology Department describing our results in the chronic dog model with intrapericardial cardiac denervation, and how this procedure might be applicable to selected heart patients. I was really trying to sell the Cardiologists on selective cardiac denervation as a potential therapeutic regimen. I felt I could make a case for denervation in situations in which: (1) there is evidence for neurally induced coronary vasospasm, (2) where intractable ventricular tachycardia is life threatening, (3) when there is danger of severe ventricular dysrhythmia, particularly fibrillation, (4) in cases of profound, uncontrolled anginal pain, and (5) where there is hope for sparing of functional myocardium in occlusive coronary arterial disease. Some surgeons around the world are now combining denervation with bypass surgery, and the intrapericardial approach should provide an ideal setting for selective denervation.

I presented this seminar on a Tuesday evening, and on Wednesday morning, mentioned to the Chief of Cardiology that I wanted him to check me over when I returned from an out of town lecture trip that I was starting that afternoon. I explained that I had experienced some "walk-through" angina and wondered how serious it was. He insisted he take an EKG right then and there, and I simply never got away from him. I was admitted to the hospital within the hour, catheterized the next morning, and sustained aorto-coronary bypass that same afternoon. It all happened pretty fast.

Research: An Investment of Tax Money

This personal encounter with the dramatic advancements in recognition and treatment of cardiovascular diseases undoubtedly sensitized my perception of the Federal government's vacillations in support of Biomedical research. You and I apply for research grants, and *a few* may still actually be funded. We perform the research and see it published (our promotion and our future research funding depends upon it). But how often do we feed back effectively to the tax-paying public or to our representatives in government just how useful and how essential that Federal funding is? Do we go out of our way to remonstrate with our congressman when he doesn't pay attention to us? Equally important, how often do we acknowledge the insights and guidance of the Holy Spirit in our ideation and orientation?

To illustrate my point more poignantly, imagine yourself to be side by side with me in the following situations: first, you are lying with me on the catheterization table, a bit later we're in thoracic surgery, still later in the intensive care recovery room, and finally we find ourselves in the pharmacological aftermath dealing with anticoagulant therapy, concern for cholesterol, triglyceride, and fatty acid metabolism, adrenergic receptor physiology, antihypertensive medication, and concern that the bypass vessels remain patent. Look around you; how much the scenery has changed in the past 5-10-15 years. *All because of research,* yours, mine, that of our FASEB associates, and colleagues around the world.

During the angiography, I asked to be positioned so that I could see the monitor, and during the dye injection, I thought I saw evidence of *extensive* collateralization. The cardiologists agreed and said that I was undoubtedly living off the collateral vessels since the native coronary arteries were pretty well occluded. I had been systematically exercising for the past 12 years, and I have come to *believe* in a functional relationship between exercise and coronary collateral vessels. In fact, if my view of the angiogram was accurate, I represented a better model than the dogs in a series of experiments that one of our cardiologists had designed to test this relationship. One group of dogs was subjected to carefully controlled partial occlusion of LAD and compared with another group without such occlusion. Both groups systematically performed identical treadmill exercise over a period of several weeks, after which all were subjected to radioactive microsphere injections to determine levels and distribution patterns of coronary blood flow in both normal and ischemic heart muscle. Unfortunately, he couldn't demonstrate clear differences in the two experimental populations, and the data did not merit publication. Thus, it occurred to me that perhaps I was a better study model than were the dogs.

During catheterization, I listened to the conversations between the resident who did the cutdown and his mentor who was one of our former physiology students and also one of Dr. Mason Sones' early trainees. That was of considerable interest to me because I had sat with Dr. Sones on an NIH Study Section during the period in which he was pioneering the first therapeutic angiographic catheterizations. Furthermore, as the resident inserted the Swan-Ganz catheter, it also occurred to me that I had sat on the NIH Committee, and chaired the Site Visit, that had evaluated the original application from Drs. Swan and Ganz for development of this instrument as a research and clinical tool. I began to realize what a good investment of taxpayers money those NIH grants had been. Do you have any idea how many patients have benefitted from that little device? Did you know that the original idea and prototype for the flotation catheter was developed in totally unrelated dog experiments in Herman Rahn's respiration physiology laboratories?

During the catheterization procedure I recognized some degree of consternation among the physicians making the study, and I learned that my coronary vasculature had undergone intense vasospasm during the procedure. Most of those present had heard my presentation the evening before, and recognized the direct applicability of selective cardiac denervation, probably for the first time.

When I awakened after surgical anesthesia, I immediately found, among the accessory lines coming out of my chest, a pair of wires just like those protruding from chests of my chronic, experimental dogs. They were from implanted atrial electrodes permitting either recording or pacing, and of course I recognized their purposes. Here again, this technology had only recently been introduced (by a close friend) to human cardiology. Throughout these procedures I experienced a peculiar fascination with these technologies which were actually in transition, or had only recently been transferred from the experimental animal laboratory, many by close personal acquaintences, and many still being employed in research, even in my own chronic animal laboratory.

There was a period of two or three days during the early postoperative recovery period about which I have absolutely no recollections. Apparently one of the bypass vessels had sprung a leak at its point of insertion into the aorta, and I lost consciousness, along with considerable amounts of blood. It became necessary to reopen my chest in an emergency procedure and repair the damage, so I was kept sedated for a few days. During this time, the Intensive Care Unit, and the many hours I spent on the Ad Hoc NIH committee evaluating MIRU (myocardial infarction research unit) applications assumed a different perspective and a different level of importance to me. I began to think those NHLBI investments in clinically oriented research were also pretty well conceived.

It was during this period that your prayers, joined with those of my family and other Christian friends, reached out to touch the very hem of Christ's garment. He answered your prayers and I came out of the experience very well, considering. When I was able to put things together, I also received God's assurance that He still had things for me to do. I determined that I would try to do whatever He wanted and I think that accounts for my speaking to you tonight. I want to praise Him for a wonderfully rewarding career in Physiology teaching and research.

Our Christian Testimony

You and I hold numerous characteristics in common: First and foremost is our personal belief and commitment to Christ. Secondly, we are teachers, scientists, investigators, with common interests in teaching, development of new knowledge with practical implications for medicine, and a sense of making the world a bit better because we passed by. Probably most of us consider our professional career as a *ministry* to which we were specifically called. We enjoy a bond of kinship in this ministry, and we believe we are in His Will. A very good friend was disappointed in his teaching experiences in medical school because he felt he was not contributing much to the spiritual or philosophic aspects of the medical student's experience; he returned to a responsible post in undergraduate teaching where he was able to guide literally hundreds of undergrads into medicine with a clear Christian philosophy. Another close friend is a medical faculty colleague who daily *lives* a clear Christian testimony. He attracts many medical students to weekly Bible study sessions, and is respected as one of the best teachers on our faculty. My point is simply that each of use has daily opportunities to extend our Christian testimony to our colleagues and our students. Are we faithful to that mandate? If a stranger were to ask one of my students about me some years *after* he sat in my class, would he recall me as "that enthusiastic, committed Christian teacher" or as "just another member of the faculty in Physiology"?

A Good Teacher

I happen to believe that Willis Hurst was correct in stating that the student can't accurately designate a really good teacher until he has been out of school for perhaps ten years. By that time he will have forgotten most of the so-called "facts" we have taught him, but he *will* remember the intellectual challenges, the times we showed him how to observe and how to *think critically,* the times we required him to clearly analyze his laboratory results, the opportunities he had to sharply define and to defend his ethical and spiritual values. Is our teaching perceived to be at arms length, designed solely for mass education; factually efficient but cold? Is our emphasis upon factual knowledge without thought of spiritual values? Can the student really experience our personality if we remain strangers?

Sydney J. Harris recently told about a University of Chicago Professor whose newspaper obituary ended with the bleak sentence, "He left no survivors." One of the Professor's former students protested that this was not true. While the Professor, a lifelong bachelor, died without next of kin, he left hundreds of student "survivors" all over the world. A great teacher, even if he writes not a word, may be survived by generations, even centuries. Jesus, like Socrates, wrote simply with a stick in the sand, but published not a word during their lifetimes. Still, their thoughts remain eternally fresh. They acquire new disciples (students) every day. I suspect the impact and power of a teacher's personality is far more decisive and more permanent than the facts he imparts. I think this is what Einstein meant when he defined education as "what is left after you have forgotten everything you learned in school." What is left is the indelible memory of a teacher's insight and spiritual commitment, his moral courage, his respect for reason, his excitement for learning, his desire to share his knowledge and know-how, his eagerness to learn from his students as much as he teaches. Unfortunately, there are not many teachers of this sort, not *enough* at any rate.

Our Scientific Heritage

Do we lace our lectures with a sense of dependence upon a strong Christian as well as a scientific heritage? Do we impress our students with the idea that we stand upon the shoulders of great teachers and scientists who have come before us? In quizzing our medical or even our graduate students at the time of their Qualifying Examination, I am amazed at how little historical background they have. They still enshrine textbooks, and have not yet developed a "feel" for the progressive, stepwise advance of scientific knowledge. They have not yet acquired a perspective of the jigsaw puzzle that is knowledge, and how each individual research contribution represents a small, but crucially important part of the whole picture. Later on, after a line or two is quoted from one of their own papers, they will begin to sense a payback from this perspective.

So that the practicing physician may acquire appreciation for a strong, enduring bridge between the research scientist in his laboratory, and his own successful application of new knowledge in his daily practice of medicine, we as teachers must work harder to make this relationship real. And I believe the best place to emphasize the contributions of biomedical research to the tax-paying public is by way of the practicing physician. Virtually every individual, either personally or through members of his family, at some time experiences critically important interactions with his physician. Therefore, it is the physician who is in a strategic position to communicate real appreciation for advances in medical knowledge through research. Such dissemination is probably the best, and perhaps the only, way to justify uninterrupted, ongoing Federal tax support of quality research. If the tax-paying public insists upon this, congressional legislators will be less inclined to indulge in wholly irresponsible and repeated disruptions in research funding. But the medical student and young physician no longer have opportunity to *experience* or to appreciate this relationship unless you and I in the Basic Medical Sciences crystallize it for him. Have we properly articulated this responsibility? Haven't we told him by our decisions and our actions that the laboratory isn't even important enough to include in his physiology course any more? I am afraid the evidence is piling up against us.

God Has No Hands But My Hands

I am quite certain that each of you, at one time or another, has observed something in your laboratory that is brand new . . . The first time anyone in the world has recognized that particular truth. Has that been a *spiritual* highlight for you? It almost always is for me. While I sometimes get pretty excited at the moment, as I drop off to sleep that night, I realize that God revealed that previously unknown portion of His Creation to me. To me for the first time. Why me? Out of thousands of years and millions or even billions of people, He chose to show it to me first. Why? This experience always has deeply spiritual impacts in which I feel as though I am working in a one-on-one, hand-to-hand relationship with God. The old axiom, "God has no hands but my hands" takes on added significance, at such high moments. Certainly, I have a responsibility to communicate that information as accurately and as effectively as possible, and to see that it is made available to all who need it and can use it. Is there any place for secrecy or for selfishly holding back key items in order subsequently to aggrandize my personal identification with the "First Report"? Dare I withhold vital information that may enable others to extend this area of new knowledge even better or more effectively than I? I believe not! While I must work hard to properly document and accurately record the discovery in the scientific

literature, an I not obliged to give honor and glory to God who created it all in the first place? While I guess I wouldn't expect an editor of AJP to accept that as a credit line, am I not obligated to include it in my classroom, in my lecturers, my seminars, or whenev r and wherever I can?

In Conclusion

Thus, I hope you share with me the excitement and exhilaration of actively doing original research, passing along your sense of partnership with the Lord in teaching your rapidly advancing discipline, and on occasion perhaps even sampling the wares of the physician who dispenses the spectacularly new knowledge and technologies that come out of our research.

I leave you with Paul's admonition (I Timothy 6:20–21): "Timothy, keep safe what has been entrusted to your care. Avoid profane talk and foolish arguments of what some people wrongly call "knowledge" (some biblical versions translate this word as *science*). For some have claimed to *possess* it, and as a result have lost the way of faith."

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The Appeal (the Necessity?) of Complementarity

In his two articles on complementarity (*Journal ASA 35,* 145 and 203 (1983)) John W. Haas, Jr. has summarized some of the problems associated with using the concept of "complementarity" for science/theology interactions. The interesting feature of this discussion is that there are not that many choices. As Haas points out in his first paper, Christians have a choice among three options for relating science and Christian faith. They can adopt a *conflict* perspective in which it is believed that science and Christian theology say *the same kinds of things about the same thing;* one must choose which has demonstrated the other to be wrong in all the major cases where they appear to interact. They can alternatively adopt a *compartmentalization* perspective in which it is believed that science and Christian theology say *different kinds of things about different things;* this calls for a schizophrenic response toward life and meaning. If neither of these two perspectives is appealing, then some approach appears necessary in which it is recognized that science and Christian theology say *different kinds of things about the same thing;* both descriptions deal with the same reality, but tell us different things about it without inducing conflict or contradiction. The appropriate response to compartmentalization is integration. It is in the affirmation of this approach that the concept of *complementarity* is called into service. It is essential to note that it is complementary *descriptions* that are the focus of attention. Scientific descriptions are valid when scientific categories and methods of description are used, and theological descriptions are valid when theological categories of description are used. What should be the relationship between two descriptions in order for them to be called complementary? And what does this mean? Haas has enabled us to see the refinements that are necessary to answer these questions. In this Communication I give a brief overview of the issues.

The application of the term "complementary" to two descriptions stems from the fact that any description of what is unknown must be given in terms of what is known, by telling what the unknown is like. It is in this sense that all scientific and theological models should be recognized as similes, metaphors, or allegories, as recently described at some length by Poythress.[1] If to the request, "Describe an apple for me," from one who has never seen an apple, I reply, "An apple is usually red like a cherry, juicy like a peach, and firm like a pear," I have used three similes. Each is partially truthful, but none is totally truthful by itself. By knowing all three similes I know more about an apple than by knowing only one or two of them. If to these similes I add, "An apple is like a Japanese persimmon except that its inside is white rather than pink," I would know still more about an apple (provided that I was acquainted with Japanese persimmons), while still not knowing exactly what an apple *is*. Such simile descriptions could be multiplied many times over, giving a greater and greater awareness of what an apple is, but never converging on an accurate statement of what an apple is. Descriptions that are of partial or limited truthfulness (accuracy, exactness, correspondence with reality) may be said to be *complementary*.

Why do we give such complementary descriptions? There are two fundamental reasons that correspond to the "Classical Complementarity" and the "Logical Complementarity" discussed by Haas. Our everyday example of the apple illustrates both of these reasons. In the first place our descriptions are complementary because we are forced to use similes, metaphors, or allegories to describe the unknown in terms of the known; such metaphorical descriptions are bound to be complementary. In the second place each of our descriptions focusses on a different range of categories of the apple: its color, its reaction with our taste sensors, its feeling to the touch, and its general appearance and texture, respectively. Since each description arises out of a different category of description, it again follows that their contributions must be additive, and that the individual descriptions can be properly viewed as complementary. We can give a few examples of these two reasons for formulating and types of complementary descriptions to illustrate.

Limitations on the Known to Describe the Unknown

The first reason that it becomes necessary for us to use complementary descriptions is that we do not have the needed "tools" among the known to adequately describe the unknown with a single model or description. Reality in all it complexity is not apprehendable by the human mind. Particular models give particular insight into the nature of reality, but they of necessity convey partial and incomplete truth. It follows that more than one model is needed to encompass the full dimensions of reality.

This kind of complementary description usually arises in the context of science and Christian theology when descriptions are selected from the same area (science or Christian theology) as the phenomenon to be described. Thus scientific metaphors are used to describe scientific phenomena; and theological metaphors are used to describe theological phenomena. The classical example from within science is the description of an electron as a particle, and the description of an electron as a wave. The concept "particle" and the concept "wave" are drawn from our macroscopic experience. When we attempt to apply these macroscopic similes to the microscopic world of the electron, we are enabled to say what an electron *is like,* but not what an electron *is*. I do not think that we need to invoke the Indeterminacy Principle or the interaction between the observer and the observed to make this point. If we could invent a sufficiently ingenious model that would transcend the macroscopic concepts of "particle" and "wave," then we might be able to resolve the

complementarity between "particle" and "wave" by arriving at a model more faithful to the properties of an actual electron; perhaps in time we will find such a model. Until then we recognize that it is significant to state than an electron behaves like a macroscopic particle when its trajectory in vacuum under an applied electric and/or magnetic field is considered, but that an electron behaves like a macroscopic wave when it interacts with crystalline matter in the phenomenon of diffraction.

Biblical inspiration does not deliver us from the limitations imposed by the necessity to describe the unknown in terms of the known. What biblical inspiration secures is the assurance that the models so presented will indeed provide us with reliable partial truths. The theological models within which we describe the relationship between God's election and human responsibility (or between predestination and free will, or between determinism and free will as applied to human beings) provide us with useful and partially true representations as long as we remember their limited nature (their complementary character). Just as the question, "What is an electron like?" cannot be answered without knowing the answer to the correlated question, "What kind of experiment are you talking about?" (since the answer would be "Like a particle" if one were considering motion in a vacuum, but it would be "Like a wave" if one were considering diffraction from a crystal), so also the question, "What does the Bible teach on the relationship between God's sovereignty and human responsibility?" can be answered only if we know the content of the question. If the question is, "Does God have to wait for human beings to act before He can accomplish His purpose?" the answer is no. But if the question is, "Must a human being commit him/herself to God in order that God's purpose may be accomplished through them?" the answer is yes. From God's perspective His sovereignty is unquestionable; from the human perspective our responsibility is equally unquestionable. What is the cause of this situation? Our human concepts of sovereignty, election, determinism, responsibility, predestination, free will etc., to say nothing of our human concepts of time and interaction, are sufficiently limited that we cannot construct with these human concepts alone a single fully adequate description of the Divine Dynamics of life. Because of this, the biblical writers by inspiration have provided us with several complementary models in order that we might not be misled (in order that we might not believe, by analogy, that an electron is really a particle which just looks like a wave once in a while, or that an electron is really a wave which just looks like a particle once in a while, i.e., that God really "runs the show" without our involvement and our sense of responsibility is only an illusion, or that God's sovereignty is really reducible to His foreknowledge of what we in our free will do).

Another familiar example within the Christian context is the biblical teaching on the atonement. Here the biblical writers invoke a whole series of different similes in order to convey in some sense as much of the true nature of the atonement as it is possible to do when limited to the categories of everyday human experience. Thus the biblical writers tell us that the atonement *is like* healing and wholeness (salvation), *like* being bought back from slavery (redemption), *like* recovering from estrangement (reconciliation), *like* triumph over the Devil (victory), *like* having a legal debt paid by another (sacrifice). Each of these models tells us something true and reliable about the meaning, purpose, and accomplishments of the atonement; our understanding of the atonement is enriched by considering them all, yet never can be expected to encompass the totality of the atonement. These are complementary biblical descriptions of the atonement.

Are the complementary statements describing biblical doctrine *exactly* the same kind of statements as those describing the properties of an electron? Perhaps not. But their origin is the same; the limitations imposed on us when we try to describe the unknown in terms of the known.

Descriptions Drawn from Different Realms of Discourse

Descriptions must be given within a particular realm of discourse. Thus the color of an apple can be described by a variety of similes, but always within the categories of the color spectrum. Another occasion for the development of complementary descriptions arises quite independently of our limitations on describing the unknown in terms of the known: the limitations that we ourselves impose on a description by choosing its context in a particular set of categories.

This kind of origin for complementary descriptions can also be seen within a particular discipline, for example, science. In fact the various branches of science, extending from physics and chemistry to sociology through biology, botany, zoology, psychology and many others, each define the domain of its own description. The claim that there is only one domain within which a valid description can be given is known as reductionism and philosophically finds little support. Thus a description of an event in the life of a living creature can be given in terms of the physics of the event, the chemistry of the event, the biology of the event, the psychology of the event, and the sociology of the event, if we choose to remain within the scientific sphere as a whole. We do not expect these different kinds of description to give the same information, but neither do we expect them to contradict one another. Rather we expect them to be complementary. Phenomena involving human beings must be described scientifically with contributions from all these different domains; the goal is to integrate them into a total perspective.

The questions that we ask and the context in which we ask them may limit the appropriate categories of the responding descriptions. If we ask for the appearance of a classic painting, but insist that our answer must come from what we see when observing it with a microscope (thereby limiting ourselves to a narrow range of interpersonal categories), our response is quite different from what would be given if we stood back twelve feet from the painting and saw it within its full context and human correlations. The two descriptions that we would offer in this way might very well be said to be complementary since they apply to the same object but are drawn from different realms of discourse, as dictated by the examination procedures prescribed.

Now it is evident that descriptions drawn from the realm of science and descriptions drawn from the realm of Christian theology come from different realms of discourse. That there exists a viable description from the realm of science does not a priori mean that no viable description from the realm of theology can be given; conversely, that there exists a viable description from the realm of theology does not mean that no viable description from the realm of science can be offered. Because of the orientation of the two realms, science being a subset of the disciplines of which theology is the most completely integrating, there may well be special cases where no scientific description can be given (e.g., miracles), whereas there are no cases in which theological descriptions would not be appropriate.

In this sense, then, it appears that we may meaningfully speak of scientific descriptions and theological descriptions having the capability of being complementary: when they deal with the same phenomenon of reality and when they give descriptions of that phenomenon out of their own realms of discourse using categories and methods appropriate to those realms.

It is helpful to realize that we use the term "complementary" in a number of different ways, and for two basic reasons. We need to realize that the "complementary" descriptions offered are not identical when responding to these two different reasons. We may

indeed debate whether one should say that science and theology are complementary, but it does not appear that there is any debate that scientific descriptions are often complementary to theological descriptions of the same events. If this were not the case, what other option do we have?

[1]Vern Sheridan Poythress, *Journal ASA* 35, 65, 156, 196 (1983)

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Newton, Biblical Creationist

Isaac Newton (1642–1727) was an intellectual giant, but at the same time a social enigma, a complex personality, a living paradox (unfortunately a popular subject for modern psychoanalysis). A timid country boy, he became a powerful national administrator. A recluse scholar of academia he came to be a business man of affairs (Master of the Mint at 53, due in part to his metallurgical interests; Warden at 56, owing to his coinage changes). At 60 he was made President of the Royal Society—until his death; Queen Anne knighted him at 62 for his scientific achievements. A genius at 23 (his *annus mirabilis* 1664–1666), he had a nervous breakdown at 49 (not a turning point in his life). He exhibited an insatiable curiosity and an intuitiveness that sprang from persistent concentration, mechanical ingenuity and scientific inventiveness, religious imaginativeness. Any subject he touched was impressed with his genius.

Newton was solitary and melancholic, an indefatigable worker (hence "absent minded") and non-communicating; he was impersonal, but generous (to those who did not cross him), self-interested and self-satisfied, priggish and domineering. In his embittered priority squabbles (Hooke, Flamsteed, Leibnitz) he was acrimonious and petulant. In later life he appeared mild, pleasant, and of comely countenance. He was devoutly religious in his search for God, puritanical in his morality, abstemious, scrupulous, austere—loveless and joyless. Nevertheless, his prestige forged a permanent link between science and government.

Newton's masterpiece was in theoretical physics, *Philosophiae Naturalis Principia Mathematica* (1687), an intellectual monument to mankind, a synthesis of grandeur. Although appointed Professor of Mathematics in Trinity College, Cambridge, at 26, he was truly a natural philosopher inasmuch as he sought to understand phenomena per se rather than the mathematics involved. He adhered to the Royal Society (1660) motto, "*Nulla verba.*" He was the architect of dynamics and celestial mechanics; he formulated the laws of motion and the law of gravitation. He derived Kepler's empirical laws and initiated planetary perturbation theory; he explained the flattening of the earth, its tides, and the precession of the equinoxes. He established mathematical physics, e.g., fluid dynamics and acoustics. The *Principia* was written in Latin, its proofs were geometrical, despite his having invented fluxions, a form of calculus. On the contrary, the *Opticks* (1704) was written in English with experimental queries. In both books he was a precise, methodical experimentalist who presented a comprehensive view, an artist in expression. He had been made FRS at 29 due to his analysis of white light in the *annus mirabilis*. He presented the Royal Society with a reflecting telescope (he himself had ground the lenses). One of Newton's notable claims was, "*Non fingo hypotheses*"—specifically with respect to his agnosticism about the essential nature of gravity, but generally with regard to his rejection of all suppositions not deducible from phenomena.

The young Newton did not aspire to ecclesiastical orders—requisite for the mastership of a college. His theological interests, however, were not an aberration of old age. All his life he was a conforming member of the Anglican Church, although he had reservations about its Trinitarian doctrine. Although he appreciated its universalist humanitarianism, he was by no means a deist inasmuch as he believed in a personal God, omniscent and omnipotent, but, above all, immanent; not only had He created the universe, but He keeps it under constant surveillance and intervenes in a providential way from time to time (e.g., paths of comets). Neither was Newton a Unitarian; he believed in Jesus Christ as the Messiah, the Son of God—not a mere man, but a sort of viceroy for the Father (his precise concept is somewhat problematic). Newton diligently sought the Creator through His actions, His work (creation) and His Word (the Bible). (Newton probably kept his non-orthodox views secret to refrain from disruptive controversies in the church.)

Newton believed in past miracles ("the sun standing still," however, he regarded as a poetic expression: Moses as a popularizer) and prophecies—no longer needed. In general, he interpreted the Bible literally. (Among his effects upon death was a well-worn Bible (1660)—now lost.) He performed meticulous exegesis of the Scriptures. He regarded Church history as of primary importance for understanding Christianity. An assiduous reader and an erudite historian (he knew Greek, Hebrew, and Latin), he examined scores of texts for corruptions and misinterpretations. His vehement anti-Catholicism stemmed from the initially political endorsement of Athanasius' creed and from the later biblical mistranslation by Jerome. He himself was convinced by the argument from design in its major features, not in minutiae. Possibly a mystic in connection with his alchemical investigations, he always relied upon facts per se. Newton was a critical historian for his time, but he did have a fanatical belief in the writings of antiquity (e.g., a crucial fragment of Eudoxus). He was particularly attracted to the prophetic records of Daniel and St. John the Divine, which he regarded in agreement in the smallest detail. (Biblical prophecies, he felt, can be understood only *ex post facto.*) Newton's historical interests engaged his attention more than fifty years; his extant writings along this line are esoteric and scattered among numerous manuscripts. *The Chronology of Ancient Kingdoms Amended* and *Observations upon the Prophecies of Daniel and the Apocalyse of St. John* were published posthumously (1728). Together, in the accepted historical method of that time, they provide a chronology of world history, sacred and profane. Both the *Principia* and the *Optics* close with affirmations about God; the famous "Scholium" of the former is a passionate statement about the creation. As our idea of the universe expands, so, too, does our concept of God.

Newton was wholeheartedly committed to the commandments of the Bible (O.T. and N.T.)—in an absolute sense. Unfortunately, he envisaged God more as a just ruler than a Father of grace, love, and mercy. He lacked emotion, although he did record 58 sins about Whitsunday when he was 19. He minimized ritual, as well as dogma. (He did not seek the last rites of the Church.) He noted that there were many rites among the early Christians, but only one faith.

Although the Royal Society had many divines as members, in the spirit of Francis Bacon, it barred any public discussion of politics and of religion—presumably for the sake of unity. Privately, however, Newton recognized that we all live in one world, our Father's world.

He regarded religion and science as interrelated; science, indeed, the handmaiden of religion, its Te Deum—hence no fundamental conflict. In both he insisted upon a common mental approach, a foundation of facts, historical and natural. He corrected the death date (34) of Christ, and that of the Argonaut's search (956) and hence of Troy's fall, 904 (both about 3 centuries late by modern standards). His application of astronomical dating (eclipses, equinoctial precession, et al.) was revolutionary. He was, however, very much opposed to metaphysicians such as Descartes and Leibnitz, both in science and in theology. He looked upon history and nature as similar in that they both have latent secrets, both being actually simple and measurable.

Newton's whole life was dominated by religion, his search for the Creator of heaven and earth. Toward the end of his life he mused, "I do not know what I may appear to the world; but to myself I appear to have been but a little boy, playing on the sea-shore, and diverting myself, in now and then finding a smooth pebble or a prettier shell than ordinary, whilst the great ocean of truth lay all undiscovered before me."

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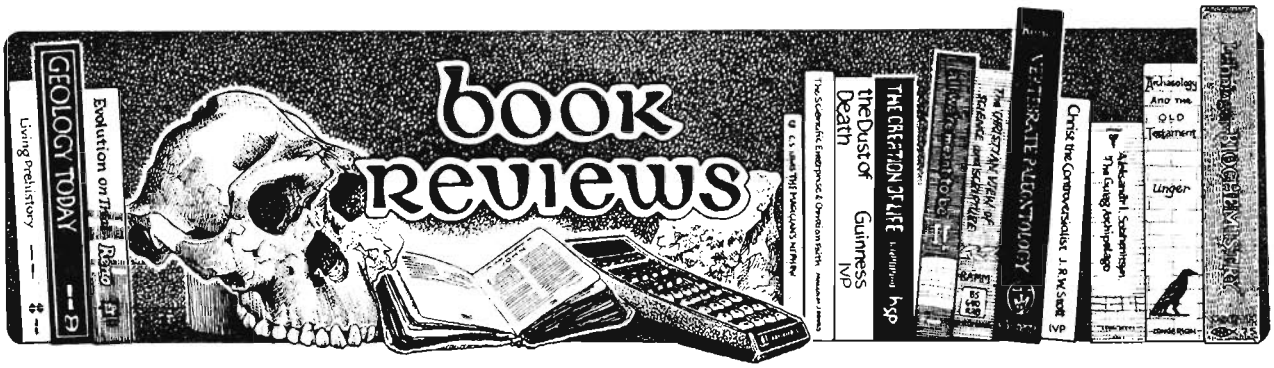
This is the fifth in a series on religious scientists.



THE SORCERER'S APPRENTICE: A CHRISTIAN LOOKS AT THE CHANGING FACE OF PSYCHOLOGY by Mary Stewart Van Leeuwen, InterVarsity Press, Downers Grove, Illinois, 1982, 151 pp., $5.95, paperback.

Mary Stewart Van Leeuwen sounds a clear clarion call for a new approach to the study of human beings. This book presents a well-reasoned case for the need for a psychology in which human distinctives are paramount and methods used are appropriate to those distinctives.

She notes, in tracing the development of modern psychology, that psychology has been strongly influenced by the natural science and secularism of the eighteenth century. In her view the natural-science model has serious inadequacies which center about two foci: lack of dependable knowledge resulting from application of these methods to humans, and ethical considerations.

Psychology has adopted not only the natural-science model but also its criteria for scientific method: reductionism, emphasis on the experimental method, explanations rooted in prior experimental conditions, operationism, a penchant for quantification, and objectivity in the sense of viewing research subjects as objects to be manipulated. In her view these six criteria together make up positivism, the dominant current approach to psychology. She analyzes a well-known research study from her specialty, social psychology, as an example of the positivist approach. Her analysis shows that the careful application of each of the six criteria does not lead to the lawful, exceptionless results that one might expect from such a competent application of the natural-scientific method.

Concerning ethical issues she points out that human subjects in experiments are treated as if they are passive responders to environmental pressures, but the experimenter is viewed as a purposive, reflexive being. In addition, she notes the problems in deceiving subjects—problems that never arise in the work of the physicist. She points out the long-range difficulties of the escalating "cat-and-mouse" game of more and more elaborate deceptions in the search for naive research subjects.

In her view the application of positivist methods in psychology, especially the experimental method, has contributed greatly to the fragmentation that exists in psychology today. She concludes that vigorous application of the positivist, natural-science approach has not led to the sound, lawful knowledge of human beings which that approach once promised. It is her contention, furthermore, that Christians in psychology have done very little to protest or counteract this positivist trend.

One of the many strengths of this book is its careful proposals for remedying the lamentable situation she describes. Van Leeuwen believes that the time is ripe for a period of "extraordinary science" as described by Kuhn in *The Structure of Scientific Revolutions*. She makes extensive use of the "routes to resolution" of differences in positivistic and Christian viewpoints in psychology proposed by Stephen Evans in *Preserving the Person: A Look at the Human Sciences*. She notes that the Compatabilists, the Capitulators, and the Territorialists all have inadequate means of resolution. She believes those who are "Humanizers of Science" have a more promising approach. The Perspectivalists, whom she sees as representing the most common type of resolution, have an intermediate place in her thinking—neither fully adequate nor fully inadequate. She clearly opts for a "human-science revolution."

The human-science psychology that she proposes has many similarities to modern "third-force" psychologies, but with a significant difference. Although she shares with the humanists an emphasis on reflexivity, meaning, and wholeness, her proposed human science would hold "control beliefs" markedly different from most humanists. Prime examples would be that persons are created in the image of God and are also products of humanity's Fall. She also holds a less exalted view of the purity of human rationality, and takes into account the creatureliness of persons. Her human science would avoid cloaking non-biblical concepts, such as pantheism, in a religious vocabulary, and would see man's search for meaning as a fulfillable search for truth rather than only a significant process.

This book is highly recommended for those seeking a scholarly Christian foundation for a psychology that acknowledges a biblical concept of man, yet does not reject those solid contributions that natural-science psychology has made, and can continue to make if applied appropriately. The book has an index and extensive chapter end-notes.

Reviewed by Forrest E. Ladd, Ph.D., Professor of Psychology, Bethany Nazarene College, Bethany, Oklahoma.

CHURCH GROWTH AND THE WHOLE GOSPEL: A BIBLICAL MANDATE by C. Peter Wagner, Harper and Row, 1981, 208 pages, $13.50.

When the most articulate proponent of Church Growth writes about the whole gospel, the reader expects a book that deals with many issues. This book is no disappointment on this count. It is amazing that a relatively small volume can deal in such detail with so many issues.

Wagner has changed in his thinking during the last decade. He has taken seriously the major critics of the Church Growth Movement. He explains, with a minimum of defensiveness, historical antecedents of the weak points in his former theology, and gives due credit to those who have helped him grow.

He begins with a discussion of the Kingdom of God as normative for mission. He adopts the position he calls "holistic mission," which includes both the evangelistic and the cultural mandate. But he rejects "holistic evangelism," which gives equal status to evangelism and social concerns. He insists on the priority of evangelism, and argues that social concerns are best advanced when priority is given to evangelism. To give social issues equal or superior status is to weaken both evangelism and impact on society.

Many criticisms of the Church Growth movement are included, and give occasion for Wagner's explanations. His treatment of differences is fair and respectful. He deals seriously with other points of view, and states clearly the Church Growth position.

Wagner thinks analytically, so the book is full of fine distinctions and deductions. He includes several charts that help to distinguish one position or approach from another. Whether or not one agrees with his positions, his writing is vivid, clear and stimulating.

Adopting the position that dealing with all kinds of social issues is a necessity for believers, Wagner differentiates social service from social action. He then contends that different structures are required for these different aspects of social issues. Service, which counts on congregational consensus, should be a function of the local church, and will contribute to its growth. But social action is likely to be more controversial, and will lead to church decline unless carried out by a voluntary organization of those committed to it.

This book is a landmark in Church Growth literature, and is an important contribution to missiological literature. Wagner's openness and candidness in dealing with such an array of criticisms and issues, and the substance of his answers, make it a valuable resource for Christians seeking for guidance in carrying out the evangelistic and cultural mandates of Scripture.

Reviewed by Joseph M. Martin, Professor of Missions, Edward Lane Bible Institute, Patrocinio, M.G., Brasil, S.A.

SCIENCE AND CONSCIENCE by Milton R. Wessel, Columbia University Press, 1980, 293 + xxi pp., $15.95.

According to the dust jacket, Wessel is a lawyer who has had considerable experience in settling "complex public interest disputes." The theme of his book is that "socioscientific disputes" should be settled in a different way than they usually are now, namely in long legal and/or political battles. Examples of socioscientific disputes include SALT, the ozone question, laetrile, the IBM and Bell cases, and auto safety.

Wessel's method of solution is "the rule of reason," aided by "scientific consensus-finding conference." He describes how these tools have been used in two particular disputes he has been involved in concerning coal policy and 2,4,5,T ("Agent Orange"). Wessel states his belief:

> I am convinced that substantially all of the present adversaries to socioscientific disputes are genuinely searching for what they believe to be in the public interest. They may be adamant. They may be obstinate. They may be wrong. But they are driven by a real sense of public purpose. If their opponents can only be made to understand this, much of the heat and bitterness can be eliminated from the contests. Then both sides can move more responsibly and rationally to serve the public. (p. 186)

Wessel also believes that one of the problems is that the legal profession has more of a vested interest in perpetuating disputes than in solving them, which will surprise few, and that the likely saviors of modern society are going to have to be responsible corporate managers, which surprised me, at least. He believes that it is in their ulitimate best interests to be candid and cooperative with all segments of the public, and to instruct their legal staff to aim for quick, reasonable solutions, rather than being (as so often happens) deceptive and dilatory, and instructing their legal staffs to be the same. The author devotes 48 pages to an appendix outlining how corporate legal affairs should be handled.

Wessel's main message to scientists is that they do not help anyone by being advocates. They should be dispassionate, unbiased, and fully informative. He cites some horror stories, and an exemplary case or two.

As Wessel himself recognizes, the book's main weakness is that it is difficult to find an intended audience. He finally states that the book is for everyone concerned with socioscientific disputes. That, of course, means all of us. That there is no subdiscipline devoted to these public policy monsters is not Wessel's fault. Perhaps, like his book, they have no intended audience, other than all of us. All of us have a stake in solving them, and the book is a step in the proper direction.

Reviewed by Martin LaBar, Visiting Professor, Bryan College, Tennessee

KEN PIKE: SCHOLAR AND CHRISTIAN; by Eunice V. Pike. Summer Institute of Linguistics (1981) vi + 268 pages, $4.95 paper.

Ken Pike is an outstanding linguistic scholar, a dedicated missionary, and one of the prime movers in the Summer Institute of Linguistics and related activities. This book is an intimate (not scholarly) biography written by his sister. Pike is a significant figure, and the book contains a good deal of interesting and useful information. The presentation suffers at times from failure to distinguish anecdotes from more significant decisions and events, from uneven writing style, and even from surprisingly erroneous typography. Nevertheless, it is a worthwhile book for those interested in linguistics, or in translation as a missionary activity.

Reviewed by David T. Barnard, Director of Computing Services and Associate Professor of Computing and Information Science, Queen's University, Kingston, Ontario, Canada.

THE MASKS OF MELANCHOLY by John White, 1982, InterVarsity Press, Downers Grove, Illinois, 256 pages, £2.75.

Enthusiasts of John White's earlier books such as *The Golden Cow* and *People in Prayer* will not be disappointed by this, his latest work. In *The Masks of Melancholy* the Christian psychiatrist explores the subject of depression in the hope of alleviating the unnecessary "pain and shame" associated with this condition. The shame attached to depression is all too prevalent in the church today because of our ignorance of depressive illness and our unwillingness to help or accept those who suffer from it. As in his other books, the author's writing is refreshingly free from evangelical clichés as he describes his relationship with God in real, everyday language. Unlike his other books, this volume is not easy reading, but it is well worth the effort and by the end of the 256th page, the reader will have a greatly enlightened and more sympathetic approach to those with depressive illnesses. Although the book is full of technical jargon and psychoanalytical concepts, the author holds the reader's attention and supplies an extensive glossary to fill any gaps in knowledge.

Depression, as described here, is not just the "blues" we all experience from time to time. It is an illness that can be classified as primary, secondary, bipolar or unipolar depression, each with specific characteristics. Whatever the type, melancholy wears different masks ranging from tiredness, weakness or lack of concentration to fear of people and changes in sleep and appetite patterns. The author makes us aware of these and depression's camouflage symptoms such as phobias, obsessions and compulsions, emphasizing our responsibility as Christians in a caring community to unmask the symptoms and guide the person back to "normality."

In the first of the four sections in his book Dr. White discusses the relationship between disease and sin. Although appreciating that all sickness is ultimately a consequence of humanity's fall and that some sicknesses such as syphilis are due to specific sins, he does not accept that those who experience depressive illness are being punished by God. Added to the symptoms of depression experienced by the non-Christian, the Christian is often overcome by fellings of guilt. White points out the folly of these feelings and gives poignant examples of depression experienced by both biblical characters and well known contemporary Christians alike.

In the second section, entitled "Science and the Masks," some very perceptive comments are made with regard to the relationship between Christianity and science. If science "discovers" something that strengthens our favorite interpretations of Scripture, we accept it. However if science produces a theory that threatens Scripture, it becomes the enemy. White suggests that this is due to our overrespect for science and our overestimation of its power both to undermine and build our faith. We should appreciate its limitations and understand that it can neither "discover" God nor confirm His Word. Nevertheless with science as our tool we can begin to understand the nature of our minds and personalities and strive to lessen the distortions that can occur.

In his final section, White broaches that subject—unmentionable in Christian circles—suicide. He writes pragmatical-

ly, explaining how to assess the seriousness of the suicidal person's intentions and suggesting ways in which we can help such a person. He writes with a deep understanding and compassion that I am sure most of us lack.

My only reservation about White's book is that he covers the topic of depression from too many angles. He attempts to write not only as a psychiatrist but also as a counsellor, physiologist and philosopher. For example, in the third section he skims over such complex concepts as Kant's understanding of cognitive therapy in three pages and his chapters on the physiology of the electrical impulse and the physical therapies available for straightening bent minds are given only sufficient space to confuse the lay person while remaining too elementary to benefit the more informed reader. Nevertheless, I believe that this is a much needed book in the church today for clergy and laity alike, helping us to fulfill our responsibility to God by caring knowledgeably for those of His Body who suffer in this way.

Reviewed by Sheena Lewis, Clinical Research Fellow, Physiology Department, The Queen's University, Belfast, N. Ireland.

CREATION, SCIENCE, AND THEOLOGY: ESSAYS IN RESPONSE TO KARL BARTH by W. A. Whitehouse, ed. by Ann Loades (Grand Rapids: William B. Eerdmans Publishing Company, 1981), xxiv + 247 pp., $10.95.

Creation, Science, and Theology is a collection of essays, reviews, and addresses given by British theologian W. A. Whitehouse over a wide range of subjects. The primary organizing concept is the theological perspective of Karl Barth, which Whitehouse is at pains to elaborate and clarify. Subject matter discussed include Barth's views on creation, man, providence, and ethics; human rights, eschatology, and the natural sciences; and the Christian in the university. Throughout, the author upholds a theological perspective that seeks to create a synthesis between truth as it is encountered in the Christian context (in the Person of Jesus Christ and in the Church) and truth as it is set forward in the secular community. Whitehouse maintains that, in the pursuit of reliable truth, it is necessary for us to "look for correspondences of some kind" between the Christian and the non-Christian spheres (p. 194).

The first section (of three) amounts to a celebration of the theological works of Karl Barth. Whitehouse applauds Barth's insistence that revelation, if it is to be meaningful, must be found both in encounter with Jesus and by reflection on the world around us. The scriptural record is merely a "witness" to greater truths. Creation is real and partakes of the essence of the Creator, and is itself revelatory in nature. But this conclusion leads Barth and Whitehouse to universalism:

> To be a creature means to be destined to this, to be affirmed by God, chosen and accepted. To be a creature means to be in the manner of Israel, of the kind that God in His Son has not been ashamed to make His own (p. 15)

Thus, to be human is to belong to God by grace, to enjoy a fellowship with God that is wholly dependent upon Him (p. 22). This comes to men "by nature" (p. 25) and not because of any special differentiation among men on the part of God. All men are God's; all belong to Him by virtue of their having been made in His image (p. 26).

Of particular interest for our consideration, and most to the point of the book's title, are Whitehouse's two essays on theology and the natural sciences. In these, two of the better works in the collection, the author attempts to elaborate how the synthesis between Christian and secular truth may be hammered out.

Theologians and scientists occupy separate "territories," and it is primarily in the area of "frontier relationships" that we can determine whether conflict or synthesis will result (p. 171). Science has "improved our stock of explanations" (p. 174). Yet science has evolved out of a theological context, to which it is indebted but which it has, due to its ever-expanding scope, unfortunately managed to obscure. Natural processes have come to be explained more "in terms of autonomies" than in terms of "cosmic personality" (p. 176).

But we must learn to see theology and science "as complementary and not as competing authorities" (p. 178). This we can begin to do by freely acknowledging the pre-scientific or metaphysical assumptions underlying modern science (p. 179). Such a stance creates a genuine context in which theologians and scientists can begin to make mutual contributions to the synthesis of a new understanding of truth.

Although this book is very interesting, from the evangelical perspective of this reviewer there are some problems. These all derive from the author's view of Scripture. In his insistence that revelation is primarily an event or an encounter, he is forced to relegate the Bible to the status of being a mere witness to revelation. It is not itself propositional truth about God, but it may effect encounter with Him. As such it is simply one of a number of such revelational agents, each of which needs to be introduced into the process of synthesizing truth for our day.

This theological mistake causes the author to have an incorrect understanding of the Person and work of Christ. His atonement is a fulfillment of the covenantal promises of God, yet not (as Whitehouse indicates) for all men indiscriminately, but only for those who believe.

Finally, the author is rather starry-eyed when it comes to discussing the process of finding a common ground between theology and science. He fails to understand the teaching of the Bible about the natural hostility of secular man to the knowledge of God. He is also not entirely accurate in suggesting that all scientists have in common room in their cosmologies for some form of "cosmic personality." This certainly is not true of such popularizers of modern science as Carl Sagan nor of those scientists who subscribe to the Humanist Manifesto II.

Thus, though there is much of value in Whitehouse's

collection, the Christian who wishes to discuss these matters effectively from a position consistent with historic Christian faith, must begin with a better view of Scripture and a determination to be guided by faith by the propositions and precepts therein disclosed.

Reviewed by T. M. Moore, Sr. Vice-President, Evangelism Explosion, 730 W. McNab Rd., Ft. Lauderdale, Florida 33309.

THE NATURE AND ORIGIN OF THE BIOLOGICAL WORLD by Edmund Jack Ambrose. Halsted Press (John Wiley and Sons), New York. 1982. (ISBN 0470-27514-6.) $22.95.

E. J. Ambrose, Emeritus Professor of Cell Biology at the University of London, has conducted extensive research in the biology of cancer cells, cell biology, and microbiology of leprosy, and has authored and coauthored numerous technical books and articles in these areas. In the present work, Ambrose seeks to unify the diverse areas of biological science. In doing so, he explores the theme expressed in the title of the book, *The Nature and Origin of the Biological World.*

The book includes three sections: Part 1 is an "Introduction to Modern Biology," Part 2 examines the "Nature of the Biological World," and Part 3 discusses "Origins."

The first section of the book begins with a discussion of the functioning of science and the scientific method. The author, a practicing scientist, obviously understands and appreciates the processes of modern science. Yet, he also is willing to accept other sources of information. He states:

> But we must recognize that there are ways of acquiring knowledge other than those obtained by the scientific method of successive approximations, ever approaching closer and closer to reality. As scientists we must respect these other approaches to the acquisition of knowledge (Pg. 9).

The remainder of the first section explores some areas of the chemistry of life and molecular biology. Chapter 3, "Order out of Chaos," is a brief, yet lucid discussion of life at the molecular level.

In Part 2 the author explores in brief summary fashion the complexity and diversity of living things. Beginning with the energy activities of the cell, the author moves to the area of developmental biology. The author here utilizes one of the numerous analogies that seem to bring the reader in touch with an often abstract or complex subject:

> A symphony is a musical composition performed by a large number of instrumentalists who must adhere exactly to the score, perfect timing and harmony being maintained between all instruments. For this reason one may refer to the development of organisms from a single fertilised ovum as a living symphony (Pg. 49).

In the remainder of this section, the author discusses the diversity of form in the living world. Beginning with simple organisms, such as the bacterial cell, he surveys some major plant and animal groups.

Part 3 begins with a chapter entitled, "How it all began." This chapter contains a very objective discussion and summary of the present theories of the origin of life and of living forms. The author examines Darwinism and Neo-Darwinism and exposes some problem areas. For example, he discusses the stability of genes within "kinds" (i.e., the Genesis usage of "kind") and the lack of transitional fossil forms. Some current theories, such as a "gene cluster," the "selfish gene," and "punctuated equilibrium" are also examined.

In the closing of this chapter, the author asserts that the origin and development of life cannot be explained purely in terms of chemical and physical principles and that an "addi-

Books Received and Available for Review

(Please contact the Book Review Editor if you would like to review one of these books.)

A. Andelin, *Man of Steel and Velvet* (A Christian approach to the vital part a man plays in marital and family harmony), Bantam.

N. Anderson, *The Teachings of Jesus*, IVP.

J. Barrs, *Shepherds and Sheep*, (A Biblical View of Leading & Following), IVP.

F.F. Bruce, *The Hard Sayings of Jesus*, IVP.

H.L. Bussell, *Unholy Devotion*, (Why Cults Lure Christians), Zondervan.

M. Clarkson, *Destined for Glory*, (The Meaning of Suffering), Eerdmans.

S.T. Davis, *Logic and The Nature of God*, Eerdmans.

W. Frair & P. Davis, *A Case for Creation*, 3rd Ed., Moody.

M. Goldsmith, *Islam & Christian Witness*, IVP.

O. Guinness, *The Gravediggers File*, (Papers on the Subversion of the Modern Church), IVP.

D. Hewetson & D. Miller, *Christianity Made Simple: Belief*, IVP.

A. Holmes, *Contours of A World View*, Eerdmans.

E. Jungel, *God as the Mystery of the World*, Eerdmans.

King & Salmon (eds.), *Teilhard and the Unity of Knowledge*, Paulist.

P. Kreeft, *The Unaborted Socrates* (A dramatic debate on the issues surrounding abortion), IVP.

H. Lindsey, *The Rapture*, Bantam.

I.H. Marshall, *Biblical Inspiration*, Eerdmans.

D. McKim (Ed.), *The Authoritative Word*, Eerdmans.

B. Mount, *Sightings in the Valley of the Shadow*, (Reflections on Dying), IVP.

W. Mouser, Jr., *Walking in Wisdom*, (Studying the Proverbs of Solomon), IVP.

M. Muggeridge & A. Thornhill, *Sentenced to Life*, Nelson.

Reisser, Reisser & Weldon, *The Holistic Healers*, (A Christian Perspective on New-Age Health Care), IVP.

D. DeRougemont, *Love in the Western World*, Princeton.

H. Schlossberg, *Idols for Destruction*, (Christian Faith and Its Confrontation with American Society), Nelson.

E. Teller, *Energy from Heaven and Earth*, Freeman.

W. Trobisch, *The Misunderstood Man*, (Why men suffer and what can be done about it). IVP.

D. Voskuil, *Mountains Into Goldmines*, (Robert Schuller and the Gospel of Success), Eerdmans.

E. Wilson, *The Undivided Self*, (Bringing Your whole life in line with God's will), IVP.

tional factor X" must be invoked to explain these processes.

In the final chapter, "Creative Intelligence," the author explores the role and identity of this "factor X." He states:

> I now suggest that our factor X, being the input of new information, required the operation of Creative Intelligence, and I hope to show that the operation of creative intelligence leads to a minimum number of universals to explain both the origin and basic nature of living organisms (Pg. 141).

In the final pages the author equates the "factor X" with the Creator, the God of the Bible. To support the inclusion of this creator into the scientific study of life the author cites four main areas: (1) the complexity of life even at the lowest levels, (2) the great diversity of living forms, (3) the increased complexity from simple to advanced forms, and (4) consciousness, intelligence, and creativity in humans.

The following statements by the author summarize the thesis of this book:

> It looks as though the advances in molecular, cellular, and developmental biology, which have been made in recent years and are summarized in this book, have brought us to the stage where a creative view of the origin of life and species no longer needs to be defended against evolutionary arguments. It is the reductionist evolutionist who is now in retreat (Pg. 144).

> But I hope that I have been able to show in this book . . . that to invoke the operation of Creative Intelligence to explain the origin of life and the panorama of life as we find it today, is a sound scientific explanation (Pg. 146).

This book obviously results from a lifetime of research and contemplation of the living world. The author does not present any new information, although perhaps he does present different ways of looking at the information. The book can best be appreciated as stating a commitment, at a time when such commitments are often unpopular and generally controversial.

Reviewed by Dr. Phillip Eichman, Department of Biology, Columbia Christian College, Portland, Oregon 97220.

CONFESSING CHRIST AS LORD: THE URBANA '81 COMPENDIUM by John W. Alexander, ed. Downers Grove, Ill., Inter-Varsity Press, 1982, 269 pages, $5.95.

Confessing Christ as Lord is edifying. It strengthened me. It made me rejoice. It brought tears to my eyes. It presents, even on paper over a year later, the warmth and thrill of a Convention (which, by the way, I did not attend).

A compendium is usually uneven, with some parts stronger than others. This one is not different. But, as a whole, it reflects forcefully many of the most important issues in missions today. It deals with social justice and structural changes, as well as Bible translation. It deals with world peace, human rights, and sexism, as well as knowing God's will and the power of the Holy Spirit. It presents the ecstasy of victory, and the quiet peace of perseverance in suffering.

Some of the speakers are well known to evangelicals: Billy Graham, Helen Roseveare, David Howard, Samuel Escobar. Some of them are less well known. They come from urban and rural areas in Asia, Latin America, Africa, Europe, and North America.

A few quotes illustrate something of the contents. "Many witnesses start by being servants, and are pushed by the logic of their call into being prophets" (Samuel Escobar). "If your witness reflects nothing of God's concern for the oppressed and needy and suffering people of this world, there will be little authenticity to your testimony" (Rebecca Manley Pippert). "God hears the cries and the hurting of the hopeless in the city. . . . The only power to save the city is God's redemptive power. And He uses human instruments" (George D. McKinney). There are a total of seventeen speakers, whose messages are in the compendium.

Confessing Christ as Lord had an impact on me. I have found myself quoting it in conversations, sermons, and classes. It is not an easy book to read. It prods Christians to commitment and involvement. It will do you good.

Reviewed by Joseph M. Martin, Edward Lane Bible Institute, Brasil.

EVOLUTION OR CREATION? by Arthur C. Custance, Zondervan Publishing House, Grand Rapids, Michigan, 1976. 330 pages, $8.95

This book contains five, independent, previously published essays on the general topic of the nature and origin of man. In the first essay "The Preparation of the Earth for Man," Custance argues for his version of creation: the "gap" theory, i.e., that an original creation (Gen 1:1) was destroyed by some catastrophe and that the Genesis creation account (Gen 1:2–2:3) refers to a re-creation over six 24-hour days. The emphasis in his arguments is on evidence that the earth was prepared as a place for man. The second essay, "Primitive Monotheism and the Origin of Polytheism," proposes that the history of religion progresses from an early monotheism to a derived polytheism, rather than the reverse process as an evolutionary interpretation of religious history suggests. In the third essay, "Convergence and the Origin of Man," Custance points out the difficulty of using structural similarities to trace descent since evolution can be convergent as well as divergent, and since some structural features are due to behavior, environment, and disease, as well as heredity. The fourth essay, "The Survival of the Unfit," examines the "survival of the fittest" interpretation of natural selection, and concludes that "survival of the fittest" is a tautology, and that there are many examples where animals do not seem to be locked in a struggle for survival. In the fifth and final essay, "Is Man an Animal?", Custance examines the question "What is man?" and concludes that man was "made for God."

The author is rather verbose. For example, a whole series of quotations is often used to support a point when one or two would suffice. The result is that reading the book requires a certain amount of dedication. On the other hand, the text is usually clear and understandable.

When discussing the theory of evolution, Custance constantly picks up what he considers to be evidence against it. However, there is very little about what alternative theory he would argue for. His approach is almost entirely negative. The entire essay on convergence is a good example. Custance argues that since evolution can be convergent as well as divergent, tracing descent by identifying structural similarities becomes difficult. What this has to do with the topic of the book "Creation or Evolution?" is never made clear.

Custance usually presents scientific modes of explanations and theological modes of explanation as mutually exclusive alternatives (e.g., p. 177, "Fitness . . . could be evidence of the hand of God; or it could be evidence of some natural law . . ."). He seems unwilling to consider the possibility that scientific and theological explanations could be complementary ways of looking at the world rather than mutually exclusive alternatives. This attitude permeates the book, since the author's perception of the hand of God at work is taken as somehow eliminating the need for a natural explanation.

A more appropriate title for the book would be "A Critique of Evolutionary Thinking," since creation is not really considered in much detail except as the alternative left after evolution is dispensed with. As a critique of some problems of evolutionary theory, the book is quite useful; but as a positive presentation of creation this book is much less successful. It will give insights to the diligent student in those areas covered by the several essays, but does not give the broad coverage of the issues that one might expect in a book of this title.

Reviewed by Steven R. Scadding, Department of Zoology, University of Guelph, Guelph, Ontario, Canada N1G 2W1.

TEMPTATION: HELP FOR STRUGGLING CHRISTIANS by Charles Durham. Downers Grove, Inter-Varsity Press, 1982, 166 pages, $4.95.

Charles Durham's book is intended to give hope and practical help to those facing temptation. He believes all of us are tempted, but recognizes degrees of intensity in temptation, due to factors like tiredness, illness, family background and genetics. After discussing the external and internal sources of temptation, he goes into the major section of his work, "Solutions."

In the eleven chapters of this section, he presents such solutions as renewing of the mind, knowing God and the enemy, and focusing on the source of power rather than the force of the temptation. He also deals with practical aspects of building up barriers to temptation, by general spiritual growth and Christian service. He has helpful chapters on the purpose of temptation ("to bring the scum of the heart to the surface, so the great Refiner can skim it off, and thus purify the heart," p. 133), and the relationship of psychological problems to temptation. (Christians are subject to such problems that weaken resistance to temptation.)

A final brief section brings encouragement to strugglers—we lose battles, but not the war, and we move towards a time of total victory in God's presence.

Durham writes as one who has struggled with temptation and lost, but who has found God's grace adequate to keep him growing. He does not belittle the battles Christians have, but does maintain an optimistic posture. It is possible to grow, to overcome the enemy, and to receive forgiveness when the enemy has won a battle.

Durham writes simply, forcefully and clearly. He expects his book to be useful and effective, and this reviewer agrees with his assessment of this meaty little volume. Unfortunately a sensationalistic cover could lead one to think the book oversimplifies the kinds of temptations to be faced, and how to face them. But don't be scared off, the contents are presented with sensitivity and balance.

Reviewed by Joseph M. Martin, Edward Lane Bible Institute, Caixa Postal 12, Patrocinio-inas Gras, 38.740 Brasil.

BETWEEN SCIENCE AND VALUES by Loren R. Graham, Columbia University Press, New York, 1981.

Graham has written a book full of insights about the way different important scientists of the past have seen the interface between science and society. He has classified his scientists into "Expansionists" and "Restrictionists." Restrictionists try to do, and write about, value-free science. Expansionists use evidence from science to support a particular side of an argument on values in society at large. Restrictionists, claims Graham, believe that science and religion not only should not but cannot conflict, because they are mutually exclusive ways of looking at the world.

The last section's title, "What Kind of Expansionism do we Want?", gives Graham's conclusions. (1) Science and values are automatically linked because there are scientific terms that are value-laden, like "normal." (2) There are theories that lead scientists to assume that they have value. Social Darwinism is an obvious example. (3) The findings of science may shed light that makes us rethink religious or other doctrine:

> Scientific descriptions of our universe—for example, the Copernican or Ptolemaic alternatives—are, in the abstract, value-free, but the new and successful Copernican variant had a very large impact on values when absorbed by European civilization at a time when the older variant was firmly interwoven with religion and culture. (p. 254)

(4) The methods of science may point men in a direction having nothing directly to do with science. Elegance, rationality and order are implied in the methods of science. Their presence there may attract us toward order in society. (5) Technological advances make us re-examine our values. (6) External values have influenced science.

Among the scientists Graham discusses to reach his conclusions are Einstein, Bohr, Eddington, Heisenberg, Bergson, Monod, Lorenz, Skinner and E. O. Wilson. As I have indicated, I think Graham's discussion of how these and others dealt with the interactions of science and society is the greatest value of the book. Two quotes exemplify Graham's work:

> Bohr . . . granted a universal scope to the regularities of physics, so that they could be extended to human behavior as well as to inanimate objects (here was his contrast to Einstein), but that scope included within it a concept of contradictory and complementary aspects of truth. Therefore, to Bohr physics did not iron out the paradoxes of life and thought in accordance with some rigid plan, it explained and informed those paradoxes. Physics made the riddles of human existence plausible and tolerable. It provided a grounding for freedom of will, rather than an attack upon it. Bohr thus believed that he had found a new way out of the dilemma between mechanism and vitalism constantly posed in the dining room discussions of his youth, and this sense of discovery must explain the zest with which Bohr celebrated the apparent tensions inherent in the concept of complementarity, a concept that always discomfited Einstein. While Einstein saw complementarity as a rather hopeless muddying of his picture of simplicity in (physical) nature, Bohr saw it not only as a helpful aid in understanding atomic phenomena, but as a method of successfully coping with the most complex issues in (physical *and* biological) nature. (pp. 64–65, emphasis in original)

> In some psychology laboratories where experiments are conducted with animals, a sign is displayed, "The animal is always right." In other words, if the results gained from an experiment seem perplexing to the experimenter, don't argue with the animal. Skinner was engaged in an argument with his animal. The human animal displays a remarkably consistent aversion to Skinner's definition of its nature. Yet Skinner insisted that this aversion is not an innate characteristic, but instead a by-product of a supposedly transient "literature of freedom." (p. 178)

Ernan McMullin has taken Graham strongly to task in his review (*Hastings Center Report* 12 (Dec 1982) pp. 38–40). Anyone reading, or considering purchasing, Graham's book ought to read that review. McMullin's major criticisms that I believe to be valid, are that Graham's notion of "value," or "a value," is extremely fuzzy; that he has paid almost no attention to the work of philosophers of science, as opposed to scientists; and the distinction between restrictionism and expansionism is artificial. In spite of these criticisms, I believe that this book has a place on the shelves of libraries concerned with the interaction between science and society.

Reviewed by Martin LaBar, Visiting Professor, Bryan College, Dayton, Tennessee 37321.

CARE OF MIND, CARE OF SPIRIT by Gerald G. May, Harpers, San Francisco, 1982. 175 pp. $11.95.

The health care of the spiritual dimension of personal health has now been disciplined to a serious medical science in the recent publication of three books: For *spiritual diagnosis,* we have Paul Preyser's *The Minister as Diagnotician;* for *spiritual growth theory,* T. E. Dobson's *How to Pray for Spiritual Growth;* and now, for the *health care practice—discipline of spiritual growth counseling,* we have Gerald May's *Care of Mind, Care of Spirit.* These three books on the spiritual health care of the individual complement the evaluation of health-systems for the collective by sociologist Joseph Fichter, the *"Spiritual Dimension of Health Care"* (Crossroads, 1982), an empirical description that studies the motive(s), in contrast to the lack of skills and effectiveness, of traditional health care deliverers to give sufficient and competent spiritual care. The four books together provide the cornerstone foundation for a modern library on the contemporary clinical care for the spiritual dimension of the whole person by the nation's health industry. Finally, at long last, the spiritual (-existential) dimension of personal health is acquiring its appropriate health care literature.

May, a psychiatrist member of a Columbia, MD transdenominational community of intellectual Christians, in this book brings precision to the description of the intervention technology of the spiritual counselor (or "director") to facilitate an individual's unique spiritual growth. A long-term psychotherapist, May carefully draws the distinctions between the two disciplines: psychotherapy and spiritual growth counseling. In this rigor, May provides a valuable service to health care specialists, since the vast majority of psychotheological or pastoral counseling literature in the name of "integration" blurs the distinctions between spiritual counseling and mental health therapy. Further, May's work is richly informed by the Catholic mystic tradition and the spiritual disciplines of meditation; it provides excellent definitions of the concepts of "desolations" and "consolations" in response to persistent prayer and fasting. May's fine distinctions in defining "Dark night of the soul" and "Spiritual discernment" alone are well worth the purchase of the book. May is a member of the Shalem Institute for Spiritual Formation on Mt. St. Alban in Washington, DC (20016) and represents in his work that he is deeply indebted to the influence of Shalem's director, Fr. Tilden Edwards.

May's book is a great step forward in describing the discipline of spiritual health promotion of adult spiritual development counseling within the rigor of standard health care technology. It is eminently adaptable to the practice of qualified physicians, other health care experts, and disciplined laity. How does it differ from standard pastor counseling or medical chaplain care? First, it is very disciplined scientifically, both medically and psychiatrically; and, second, in its orientation to adult growth or wellness development, it richly employs serious spiritual disciplines, those recently so eloquently described by Richard Foster's two books: *Celebration of Discipline* and *Freedom of Simplicity* (Harpers, 1978 and 1982, respectively). Most pastors writing in the pastoral counseling literature apparently do not risk encouraging the deep utilization of such spiritual disciplines

with their clients. May speaks as a deeply spiritual-disciplined and experienced counselor. The spiritual development literature needs more reporting by spiritual specialists willing to deal with in-depth-disciplines of soul growth and the resultant experience, as May does, rather than the soul-poultices plastered on the surface of deep soul hurts, needs, and potentials, like so many bandaids by so much of the modern pastoral-care literature.

Certainly, one sees enormous growth in discipline in May himself in the description of his special discipline and in the writing itself if one reads May's most recent book after his other (*Simply Sane:* Crossroads, 1982). The difference is dramatic and inspiring.

For such a well-informed professional, however, May seems curiously insular in his references to others working in the area of adult spiritual development. May also seems strangely unenriched by God's biblical self-descriptions. Discussing how to know God, early in the book (p. 10–11) May leads us into the definition of two types of ecstatic-knowing of God: Kataphatic ("Sensate") and apothatic ("truth behind all sensory or intellectual representations"—"the form of knowing in the emptiness of Zen Buddhism"). This latter form May suggests is more characteristic of persons maturer in spiritual experience; the former more often is characteristic of neophyte experiencers. One senses the same prejudice in this form of description of spiritual maturity, as that seen in what some Jewish theologians describe as the "maturer concepts of God": (Buber; the post-Descartians; and the "beyond Cosmic Realities" concepts of famous medical scientist, Albert Sabin,[1]). We wait patiently at first for May to develop a thesis that can justify such an assertion. Unfortunately throughout the book it never comes.

Next, May appears unusually uninformed by the rich revelation of the Godhead from descriptions of over 10,000 years' experience covered in Scripture. Since "words are the stuff and texture whereby we express ourselves into existence" (Iris Murdoch), it is curious a spiritual-counselor expert would ignore biblical understandings in his educating about the nature of the Judeo-Christian God. For example, since He is represented as the most refined description of Presence ever offered: the "Living Word," how can one justify the eclipsing of the enormous, immanent, formative power of the enabling love and bright magnetism of the winsome Christ, by some big, bland, "beyond sensate" nothingness? Somehow to a Christian humanist like many, including myself, the enabling, loving intimacy of the latter seems far more powerful in its ability to enable the human race than "cosmic nothingness." May needs to support his assertion about maturity using a biblical rebuttal or exegesis that is supporting. One senses most of May's experience has been modern-mystic-Catholic, very little informed by Scripture.

The second problem with May's work is even more problematic from a disciplined intellectual's point of view. (a) How does he justify completely ignoring reference to all the other major adult-human-life cycle, spiritual-moral growth work that has burgeoned in the last decade and a half? And (b) How does May justify a jump right into caring for deeply God-committed spiritual growth (serving a God with a strong similarity to the God of Catholic mystics: John of the Cross and Meister Eckhardt) while ignoring the great mass (≥80%) of medical and public health-scientists[2] who probably have no interest in spiritual growth as it relates to any classic representation of the Judeo-Christian God, yet somehow still feel they are morally developing throughout their lives? How does May integrate the outstanding work of Greek Orthodox, Harvard Researcher, John Chirban, Ph.D., on the Orthodox mystic tradition[3] or Oxford's Margaret Smith[4] in the feminist-Muslim influence in Sufism's God-knowing? Where is James Fowler's *Stages of Faith* or, Iowa's David Castle (Ph.D.) and "*The Spiritual Checkup,*" a Quaker mystic spiritual development schema? How does May deal with T. E. Dobson's inner-man spiritual growth schema[5] or other, more complex, integrative models[6]? Nowhere does May cite former Spinozan naturalist, L. Kohlberg's stages of homo-homo moral development[6] which has as its top stage a bright-light, Quaker Agape; and in which the question "Why be moral?" at each stage "is answered by religion." Or, the schema of theo-homo (spiritual) moral development newly developed by Kohlberg with the Zurich theologians? These and many other questions open widely simply because May's work is otherwise so crystal clear; it becomes painfully apparent he has not helped us at all make these resolutions and discernments in the broader context. My own view is that health care, to be totally fair to all clients, must make some kind of accommodation in spiritual profiling and resource development counseling to the "unconscious Christian" or "unconsciously, highly-developed spiritual person."

Not a small work[7], but rather a giant, May's book provides a classic cornerstone in the foundation of the modern health care science of adult spiritual development ("wellness") counseling. It is a must for the library of every serious scientist of human health[8].

[1]Sabin, Albert B. "Judaism and Medicine," *Perspectives in Biology and Medicine 26* (2), pp. 188–197, Winter 1983.
[2]Gallup, George, *New York Times,* 4/6/83.
[3]Chirban, John T. *Human Growth and Faith,* Acad. Press of America, 1982.
[4]Smith, Margaret. *The Christian Origins of Sufism,* Oxford University, 1978.
[5]Dobson, T. E. *How to Pray for Spiritual Growth,* Paulist Press, 1982.
[6]McSherry, E. "*Spiritual Maturation: Ideal and Actual,*" In Maloney, N. Ed., *First Dictionary of Pastoral Care and Counseling,* Abingdon (in press), 1984.
[7]J. Psych. Theo. (1982) *10*:282.
[8]McSherry, E. "The Scientific Basis of Whole Person Medicine," *Journal* ASA (in press) Dec., 1983.

Reviewed by Elisabeth McSherry, M.D., Boston University School of Public Health, Health Systems—Health Promotion.

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Letters

Appreciation for LaBar, Geisler and Smitka

I much appreciated Martin La Bar's review of Norman L. Geisler's *The Creator in the Courtroom* (not Classroom, as was printed) in the *Journal ASA* June, 1983 issue.

As one of the reporters at the trial of Arkansas' Act 590, I was dismayed at the behavior of most of the rest of the press, and puzzled at the absence of reporters from major Christian media. When I read reports daily in the two major area newspapers of the previous day's testimony, I wondered, as did La Bar after reading Geisler's book, if I were attending the same trial. Since then I have surveyed much of the media coverage of the trial from around the nation and have found none which could earn the name of unbiased (surprisingly enough, most of it didn't even report accurately the testimony of the evolutionist witnesses, let alone the creationists!).

At present, I know of no source other than Geisler's book in which one can find a thorough and objective report of the testimony in that trial. We owe Geisler thanks for making that available.

Thanks also for publishing Michael Smitka's letter ("Missed the Mark") on world hunger. His is a much-needed corrective to the mistaken view that a shortage of food is at the root of world hunger. In the real world (as opposed to the ideal world that never experienced the Fall), men need incentive to produce goods. The negative return on investment from producing food for sale to the Third World cannot be expected, therefore, to motivate farmers to produce much more than they do now. And as Smitka says, even if they did it wouldn't get into the stomachs of the destitute of third world countries. The key is teaching them to provide for themselves, not sending more and more food to them.

E. Calvin Beisner

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More on Sandemanians

I was delighted to read Raymond Seeger's tribute to the unobstructive but firm faith of "Faraday Sandemanian" (*Journal ASA* 35, 101, June 1983). This remarkable group and its contribution to the religious movements of the English speaking world in the 19th century deserve to be more widely known. In his day Robert Sandeman caused quite a stir by his uncompromising statements on the nature of saving faith, maintaining that it was simply belief in the Divine testimony to Christ found in the Scriptures and the proof of faith was prompt obedience to the commandments of the Lord and his apostles. He took strong exception to preaching directed at working on the hearers' feelings to produce an emotional turmoil as a prelude to a sudden feeling of justification, followed at a later date by a sudden feeling of sanctification after another emotional crisis. To Glas and Sandeman a belief is conviction produced in the mind by evidence and not an act of the mind requiring human effort.

Walker, although he differed from Sandeman on a number of points, was in full agreement with him on this one and was equally active in championing it. The result was a heated debate during their lifetimes on saving faith. Rather than marking a new departure I suspect that the definition Sandeman and Walker gave to saving faith was a rephrasing of the Reformed position in more uncompromising terms as a corrective to the emotional revivalism of their day. One cause of misunderstanding was the failure by some of the contestants to realize the distinction that certainly Walker, and I suspect Sandeman also, made between faith and its effects.

Now-a-days few know about this most instructive and illuminating controversy. My father's family were Walkerities so I have known about the Sandemanian view of faith, the controversy surrounding it, and have been helped by Sandeman's and Walker's searching and thought provoking opinions.

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Finally, all of you, have unity of spirit, sympathy, love of the brethren, a tender heart and a humble mind. Do not return evil for evil or reviling for reviling; but on the contrary bless, for to this you have been called, that you may obtain a blessing. . . . Always be prepared to make a defense to any one who calls you to account for the hope that is in you, yet do it with gentleness and reverence; and keep your conscience clear, so that, when you are abused, those who revile your good behavior in Christ may be put to shame. (I Peter 3:8–16)

Founded in 1941 out of a concern for the relationship between science and Christian faith, the **American Scientific Affiliation** is an association of men and women who have made a personal commitment of themselves and their lives to Jesus Christ as Lord and Savior, and who have made a personal commitment of themselves and their lives to a scientific description of the world. The purpose of the Affiliation is to explore any and every area relating Christian faith and science. The *Journal ASA* is one of the means by which the results of such exploration are made known for the benefit and criticism of the Christian community and of the scientific community.

A closely affiliated organization, the **Canadian Christian and Scientific Affiliation,** was formed in 1973 with a distinctively Canadian orientation. The **CSCA** and the **ASA** share sponsorship of the publication. **CSCA** subscribes to the same statement of faith as the **ASA** and has the same general structure. However, it has its own governing body with a separate annual meeting in Canada.

Members of both organizations endorse the following statement of faith: (1) *The Holy Scriptures are the inspired Word of God, the only unerring guide of faith and conduct.* (2) *Jesus Christ is the Son of God and through His Atonement is the one and only Mediator between God and man.* (3) *God is the Creator of the physical universe. Certain laws are discernible in the manner in which God upholds the universe. The scientific approach is capable of giving reliable information about the natural world.*

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