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Faith, the Unrecognized Partner of Science and Religion

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What Is Faith?

The notion of faith[1] as a legitimate component of all human understanding has varied widely through the ages. The following spectrum of definitions and thoughts concerning faith makes this abundantly clear:

1. A schoolboy's definition of faith[2]—"Faith is when you believe something that you know isn't true!"

2. T. H. Huxley[3] on faith—"Blind faith is the one unpardonable sin." Does it necessarily follow that faith in general should therefore come under suspicion? Cannot unbelief as well be blind?

3. David Hume[4], the dour and skeptical Scotsman, in his lighter moments acknowledged the necessity of having "a kind of firm and solid feeling." Is this not a possible definition of faith?

4. Hebrews 11:1—"Now faith is the assurance of things hoped for, the conviction of things not seen." Biblically, faith is thus taken neither in an exclusively religious sense, much less in specific reference to faith in Christ as Redeemer and Lord, but very generally as an "assurance" and "proving" of objects and concepts which escape our perception because they do not yet exist or because they are not immediately apparent to our senses.[5]

5. The noted physical chemist and philosopher, Michael Polanyi,[6] has pointed out that no one can become a scientist unless he presumes the scientific doctrine and method to be fundamentally sound and that their ultimate premises can be unquestioningly accepted. Only by an unlimited commitment and trust to these premises can he develop a sense of scientific values and acquire the skill of scientific enquiry. This is the way of acquiring knowledge which the Christian Church Fathers described as *fides quaerens intellectum*, "to believe in order to know."

Ignoring Huxley's and the schoolboy's judgment as somewhat short-sighted, we see that faith can be defined as an act of trusting, of holding to convictions when the evidence for such commitment is not immediately apparent. It should be noted that faith is not blind, nor does it arise out of a vacuum. Faith stems from man's previous experience; salvation faith from

Faith is illumination by which a truly rational understanding can begin.

specific historical events (seen through the eyes of faith as God revealing Himself in history), more general faith from man's contact with reality through personal contact with others and experience of order in nature, etc. Faith, however, is much more than a mere extrapolation of past experience, for it interprets such experience and holds to convictions which cannot be reduced to mere inductions from scientific experience. The conviction that a scientific theory must possess a rational beauty and symmetry in a unifying sense is a good example.

Faith: A Component of All Human Understanding

How can faith be a necessary component of scientific as well as religious experience? Let us first clearly understand that faith does not provide the data of empirical knowledge; faith rather plays its role in seeking to find a keystone idea, a pattern that will fit and explain the data. Science does not consist merely of the collecting of data; we must recognize what is truly coherent in what we observe, which observations are truly significant. Such recognition is intimately related to having faith in the soundness of some key idea or pattern. Once faith in a key pattern is established, reason then takes over and develops a more ordered picture, looking for possible faults and finally conceiving of experiments to further test the theory. Faith[7], to paraphrase St. Augustine, is not a trusting in unprovable truths which can be disregarded as a rational picture develops; it is, rather, illumination (which guides one in seeing a pattern) by which a truly rational understanding can begin. The scientific enterprise is no exception to the universality of Augustine's insight. A scientist cannot begin his task of deciphering the puzzle of a very complex physical world without an unconditional and complete trust or conviction in certain basic premises that undergird all scientific effort. In essence he must possess a *firm faith* that nature is intelligible, that an underlying unique and necessary order exists, that there is an ultimate simplicity and inter-connectedness to the laws of nature, that underlying symmetries exist in the physical world, that nature behaves in the same way whether observed or not, that a direct, correct correspondence exists between events of the universe and his sensory-brain responses, that his own senses and memory are trustworthy, and finally that his fellow workers do and report their work honestly. To doubt or engage in endless questioning of such points is to abandon the whole purpose of scientific pursuit. Faith coupled with observation and deduction, not merely observation and deduction, is required for progress in science.

Let me stress that the scientist's glimpse of the simplicity and inter-connectedness of the laws of nature, while being far wider than the layman's, is by no means exhaustive. The condition of the scientist and the man of religion are in this respect the same. Religious faith stems from its own evidences, exactly as that of the scientist; it is not a blind faith. Yet as numerous as religious evidences are they do not form a complete exhaustive set. "Those evidences, like the evidences of science, are rather a prompting toward espousing propositions that imply unconditional affirmation and absolute commitment."[8] It is through such commitment that the man of science grasps the simplicity and order present in nature and through a similar commitment that the man of religion grasps the transcendent dimension of God. Michael Polanyi's description of reality is a strikingly fitting example of these last thoughts:

> . . . reality is something that attracts our attention by clues which harass and beguile our minds into getting ever closer to it, and which, since it owes this attractive power to its independent existence can always manifest itself in still unexpected ways. If we have grasped a true and deep-seated aspect of reality, then its future manifestations will be unexpected confirmations of our present knowledge of it. It is because of our anticipation of such hidden truths that scientific knowledge is accepted, and it is their presence in the body of accepted science that keeps it alive and at work in our minds. This is how accepted science serves as the promise of all further pursuit of scientific inquiry. The efforts of perception are induced by a craving to make out what it is we are seeing before us. They respond to the conviction that we can make sense of experience because it hangs together in itself. Scientific inquiry is motivated likewise by a craving to understand things. Such an endeavor can go on only if sustained by hope, the hope of making contact with the hidden pattern of things. By speaking of science as a reasonable and successful enterprise, I confirm and share this hope.[9]

Specific Examples

It would be helpful at this point to give some specific examples that testify to the validity of faith being a necessary component of scientific endeavor. It should be understood that I have picked out a few key cases; the history of science provides an almost inexhaustible number of illustrative cases for the basic thesis.

1. *Faith in the orderliness and simplicity of nature is truly required to contribute in a period of scientific revolution where the foundations of existing understanding are overturned by new evidence and new theoretical interpretations.*

a) Max Planck terminated the classical era of physics by his introduction of the quantum of energy. The classical assumption of the continuity of nature was shown to be invalid. One had to look for order in a completely new way. Planck's testimony as to how the scientist proceeds in his investigation of nature is illuminating:

> The man who handles a bulk of results obtained from an experimental process must have an imaginative picture of the law he is pursuing. He must embody this in an imaginary hypothesis. The reasoning faculties alone will not help him toward such a step, for no order can emerge from that chaos of elements unless there is the constructive quality of mind which builds up the order by a process of elimination and choice. Again and again the imaginary plan on which one attempts to build up that order breaks down and then we must try another. This *imaginative vision and faith in the ultimate success are indispensable. The pure rationalist has no place here.*[10]

b) A. Einstein[11] in the creation of his relativity theory rejected the notion that space and time are absolute. He defined them in terms of reference to the frame of the observer. Einstein abandoned absolute space and time, but he did not therefore view the sim-

plicity and order of nature as merely constructs of the human mind (this is how idealist philosophers wrongly interpreted Einstein as making the laws of nature subjective). He held rather to the strong conviction that the basic laws of nature are always and everywhere the same, regardless of the frame of reference in which they are observed. This conviction led him to the devolpment of his revolutionary theory.

c) The current state of elementary particle physics has been aptly called an "infernal race". With new "particles" being discovered all the time physicists still persist in searching for order in this "maze". A strong conviction that order exists is an absolute necessity to make progress in this rapidly changing field. One central motivating factor is the strong faith of physicists in the universal validity of key conservation laws. An example from the early history of particle physics shows this clearly. The existence of that unusual elementary particle, the neutrino, was postulated in ordered that certain nuclear reactions maintain the conservation of energy, momentum and spin. For some time, the only empirical evidence for the neutrino's existence was that these reactions would otherwise negate the conservation principles. Even today, the additional empirical evidence we have for the neutrino is quite different from observations of other elementary particles; it cannot be observed in the same ways as these others (electrons, positrons, mesons, etc.). There is good evidence it can never be seen in the sense that other particles are seen. Yet neutrinos are today accepted as a component of real nature. Why? To a large degree, the physicist's faith in a fully lawful cosmos compels such acceptance.[12]

d) The Medieval picture of the universe was overthrown by Copernicus when he proposed a sun-centered planetary model in contrast to the earlier earth-centered model of Ptolemy. The earth-centered system was really in keeping with common sense observations; furthermore, even if the detailed motions were complex, it made accurate predictions. Copernicus' strong faith that planetary motions "are simple" led him to develop his sun-centered theory which violated ordinary sense observations.

e) Newton,[13] in formulating his system of dynamics, brought together the results of many earlier workers, as Galileo and Kepler, for example. His great contribution was to see a fundamental pattern to these results that had not been noticed or deeply appreciated before. He was strongly motivated by a basic faith that the laws of motion are truly universal in scope; i.e., an apple falls to the earth in the same way that the "moon" falls to the earth, and that these laws are mathematically simple, i.e., an inverse, integer, power law of gravitational attraction. Such premises were considered to be rather speculative by many natural philosophers of the day.

2. *Faith in the interconnectedness and symmetry of nature has played a role in the scientific venture.*

a) Faraday, all of his life, searched for a connection between electromagnetic and gravitational forces. He never gave up hope of finding such a connection.[14]

b) Maxwell pondered over the fact that a changing magnetic field creates an electric field. From symmetry considerations he was motivated to work out the consequences of assuming that a changing electric field creates a magnetic field. He was thus led to discover a valid law of nature that led to the prediction of electromagnetic waves.[15] In a similar vein, Faraday was deeply impressed by the experiments of Ampere which showed that electric currents create magnetic fields. This motivated him to search for possible ways in which a magnetic field would create electric currents. His faith in the possibility of finding "symmetrical" effects in nature led eventually to his discovery of the law of magnetic induction.[16]

c) P.A.M. Dirac, the brilliant theorist who successfully merged quantum theory with relativity, predicting both the existences of positive electrons (positrons) and electron spin, has testified to his motivating faith that scientific theory should be beautiful (simple, symmetric-balanced and possessing harmony):

> Yet if we believe in the unity of physics, we should believe that the same basic ideas universally apply to all fields of physics. Should we then not use the equations of motion in high energy as well as low energy physics? I say we should. A theory with mathematical beauty is more likely to be correct than an ugly one that fits some experimental data (of the moment).[17]

3. *The very fact that mathematical systems formulated by the human mind for sheer intellectual pleasure have later proved remarkably applicable to an accurate description of nature is a great surprise.*

As nature is certainly not itself a product of the human mind, the correspondence between the mathematical system and the structure of physical reality is not something that would have been anticipated in advance. A strong faith that such correspondences indeed exist was and is central to the motivation of scientists as they attempt to understand the complexities of nature. To list but a few examples of this remarkable correspondence: the mathematical system of second-order differential equations coupled with

To express trust and to act on that trust, to act by faith is not contrary to true rationality.

the inverse square law was later found by Newton to describe precisely the motion of masses (and physicists found it later to be applicable to charged particles as well); the abstract four-dimensional geometry of Riemann was later found by Einstein to be applicable in describing the motion of bodies in each others' gravity (the correspondence was all or nothing—ten equations of motion fit the only one allowable Riemannian tensor); and, as a final example, the infinite-dimensional abstract Vector space developed by Hilbert with its use of imaginary numbers was later found by the pioneers of modern physics to be amazingly applicable in describing the quantum nature of both light and matter. Eugene P. Wigner who formulated these concepts in a paper, *The Unreasonable Effectiveness of Mathematics in the Natural Sciences,* concludes with words that are embedded in faith:

> The miracle of the appropriateness of the language of mathematics for the formulation of the laws of nature is a wonderful gift which we neither understand nor deserve. We should be grateful for it and hope that it will remain valid in future research and that it will extend, for better or for worse, to our pleasure even though perhaps also to our bafflement, to wide branches of learning.[18]

Conclusions

A deep cleavage exists today between the scientific and religious communities, between scientists and humanists in general. The goals, methods, and problems of one group are considered irrelevant, of no interest and significance by the other. Communication between the two groups is at times almost completely lacking. One remedy, suggested by C. P. Snow, is that compulsory courses in science be a requirement at all educational levels. This can be of some help but without a strong personal motivation, the average non-scientist will easily become lost in a "maze of facts" resulting from the scientific knowledge explosion. Following Jaki, I would suggest that both motivation and true comprehension would be greatly enhanced if one looked in detail at the foundations of both the scientific and humanist quests. The history of science, past and present, shows that both the sciences and the humanities have at their center some common mental attitudes. One of them, perhaps the most significant, is man's dependence, as he creatively seeks to understand all of reality, on his "firm and solid feelings," on his faith.[19] Faith is a valid component of all human knowledge, scientific as well as religious.

Biblically man plays a unique role in creation for he reflects God's nature, being made in His image. The Bible portrays God not as an abstract idea or a force, but as both infinite and personal. Jesus Christ, the God-Man, stressed the ultimate uniqueness and significance of personality, of personal relationships based on absolute and unconditional trust and commitment, on faith of men toward God and themselves. Jesus stressed that a personal faith is essential to a true relationship to God and He praised those who responded in faith without complete factual details.[20] St. Paul continued Christ's message, pointing to Him as the personal creator and sustainer of all reality, who calls us to commitment to Him as our Savior and Lord. Personal response by faith in God is central to Christian teaching and part of that teaching is St. Paul's observation that God's presence can be seen in all He has created, both in the inner nature of man and in external reality.[21] Is not the meaning of St. Paul's insight that God, the author of all order, who calls us to a full and complete knowledge of Him by personal commitment, has structured reality in such a way that personal response and commitment, or more simply put, faith, is required by man to gain an understanding of all existence, temporal and transcendent? Indeed, is not man's capacity to have faith a part of his uniqueness that comes from man reflecting the nature of the triune God?

A Biblical aspect of man's nature, necessary for gaining knowledge of God and other people, is also required to gain knowledge of a purely scientific nature as well.

The intellectual mood of our age has presented to us the distortion that faith is the height of irrationality. Science has been portrayed as a cold, analytical discipline devoid of faith or metaphysical content; human and spiritual values cherished as unique are now claimed to be reducible to physical-chemical explanations. It is my belief that the dissatisfaction of many of our young for the scientific professions (as indicated by dropping enrollments in these fields), stems partly from a rejection of an image of science that is deterministic and impersonal. These young people ask: How can the same man say that order as expressed in the countless mathematical invariances of the physicist exists, and yet all we can know in the moral realm is disorder? Unsatisfied by a caricature of science which is devoid of all personal passion, some of our brightest youth have adopted an extreme form of existentialism in which feeling alone is meaningful and rational analysis of no significance.

Christians have also reacted to this downgrading of the validity of faith in human experience. Some have reacted by completely compartmentalizing their perspectives of the spiritual and natural orders. Others, perhaps repelled by the very radical nature of the Christian solution to life's dilemma have tried to build a 'Christianity' without the necessity of faith. Such attempts, to my mind, are reactions to a very faulty picture of faith. Faith correctly viewed is that illumination by which true rationality begins, as has been seen through history by men the caliber of St. Augustine, Pascal, Kuyper, Polanyi, and Jaki.

To express trust and to act on that trust, to act by faith is not contrary to true rationality. Remember that faith consists not in what can be proved by results. Rather faith precedes results, faith motivates us toward results. We trust our husband or wife always to have our best interests at heart. We trust that the many long and difficult hours spent attempting to get a finicky piece of scientific apparatus to yield complex and often puzzling data will eventually lead to the universal in scope. We trust that the language and concepts of mathematics created originally for sheer intellectual pleasure will be applicable to the description of specific physical phenomena. Can we also not

learn to trust the One who made us in His image, the God whose very trustworthiness guarantees the existence of laws in all of His creation which are both dependable and discoverable human effort? True rationality is to consider all the evidence. Can we not learn to truly trust the Jesus Christ revealed in all the Scriptures, the author of all rationality, the God-Man who seeks us out for fellowship with Him, a fellowship of service and freedom, not a life of bondage to self? As servants of Christ, we have a clear responsibility for developing a world view in which faith plays an integral role. Only such a world-view can do full justice to the great richness, complexity, and order present in all reality which is far wider and comprehensive than we can imagine. Contrary to the critical attitude of some, faith is an inherent part of all human endeavor and as such is not destructive to sense experiences and rational thought but a helpmate to both as seen so well by the pioneering Christian and scientist Blaise Pascal:

> Faith indeed tells what the senses do not tell, but not the contrary of what they see. It is above them and not contrary to them.[23]

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[1]The author is greatly indebted to the pioneering work on the validity of faith-experience of Abraham Kuyper, Michael Polanyi, and Stanley L. Jaki. The insights into the nature of human experience of Blaise Pascal and St. Augustine have been of great help and a strong motivation to me in developing the perspective presented in this paper. Key references are:
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[2]Jaki, *Ibid.* (b), p. 188.
[3]Jaki, *Ibid.* (b), p. 188.
[4]Jaki, *Ibid.* (b), p. 188.
[5]Kuyper, *op. cit.*, pp. 125-146.
[6]Polanyi, *op. cit.* (a), pp. 15, 45.
[7]Alan Richardson, *Christian Apologetics*, Harber Brothers, New York, 1947. A central theme of the book is St. Augustine's approach to epistomology.
[8]Jaki, *op. cit.* (b), p. 199.
[9]Polanyi, *op. cit.* (c), pp. 119-120.
[10]Jaki, *op. cit.* (a), p. 353.
[11]Jaki, *op. cit.* (b), p. 189.

The net result of "warping" of the faith-matrix is that communication on all levels of human experience is transformed into some form of manipulation.

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[19]Jaki, *op. cit.* (b), pp. 199-200.
[20]The risen Christ's dialogue with Thomas in John 21:24-29; Revised Standard Version of the *Holy Bible*.
[21]Romans 1:19-20. The King James's Translation of the *Holy Bible* brings out clearly that God has revealed Himself to men both in the structure of their inner nature (their consciousness) and the structure of all created physical reality.
[22]I Corinthians 1:17-18. Revised Standard Version of the *Holy Bible*.
[23]Blaise Pascal, *Pensees and the Provincial Letters*, The Modern Library, New York (1941), p. 93.

APPENDIX: A COMMUNICATION MODEL OF HUMAN UNDERSTANDING

It is mainly due to M. Polanyi that we owe the rediscovery in modern times of the role of faith as a component of all human experience. In his significant book, *Personal Knowledge*, he clearly established that science as well as other forms of knowledge comes about through a matrix of personal trust and commitment, i.e., a faith-structure. Polanyi came to this conclusion by good scientific methodology if science is thought of in its broadest context. What he did was to examine carefully and comprehensively by means of the available historical record, both the individual and collective aspects of scientific activity leading to the formulation of new scientific theories and discoveries. He was careful not to neglect evidence of the many personal facets of the scientists involved that

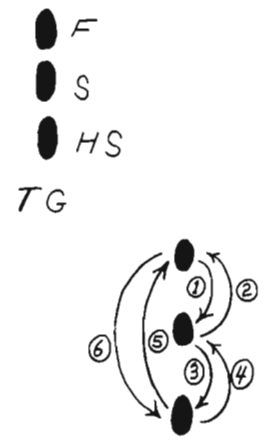

Figure 1. The triune Nature of God (this diagram is taken with minor modification from E. Schaeffer's *Hidden Art*, Tyndale House, Illinois, 1971.)

Nomenclature: TG—the Triune God, F—God the Father, S—God the Son, HS—God the Holy Spirit. 1. God the Father loved the Son and expressed this love in and through communication. 2. God the Son loved the Father and expressed this love in and through communication. 3. God the Son loved the Holy Spirit and expressed this love in and through communication. 4. God the Holy Spirit loved the Son and expressed this love in and through communication. 5. God the Holy Spirit loved the Father and expressed this love in and through communication. 6. God the Father loved the Holy Spirit and expressed this love in and through communication.

One cannot draw God—so three dots will be used to represent God.

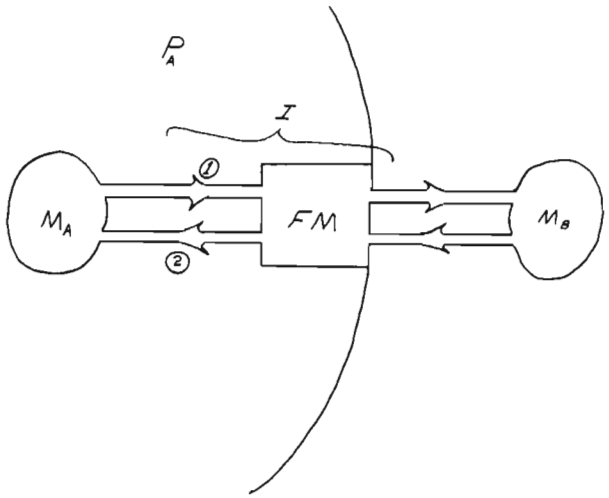

Figure 2. A model of communication on the personal level as embedded in the matrix of faith.

Nomenclature: PA—the whole person A, MA—the mind of A, MB—the mind of another person B, FM—the faith-matrix. The faith-matrix consists of those basic pre-suppositions that one must believe in, that one must trust in and commit oneself to in order to have human dialogue: (a) Another self, another mind like mine exists in the other person before me. (b) Human dialogue is meaningful and significant. I—person A *indwells* within his (or her) matrix of commitments concerning the genuine personhood of B, the basic presuppositions of that matrix tacitly guiding A in all communications with person B. 1. Messages from person A consisting of affirmations and questions. 2. Responses from person B consisting of both affirmations and further questions. These affirmations from B coupled with the presuppositions of A's faith-matrix lead to further messages from A directed by his human thought. The messages 1 and 2 are *symmetric* in the sense of both intrinsically containing a dimension in which genuine free choice takes place. A spatially reversed exact duplicate of this diagram could be drawn for the person identified as B.

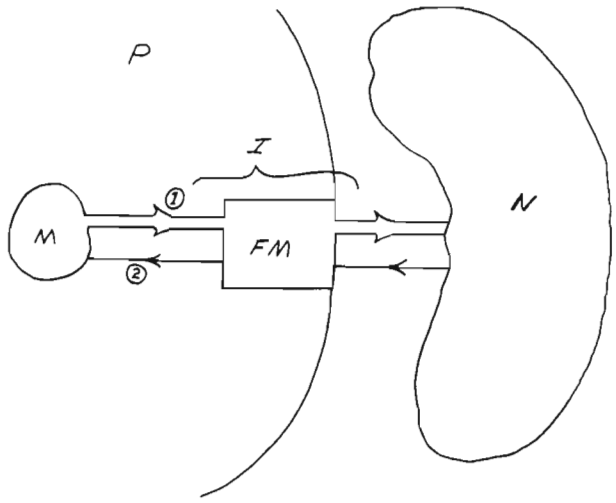

Figure 3. A model of communication in the sense of a person seeking understanding of physical reality (Nature) as embedded in the matrix of faith.

Nomenclature: P—the whole person, M—the mind of that person, N—Nature, FM—the faith-matrix. The faith-matrix consists of those basic pre-suppositions that one must believe in, that one must trust in and commit oneself to in order to begin any specific endeavor: (a) Nature exists independent of me. (b) Nature is orderly (lawful) and uniform. (c) Descriptions of Nature are inherently "simple" in terms of (mathematical) structure. (d) Logical thought is valid. Human thought is meaningful and significant. I—the person *indwells* within his (or her) matrix of commitments concerning the otherness, reality, and order inherent in Nature, the basic presuppositions of that matrix tacitly guiding him (or her) in all problems of Nature. 1. Messages which assume the form of signals directed by human thought at Nature are designed as "questions" expressed through measuring processes. 2. Responses are specific "answers" (usually quantitative) to the given measurement probes. The specific responses coupled with the presuppositions of the faith-matrix lead to further signals directed by human thought at Nature. The signals 1 and 2 are *no longer symmetric* in the sense that in principle 1 is structured freely and 2 is structurally determined by Nature's inherent order.

had a role to play in the creative discovery process. He evaluated all this evidence retroductively seeking a pattern that would successfully explain how discoveries are really made, not merely how they are reported in the impersonal form of a completed scientific manuscript. Recognition by Polanyi that scientists work "through" a faith or commitment framework provided the clue to the pattern that explains how scientific discoveries actually came about. Polanyi did not acknowledge the wider context of his work with respect to Judeo-Christian understanding; what he has actually shown by applying sound scientific methodology to the whole of scientific experience is that a Biblical aspect of man's nature, necessary for gaining knowledge of God and other people, is also required in order to gain knowledge of a purely scientific nature as well. This aspect, which is man's reliance on faith in all human activity, is part of the image of God reflected in man. Polanyi has provided scholarly evidence for the Biblical perspective that man bears the image of God.

Indeed, as F. Schaeffer has argued, the Biblical portrayal of the nature of the triune God is one in which there are and always were *love* and *communication*. As Figure 1 illustrates, there are three persons, Father, Son, and Holy Spirit within the nature of the one God. Between each of the three persons of the one God there is and always has been a reciprocal relationship of love which is expressed in and through communication. Even before the created Order had a beginning, love and communication always were. It is these attributes that express themselves in the nature of man as bearing the image of God; and these attributes consititute man's uniqueness with respect to the rest of the created Order. Any such act of communication, whether it be on the level of personal encounter or on the level of a person seeking to understand physical reality (this act may be looked upon as a form of communication), as Polanyi among others has shown, is embedded in a matrix of personal trust and commitment, i.e., a faith-structure.

A communication model of human understanding on all reality-levels in which faith plays a vital role

should therefore serve as a useful guide in understanding how the whole person seeks knowledge. It is a model which is fully compatible with both the Biblical perspective and an open-minded scientific perspective. It is, as an example, fully compatible with a behaviorist model of human personality taken as one aspect of the whole person. Its specific insight is that it stresses all communication as taking place through a channel or matrix of faith. This faith-matrix serves as a grid, a filter, and a telescope in:

a. motivating the search,
b. focusing on areas of significance,
c. reducing the noise-to-information ratio by selecting out unrelated areas,
d. seeking relations between different personal traits, conceptual constructs, etc.

In order more fully to understand any act of human communication (whether on the level of person to person or the level of a person seeking understanding of physical reality), one should first examine the actual content of the faith-matrix in which the particular act of communication is embedded. One should clearly ascertain what a person (or group of persons) actually believes to be true and holds as presuppositions (perhaps deeply buried in his or her thinking so that he or she would no longer recognize them) during the communicative act. These basic presuppositions inherent to any human communication come to be believed as the whole person encounters experience in its totality. As such, they cannot be "proved," but are yet truly rational for they are genuine personal responses to the totality and richness of the flow of human experience. Such personal responses are neither subjective or objective. "In so far as the personal submits to requirements acknowledged by itself as independent of itself, it is not subjective; but in so far as it is an action guided by individual passions, it is not objective either. It transcends the disjunction between subjective and objective (M. Polanyi, *Personal Knowledge*, Harper Torchbook, 1964, p. 300)."

If this model of communication is correct it provides a fundamental insight into the ills of modern society. The channel for acts of communication, the faith-matrix, has become "warped". This "warping" occurs because of modern man's passion to take as a basic presupposition that only one level of reality is truly significant and must therefore provide the ultimate explanation of all human experience. Those committed to scientism brand man as only a complex machine; truly self-giving love in personal encounter is therefore only an accumulation of stimuli-response mechanisms. In a similar manner truly moral acts of men are explained away. The historical evidence that many and varied human societies have expressed con-

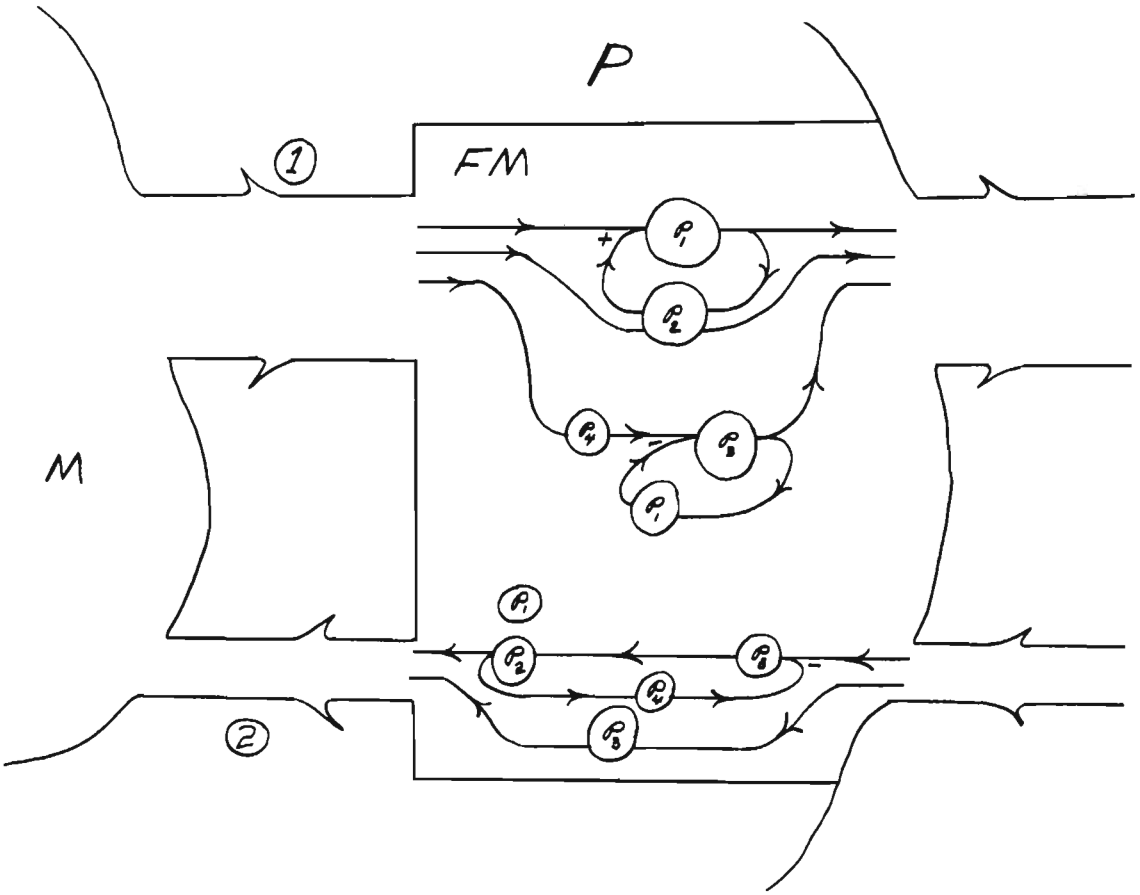

Figure 4. The indwelling thought processes that occur through the faith-matrix are complex; feedback cycling can occur among the presuppositions of which it is composed. These feedback loops ensure both stability (negative feedback) and enhancement (positive feedback) of focusing on what is truly significant during the communication act. Occasionally, however, such feedback loops can "become locked in place." The faith-matrix thereby becomes "warped" around certain presuppositional feedback loops and a one-sided communication results.

Nomenclature: P, M, FM, 1 and 2 as in Figure 1 and 2. P_1, P_2, P_3, . . .the presuppositions of the faith-matrix.

cern for justice and freedom is brushed aside. The modern mystic, on the other hand, overreacts to such claims of scientism by seeing only deeply subjective experiences as meaningful; from these all other experiences must be explained. To the mystic, rational analysis that can be duplicated by others is of no significance. In these cases and others, the net result of such "warping" of the faith-matrix is that communication on all levels of human experience is transformed into some form of manipulation. Basic presuppositions must stem from man's encounter with the totality of his experience; denial of certain aspects of many-dimensioned reality results in badly distorted vision.

Lastly, the changing perspective of anthropological theory concerning the nature of valid criteria for distinguishing manlike from animal behavior lends further credence to this model of truly human understanding being based in communication. The older criteria for human behavior were rooted in the capability of a creature to use natural objects as tools and to remake natural objects so that they were transformed into more sophisticated tools. Newer anthropological theories formulate criteria for human behavior in terms of the ability to communicate concepts requiring symbolic representation from one creature to another. Man's uniqueness has shifted from his tool-making ability to his symbol-making and symbol-communicating ability.

The model is shown in diagram form. Figure 2 illustrates a model of communication on the personal level as embedded in the matrix of faith. Figure 3 illustrates a model of communication in the sense of a person seeking understanding of physical reality as embedded in the matrix of faith. Figure 4 is an attempt to convey some idea of the complex manner in which communication is channeled through the presuppositions to which a knower is tacity committed.

Randomness in Quantum Mechanics and Its Implications for Evolutionary Theory

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Randomness is intrinsically contained in quantum mechanics because the theory can predict only the probability of occurrence of events. But no one knows how this randomness in nature is generated. Mendel's laws and mutations are examples of such random events. At least four possibilities exist: 1) The world is truly random. 2) There is a yet-undiscovered underlying deterministic theory. 3) Some divine being occasionally modifies the randomness. 4) Some divine being determines the random numbers. This talk was one of about fifty given before the California State Board of Education on Nov. 9, 1972 concerning the teaching of evolution in public schools. As a postscript I give a Biblical outline of how God acts in the world. In God's eyes, the world is not random at all.

Quantum Mechanics

In the 1920's Schroedinger, Heisenberg, Dirac and other physicists developed quantum mechanics, which forms the basis of all modern physical theories. Together with the electromagnetic, gravitational, strong, and weak forces, quantum mechanics is believed by most scientists to provide a *complete* description of physical and hence chemical, biological, geological, psychological and all other natural phenomena. Newton's classical laws of motion, for instance, which predict the paths of spacecraft so well, are merely macroscopic approximations of the quantum laws.

In quantum mechanics the behavior of a "particle" (e.g., an electron in a hydrogen atom) is described by a "wave function" which is a function of the spatial coordinates and time. The *probability* that the particle is near the specific point (x, y, z) at time t is given by the square of this wave function. *The theory does not specify exactly where the particle is, only the probability that it is in a certain region.* For macroscopic systems this uncertainty in positon is usually negligible.

If we were to make measurements on precisely identical hydrogen atoms, the electron would be found in various different positions at random, with a greater probability nearer the proton. Other atoms, molecules, and complex biological systems have similar wave functions, though the complexity of calculating them usually exceeds the capabilities of present computers.

As a second example I would like to discuss my thesis experiment, one of hundreds which have been adequately explained by quantum mechanics. We studied K-mesons produced by a particle accelerator. These radioactive particles weigh half as much as a proton and have a half life of only 12 billionths of a second, that is, half of them *at random* disintegrate after this time and half are left. Every one was, however, exactly identical, as far as we know, when it was made. Furthermore, 5% of the time—at random—a K-meson will disintegrate into three pi mesons, and the rest of the time into other particles. The directions and velocities of the pi mesons also follow a random distribution; we measured this distribution.

For comparing our data to theory we generated pseudo-data on a computer using random numbers whenever a random process occurred. The computer included the magnets, spark chambers, and other particle detectors, just like the real apparatus. The simulated data and the real data were identical within the 0.3% statistical error. The quantum prediction thus agreed with our results.

Randomness

Now I did not tell you how we generated random numbers on a computer. Because digital computers are completely deterministic in performing calculations, our "random number" program was *absolutely deterministic*. We were most careful, though, that the "random numbers" were effectively random in a statistical sense. But, as far as the physics was concerned, *there was no way to tell the difference between our real data and our deterministic computer-generated "data".*

Quantum mechanics says that there is a basic *unknowableness* about the world. The K-meson will either decay or not decay after a certain time, but the scientist cannot predict which. Quantum mechanics forms the foundation for all modern scientific theories. Quantum statistical mechanics describes the motion of large numbers of particles; air pressure is the average of the random impacts of gas molecules. Solid state physics describes solids by quantum mechanics; the hiss of a radio tuned between stations is caused by the random fluctuations in electron flow in the transistors. Weather calculations, presently inaccurate beyond a few days, are believed to be limited by random fluctuations in the atmosphere over times of months or years. Chemical reactions, including those in our bodies, are the chance interactions of molecules. Our eyes, able to detect single quanta (particles) of light, are limited to statistical fluctuations in the arrival of those quanta. The transmission from one neuron to another in our brains is influenced by randomness in the release of the transmitter chemical—our thoughts are not deterministic. Mutations and Mendel's laws of genetics—supposedly the driving forces of the evolutionary theory—are random. History and thus evolution are fundamentally impossible to predict through science because history depends on genetically-random individuals (e.g., Hitler) and "accidents" (e.g., where the bullet lodges during an assassination attempt). It is slightly possible that *homo sapiens* will not exist on this planet five years from now.

Is the world really random or does it only appear that way to our limited knowledge?

Possible Interpretations

Is the world really random or does it only appear that way to our limited knowledge? At least four possibilities exist, all of which are *equally* consistent with present scientific data.

1. The world is truly random. There is no underlying meaning or purpose. Human beings are the result of random genetic combinations, mutations, and natural selection. Whether we live or whether we die or whether we murder another human being can all be possible outcomes of the quantum equations.

2. Quantum mechanics is only an approximation to an underlying deterministic theory, just as a deterministic random number program on a computer can generate effectively-random numbers. Perhaps scientists will some day discover such underlying processes. But again there is no basis for meaning or purpose.

3. Some divine being allows the world to run more or less randomly but modifies the random numbers at chosen occasions.

4. The "random numbers" are determined by a divine being for his own purposes. Processes appear random when scientists observe them, but present events and the origin of life are directed by this divine being.

As a scientist I feel that textbooks which declare that present-day events and the origin of life are the result of mindless and meaningless chance are expressing an *assumption*, not a scientific fact. Science teachers and texts should stress not only the limitations and uncertainties of present data and theories, but also the

basic quantum-mechanical *unknowableness* and its implications for unpredictability in evolution and history. Humility in the face of this unknowableness is certainly in order.

Postscript

For the Christian the evolution-creation controversy is only part of much larger considerations. The atheist sees only mechanistic, random physical processes in tht world. But in the Bible almost every page is full of God's activity. God is active *now*; he did not stop after finishing creation.

1. *Ancient Israel.* God established his covenant with Abraham and worked in history for Israel's sake. Some theologians believe that God has restored Israel today in fulfillment of prophecy.

2. *The fate of nations.* Wise Solomon said, "The king's heart is a stream of water in the hand of the Lord; he turns it wherever he will." (Prov. 21:1, RSV)

3. *The coming of Christ.* Numerous prophecies foretold the coming of Jesus Christ. The virgin birth, miacles, and the resurrection were not natural events. Jesus predicted at his trial that he would come again on clouds of glory (Mt. 26:64).

4. *The preaching of the Gospel throughout the world.* Jesus prophesied, "And this gospel of the kingdom will be preached throughout the whole world, as a testimony to all nations . . .". (Mt. 24:14) God is now bringing this about. In the early Christian church, ". . . the Lord added to their number day by day those who were being saved." (Acts 2:47b)

5. *The Holy Spirit living in Christians.* Jesus said to his disciples, "If you love me, you will keep my commandments. And I will pray the Father, and he will give you another Counselor, to be with you for ever, even the Spirit of truth, whom the world cannot receive, because it neither sees him nor knows him; you know him, for he dwells with you and will be in you." (John 14:15-17)

6. *God's care for each Christian.* Jesus said at aonther time to his disciples, "Are not two sparrows sold for a penny? And not one of them will fall to the ground without your Father's will. But even the hairs of your head are all numbered. Fear not, therefore; you are of more value than many sparrows." (Mt. 10: 29-31)

7. *The power of prayer.* Jesus again said, "If you abide in me, and my words abide in you, ask whatever you will, and it shall be done for you." (John 15:7)

8. *God's direction of the future.* Read the book of Revelation.

9. *The reality of the Devil.* Paul says, "For we are not contending against flesh and blood, but against the principalities, against the powers, against the world rulers of this present darkness, against the spiritual hosts of wickedness in the heavenly places." (Eph. 6:12)

Personally I believe that the fourth interpretation is correct, namely, God determines the random numbers. An interesting verse is, "The lot is cast into the lap, but the decision is wholly from the Lord." (Prov. 16:33). A modern paraphrase might be, "What appears random to man is wholly determined by God." Much of God's activity in the world today can be described *within* the known laws of science, in that God foresees (calculates?) the future and accordingly has chosen the *initial conditions* of the universe and the *random numbers* so that His will is fulfilled. But I also believe that God freely acts to perform miracles, such as the virgin birth and the resurrection.

The man who denies transcendent creation, destiny or abiding meaning and worth must eventually realize that he is nothing but haphazardly animated dust that has no permanent importance; each day moves him but closer to the crematory as the finality of his being. His individual concern for social justice or for interpersonal love then has neither cosmic basis nor support, and his struggle for security occurs on a planet begotten of an unpredictable explosion and dependent on some kind of galactic lottery. . . .

The regenerate Christian must therefore radiate a burnished image that reflects the passion of the ancient prophets for public righteousness no less than for personal holiness; show a stewardship of substance impressing both disciples and doubters that the carpets and cars in our own castles and not simply the cattle on a thousand hills are truly the Lord's; demonstrate marital love as a courtship that the world cannot improve, that death alone can undo and eternity alone enhance; and live life not as a hopeless debt but as a divine gift whose horizons include the wonder of creation, redemption and resurrection. Any lesser image is likely now to seem so sheer that Christians appear as nude as the rest of the human race.

Carl F. H. Henry

"The New Image of Man," in *The Scientist and Ethical Decision*, C. Hatfield, Ed., InterVarsity Press, p. 171, 176 (1973)

Malice in Blunderland

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Professor Isis and Doctor Notnot were distinguished faculty members at the Passion for Truth Institute for advanced studies in Philosophicopaleontology (P.P.). It was my undeserved privilege to accompany these great men each Sunday afternoon as they walked and talked in the gardens at Blunder near the Institute. My task was to keep score in the unusual but fascinating game which they played. Of course I had to take notes in shorthand so as to be able to reproduce verbatim their dialogue in order that each could check the other's points at the end of the game. One particular Sunday afternoon stands out vividly in my mind, and is worth preserving for the scientific community. And so for the advancement of P.P. to which these men unstintingly gave their best, I have consented, with permission from the P.T.I. archives, to release for the first time this most memorable dialogue.

On this particular day Professor Isis was unusually anxious to begin discussion. No sooner had the three of us walked through the garden gate than he blurted at Doctor Notnot.

Isis: Do you know that there are still living some die-hard anti-evolutionists? I have never in my life been so humiliated by a colleague as I was at the conference in Tranquil last week. I used the word "evolution" several times in the paper which I delivered and this man actually questioned not only my use of the word but the very truth of the concepts entailed. I thought at first that he was joking but I soon learned he was in dead earnest—ever so serious.

Notnot: How did you answer him?

Isis: Considering that I was allowed only one and one-half hours (including discussion) I couldn't take much time. I expressed my dismay that any scientist in this enlightened age—it's been over a century since evolution was clearly established—could be so ignorant of the facts. Can you imagine it, in the midst of the world's greatest scientific minds, a man would dare question these laws of nature?

Notnot: It's a pleasant day, Professor, and I do not intend to wrangle, but is it not conceivable that most of these men of science are mistaken. You are surely not proffering the argument that because most of the great scientific minds believe evolution to be well established, then it actually is. That would be the democratic fallacy.

Isis: Good heavens, you're beginning to sound like him! Of course I'm not suggesting that because *most* think it is so then it *is* so. It is not the *most* at all that I'm emphasizing. It is the fact that the most—I would say almost all—are topnotch men in science. I am not emphasizing the quantity of those minds but the quality. However, if you do have a great number of such great minds agreeing, then the likelihood of evolution being well grounded is increased. And such a consensus is a bit more indicative of the truth than waving your right hand or saying Aye, wouldn't you agree, Doctor?

Notnot: Yes, but great minds, whether numerous or few, do not *ipso facto* guarantee the truth of the ideas to which they unanimously subscribe. It may be that these minds, great though they be, have never applied their thinking to the basic assumptions of biological evolution. Perhaps with little more than a student's intoductory course on the subject they have assumed that all is well at that level; in which case drawing upon their credentials would be committing the fallacy called Appeal to Authority. Besides, you know yourself that the trail blazers in science have been precisely those people who have not had the majority of great minds with them at the inception of their discoveries. What greater example could we adduce than Einstein?

Isis: Granted there is no absoluteness to this kind of inductive inference, but there is a much greater probability that the most in this case are right and this fellow—I wish I could remember his name—is wrong. The burden is his to establish the case against evolution.

Notnot: Well, did you give him a chance?

Isis: As I said there wasn't much time for discussion. Besides I can't imagine what he could have said.

Notnot: He might have questioned you on the argument from paleontology.

Isis: What do you mean?

Notnot: Is there really any solid evidence for the claim that one species evolved into another? Are there not great gaps in the fossil record where you would expect to find important intermediate forms in the chain of ascending complexity?

Isis: My dear doctor I can assure you that the evidence is very solid! Are you not aware of the literature on the subject? I can produce a dozen books from my library alone illustrating the gradual change in morphology of organisms which have been taken from strata that are reliably dated. Now we need not labor the elementary, that younger deposits lie above the older ones. From the concomitance of old strata and simple forms, as well as young deposits and complex forms, may we not safely assume—indeed are we not forced to the conclusion—that the lower forms are the ancestors of the higher forms; especially when we have in some cases such a complete "genealogy?"

I was never sure whether Doctor Notnot had started out playing the devil's advocate and later discovered the difficulty of his position which he then felt obliged to defend, or whether he was serious from the beginning. In any case his next query was offered in an apologizing tone quite atypical of the doctor.

Notnot: But do these evidences of graduation really exhibit a change from one species to another? What I mean to ask is: could we not think of these fossils as variations of *A or C* rather than as evidences of transitional form *B*, where *B* is the link between the radically different forms *A* and *C*? Do we really have all the stages between any species *A* and any other species *C*?

Isis: Forgive the pun Doctor but that is a specious argument. Granted we do not have the table completely filled, but we have enough gradations of complexity to establish the principle of evolution from lower to higher forms. Your criticism reminds me of Zeno's paradox. No matter how many gradations you were presented with you would always say there wasn't enough evidence to establish the case. If I showed A^1 and A^2 you would want to see A^{1a}, A^{1b} . . . . A^2. And if I showed you A^{1a} *and* A^{1b} you'd want to see A^{1ai}, A^{1aii} . . . . A^{1b}. In principle you would never be satisfied.

Notnot: Sir, I think that I have already conceded that there are changes within limits. This is a fact observable today. I have no quarrel with the microcosmic aspects of change. It's the socalled macrocosmic changes that I'm concerned about. I do not argue with A^1, A^2, . . . A^n *or* C^1, C^2 . . . C^n. What I wonder about is the form *B* which evidences the transition from *A* to *C*: that form which clearly has *A* and *C* characteristics. Surely we can expect such evidence from evolutionary doctrine.

Isis: But you are arbitrarily setting what you call the boundaries and then saying that there are no fossils which exhibit a boundary line form. By contrast I have first presented evidence, not imaginary boundaries, and from this evidence of gradual and extended change have established the spectrum from *A*-form to *C*-form. But you are saying that *B* is non-existent. What *B* are you talking about?

Notnot: Well for example, is it not supposed that reptiles evolved into birds? Where are the fossils that have both birdlike and reptilelike characteristics? The strata should be replete with these forms if in fact such forms ever existed.

Isis: There is one very good example of which I'm sure you're aware, the *Archeopteryx*. But I realize there is some doubt connected with that transitional form and I expect that you won't accept it as evidence. Just for argument's sake I shall give up that form and suppose that the *B* form in this case does not exist. There are still two mistakes in your argument. One is a fallacy and the other is an oversight regarding the nature of scientific investigation.

The fallacy is *Argumentum ad ignoraniam.* You are arguing from the fact that we haven't discovered any evidence of *B*-form to the conclusion that *B*-form has never existed. There may be several reasons for the *B*-form not being preserved which we shall discover with further geological investigation. Or perhaps through further investigation the *B*-form will yet turn up. By contrast, however, notice that I have not argued from the failure of proof on one side to the establishment of proof on the other. I have adduced the gradual sequence of forms and argued from that evidence. And here I'm speaking about forms that would be universally accepted by the scientific community—not like the *Archeopteryx*. And this brings me to your second mistake.

In science we move from the known to the unknown, not vice versa. Anomalous situations do not disprove the rule, much less establish a contradictory rule. The probability of a theory being a fact increases as the evidence continues to support that theory. And I'm quite safe in saying that the paleontological evidence has increased to the point where we can call evolution a fact.

Notnot: I quite agree, Professor, that a scientist ought to move from the known to the unknown—not withstanding the fact that hypothetical speculation plays an important part in the scientific thought process—as regards what can be stated as fact. But I fear that you accept too easily what you later claim to know. What you would call a fact I would call an interpretation of the facts and, I might add, not an interpretation that I care to endorse. Too much weight is being placed on the phenomenon of one fossil appearing after another fossil. It comes precious close to the *post hoc* fallacy which is committed when you argue that because *C*

comes after *A*, then *A* is the cause of *C*.

Isis: I beg to differ my dear doctor! I do not see how I'm committing that fallacy at all.

Notnot: Let me illustrate . . .

Isis: Please do!

Notnot: Suppose that you and I walked into a museum which displayed the history of bicycles. Imagine that the stages are represented along one long wall. Your eye moves from left to right viewing first the unicycle, second the primitive bicycle, thirdly the tricycle and finally a motorcycle. Now tell me, would you think that 2 evolved from 1, 3 from 2 and so on?

Isis: Of course not.

Notnot: Then why argue that because one form appears after another that the latter form is the result of the former one? Evolution, if there is such a thing, is not in the object observed but in the minds of the inventors.

Isis: Sir, your line of argument is irrelevant. You are arguing from analogy. (*Professor Isis was becoming visibly disgruntled with Dr. Notnot.*) Anyone who knows the first thing about logic knows that analogies do not prove anything, they only illustrate. You are taking one general characteristic in one case, namely the gradational complexity of the bicycle, and comparing it to a similar characteristic in the other, namely the gradational complexity of fossils, and arguing that the same developmental conditions prevailed in both cases. Surely you see the flaw!

Notnot: No, professor I do not see the flaw, and unless you can produce more evidence than fossil gradations, you have no right to speak of any interconnecting causes of development. In the case of the bicycle we not only can talk to people who lived through its "evolution"—first hand accounts—but we have plenty of documentation besides. We know that men made them and we can observe and repeat the process by which they were made.

Both men by this time were extremely intense and I was writing like wildfire to get down every word.

Isis: Obviously, doctor you are glossing over the evidence for development that has already been given you. For some reason you close your mind to the fossil record. If I say more I will be simply laboring the obvious. The mechanisms of development are also observable today. In your own lifetime you can observe the change in the average height of people in a country. You must also be aware of the mutant forms that have been artificially produced among plants, animals and insects. And it is right there that your bicycle analogy has a gaping hole. Even primordial organic material in the biosphere is not as rigidly formed and lifeless as bicycles. These forms are changeable and adaptable and not cast iron.

Notnot: But sir, you both smuggle in a false assumption and commit a fallacy. There are two reasons for not being able to use the fact of mutations as evidence for a mechanism of evolution. One, most mutations are deleterious to the organism and two, those which are not deleterious cause nothing more than a change in part of the organism. That is, eyes may change from one color to another but they remain eyes. Tails may become shorter or longer but they remain tails. And this brings me to the fallacy of which you are obviously unaware: the fallacy of composition.

You are arguing from the properties of the parts of a whole to the properties of the whole itself. It's like saying that because each part of an engine is light then the whole engine must be light. In your theory of evolution you are forgetting the organizational and compositional factors. To say that parts of an organism mutate is not to say that the whole organism does. Forgive the pun but that is the gaping whole.

I'd never seen Professor Isis so flustered.

"Why, ever since I've known you you have never brought up these questions. You . . . you . . . rat!"

"Ad hominem," retorted Notnot.

"No, I take that back, you're not a rat, you're a monkey's uncle."

Quite pompously Notnot said, "I've got you, because the lower primates are older than the higher primates; and if I'm a monkey's uncle then your tables are turned upside down and your theory of uniformitarianism is defeated."

With a smirk Isis came back with, "False presumption, my dear doctor, for you are a living fossil!"

With that remark Professor Notnot turned 180° and stormed down the path by the pond. Professor Isis was also in no mood for tea. He too charged off. I was left stunned in the ringing silence. Just then two Canada geese flew overhead and punctuated the dialogue with, "Honk! honk!"

The peoples of the world today are tired of an intellectualized culture which makes great discoveries, does fine things in theory, but has ceased to help them in leading their real lives. They are weary of scientists and scholars who become more and more learned, but shut themselves up in their studies and abdicate their responsibilities as the guides of mankind, because all their science does not help them to know where they themselves ought to be going. The great task to which God is calling our generation is the reconciliation of the spiritual and the material, the breaking down of the wall of partition which separates them. We must stop thinking that the spiritual world has nothing to do with science, psychology, politics, commerce, or medicine.

Paul Tournier
The Healing of Persons, Harper and Row, p. 279 (1965)

Theologizing Psychology

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Contemporary psychology contains many viewpoints. It is dynamic and thus subject to change. Many psychological ideas are not directly related to theology and conversely. While psychology and theology have many disparate interests, some topics are of common concern to both disciplines. This article discusses three subjects (man's nature, psychotherapy, religion and psychology) which elicit attention from both psychologists and theologians. It illustrates the lack of agreement among psychologists in relationship to these issues. Thus, psychologists are like theologians in at least one respect. They speak with no unity on many topics. This means that psychologists are not unanimously aligned against biblical ideas.

What Is Psychology?

Psychology had its inception as a science in 1879 when Wilhelm Wundt established the first psychological laboratory. Controversy has been the warp and woof of psychology ever since. The answer to the most basic question which can be asked about psychology, i.e., what it is, has never been completely agreed upon.

In its historical development, psychology has fostered the emergence of divergent views on its subject matter. The structuralist, functionalist, behaviorist, Gestaltist, and psychoanalyst each had a unique way of looking at psychology.

William James defined psychology as "the science of mental life." J. B. Watson argued that psychology was the study of overt behavior. Sigmund Freud believed that psychology should be concerned with man's covert behavior. E. B. Tichener concluded that it was impossible to define the subject matter of psychology. Today most psychologists agree that psychology is the study of both covert and overt behavior.

Contemporary Psychology

Contemporary psychology contains many viewpoints. It is not an impregnable, monolithic, closed system. It does not offer terminal truth but only tentative conclusions. It is dynamic and subject to revision. Merle Turner observed that we are amused to learn of Newton retiring early from his scientific career because he thought the important discoveries had been made. Turner wrote: "We are much too sensitive to the fragility of our theories and alas, of our convictions to invest much faith in enduring scientific conceptions."[1]

Many psychological topics are unrelated to theology. This is because psychology and theology largely address themselves to separate domains of inquiry. James A. Oakland, then professor at the University of Washington, held that "there is no relationship between the Bible and much of psychology."[2] Gary R. Collins, professor at Trinity Evangelical Divinity School, has written:

> Much of the subject matter of science and many of the truths of Scripture are so far removed from each other that they never come into conflict. The psychological study of animal learning, for example, and Biblical statements about salvation, are in separate and largely unrelated domains.[3]

Floyd L. Ruch is the author of a best-selling textbook on general psychology. Early in the book he delineates the field of psychology and dissociates it from religious, metaphysical concepts:

> Since psychology limits itself to the study of observable phenomena, it cannot concern itself with problems of the soul and its immortality. On the other hand, psychology does not pretend to deny the existence of the soul. It merely leaves this important inquiry to religion.[4]

In summary, many of the topics in theology are of no immediate concern to psychology. Conversely, many of the subjects in psychology are not touched on directly in Scripture and therefore tend to elicit little interest among theologians. Ultimately all truth is God's truth, it might be argued, but at short range psychophysics and propitiation seem unrelated.

Harmonizing Psychology and Theology?

Students taking introductory psychology in a Christian college often expect the course to be an exercise in harmonizing psychology and theology.[5] It

is necessay to disengage their minds from this attitude for two reasons: (1) a perfunctory examination of the table of contents of any current general psychology textbook, and there are scores available, will reveal how few topics lend themselves to theological input; and (2) psychology is a discipline in its own right, like math or biology. A proper development of its content requires that little time be spent theologizing, a maneuver more appropriate on the graduate level.

However, to say that psychology and theology have, for the most part, separate interests, does not rule out the fact that some psychological issues readily interweave with theological perspectives. Twenty years ago Hildreth Cross wrote a book which took an evangelical approach to general psychology and sought to bring out the interaction between theology and psychology. It is still in print and has sold about 10,000 copies. Cross believes that "all psychological truth can be screened through the Word of God . . ."[6]

While some of the topics dealt with by Cross seem rather remote from contemporary psychology[7] there are some appropriate analyses. There are psychological issues with definite theological overtones. The following discussion will deal with a few psychological issues which have theological import. It will become obvious that psychologists are like theologians in at least one respect: they speak with no unity. This means that psychologists are not unanimously aligned against biblical ideas.

To illustrate the diversity of viewpoints held by psychologists on biblically related topics, three questions will be discussed:

(1) Is man "good" or "bad"?
(2) Is secular psychotherapy helpful to disturbed people?
(3) Is religion compatible with psychology?

Is Man "Good" or "Bad"?

Humanistic psychology has had more to say about man's nature than experimental psychology. This is due to the vagueness of an expression like "human nature," and the resultant difficulty of reducing it to an experimentally required operational definition. Most psychological theories take a neutral view of human nature and do not state whether man is "good" or "bad."

For those psychologists who have committed themselves on this topic, there are two discernible opinions. To some psychologists man is basically good and trustworthy; to other psychologists man is intrinsically evil or bad and his nature poses a threat to himself and society.

Sigmund Freud, founder of psychoanalysis, is the most famous spokesman for the latter view.[8] Cofer and Appley, in their widely used book on motivation, summarize Freud's view of man's nature:

> . . . Freud's theory is based on the implicit assumption that the irrational and evil character of human nature is basic . . . it is clear that Freud personally held no great belief in human goodness and was not very optimistic as to the course of human destiny.[9]

In one of his letters, Freud expressed his negative attitude about man when he wrote: "In the depths of my heart I can't help being convinced that my dear fellow men, with a few exceptions, are worthless." His pessimism about man is developed more fully in *The Future of an Illusion.*[10]

Religion need not be incompatible with psychology when religion is based on the Bible and psychology adheres to a strictly objective and unbiased view.

Freudian psychoanalysis and Calvinism have much in common.[11] This led C. Macfie Campbell to say that "psychoanalysis is Calvinism in Bermuda shorts."[12] There appears to be much in common between Freud's and Calvin's concepts of sin. Paul Tournier points out this similarity:

> The inner conflict of which Freud speaks is none other than what the Bible calls the conflict of sin . . . This is what makes Freud, paradoxically enough, in many respects an ally of Christianity . . . . I claim that Freud confirms Christian teaching, since he shows that all psychological conflicts suffered by man stem from violation of Christ's commands.[13]

Freud is not alone in his negative assessment of man's nature. Christian psychologists, at least those with a Calvinistic slant, regard man as corrupted by the Fall and see his nature, in its distilled essence, as untrustworthy and evil.

There are psychologists who disagree with Freudian psychoanalytic pessimism and the religious idea of original sin.[14] They take a more benign view of man; they believe that healthy human nature is constructive and trustworthy. Illustrative of this position are the three psychologists quoted below:

> Man is born without sin, aspiring to goodness, and capable of perfection; human evil is exogenous, the betrayal of man's nature by cruel circumstances.[15]

> The idea that certain people are bad or wicked springs from the ancient theological doctrine of free will, which assumes that every person has the freedom to act "rightly" or "wrongly" . . . This doctrine has no scientific foundation . . .[16]

> To be fair, here are my prejudices: I was trained in quantum physics, and I am an indeterminist; I believe in free will; I am an agnostic; I think man is essentially good; I doubt the existence of ESP, and I don't like stupid questions.[17]

In addition to the psychologists quoted above, self-actualizing psychologists Gordon Allport, Erich Fromm, Abraham Maslow, and Carl Rogers adhere to the view that man is basically good.

Before psychologists can come to a consensus about man's nature, more basic questions must be answered. For example, what is meant by "man's nature"? What is "good" or "bad"? What data are to be received as binding in settling the dispute? How can the biblical concept of "man's nature" be correlated with psychological experimentation?

Is Secular Psychotherapy Helpful to Disturbed People?

The greatest menace to health in this country is mental illness. Half of all hospital beds are occupied by mentally disturbed patients. Psychotherapy involves

the psychological methods used by psychologists (and other psychotherapists) to help such patients.

There are many ideas as to how psychotherapy should be conducted. "A small sample of the myriad theories that have been propounded" are described in *Theories of Psychopathology.*[18] After discussing psychotherapies in *Systems of Psychotherapy,* the authors express a "discomforting sense of incompleteness of current theories about human behavior."[19]

The diversity of approaches to psychotherapy indicates that no one approach is completely satisfactory. However, the authors of *Sources of Gain in Counselling and Psychotherapy* argue that the results of psychotherapy are largely unrelated to therapeutic cults, schools, and disciplines of therapy.[20]

While some therapies claim a higher cure rate than others, Shaffer and Sloben suggest, after reviewing the literature, that psychotherapy is successful about two-thirds of the time.[21] This sounds like a fairly high success rate until critics like H. J. Eysenck point out that psychotherapy is no more effective in the cure of personality disorders than the mere passage of time.[22]

The issue involved is whether psychotherapy in its present secular form can help disturbed people. Mowrer suggests that Alcoholics Anonymous and the Salvation Army have achieved better results than psychotherapy. He believes that a patient would be better off giving his money to some good cause than paying a so-called therapist a generous fee.[23] In particular Mowrer finds fault with psychoanalysis, a therapy which he himself experienced but did not profit from.[24]

The tendency to refer disturbed people to secular psychotherapists is being challenged. Mowrer advocates that the clergy take a more active role in helping disturbed individuals rather than defaulting to the "professionals." He believes that neurosis is a medical euphemism for "a state of sin" and believes that defeat and despair can be vanquished when psychology and religion join forces.[25]

While Mowrer does not adopt an evangelical position, his Integrity Therapy is more compatible with Christianity than is Freudian psychoanalysis. His call for the clergy to become active in helping the mentally ill is reinforced by a book entitled *Competent to Counsel.*[26] Written by a Westminster Seminary professor, it encourages pastors to help disturbed people rather than refer them to humanistic psychotherapists. He believes that trained pastors are more competent than psychiatrists to counsel.

Both Carl Jung and Viktor Frankl[27] lend support to the idea that a minister may be helpful in counseling. They contend that the difficulty with many, if not most, people is a lack of meaning in life. This being the case, a minister is often in a better position than a secular psychotherapist to meet that problem. Jung believed that help is provided to the patient by a religious orientation which provides hope for the future:

> Among all my patients in the second half of life . . . there has not been one whose problem in the last resort was not that of finding a religious outlook on life. It is safe to say that every one of them fell ill largely because he had lost that which the living religions of every age have given to their followers, and none of them have been really healed who did not regain his religious outlook.[28]

Is Religion Compatible with Psychology?

Beginning with Sir Francis Galton (1822-1911), originator of the study of individual differences and cousin of Charles Darwin, a viewpoint has developed within psychology which imputes a messianic role to that science and excludes religion. Galton advocated a belief in evolutionary progress and rejected the prevalent religious dogma of his day. He "held up as the goal of human effort, not heaven, but the superman."[29]

This panacea view of psychology holds little room for religion. Even in a popular psychology text now in use this statement appears: "Psychology does not seek divine revelations."[30] In some cases it is actually adverse to them. Cross observed in the preface to his evangelical introductory psychology book:

> It is too true that this study is represented by the vast majority of professors in such a way as to question, if not to oppose openly, those tenets of our faith that we as Christians hold dearer than life itself.[31]

There is a stereotype in some places that the religiously oriented psychologists lacks competence. Roberts said, "A psychologist who is suspected of being religious is at once under the suspicion of scientific incompetence."[32] As a matter of fact, many psychologists are religious and scientifically competent although many psychologists have no religious beliefs.[33]

O. H. Mowrer accused psychologists of bias which may account for their jaundiced view of religious scientists: "Psychologists, despite pretentions of open-mindedness and scientific objectivity, have in certain respects been an arrogant and bigoted lot . . ."[34] It may be that those psychologists who themselves lack competence project this deficiency onto others.

Of course, not all psychologists attribute excessive importance to their vocation. Some are critical of the idea that psychology has all the answers. Nicolas Charney, editor of *Psychology Today,* said: "My first bias is against those who think psychology is a panacea for the world's ills."[35] Mowrer expressed a similar view when he said that the future had not yielded to psychology's manipulations as readily as had been expected.[36]

Theologians have generally held that the solutions to man's basic problems are found within the arena of religion. While other disciplines may contribute to making a better world, ultimately man's crisis is one of the spirit and must be solved by a proper vertical relationship with his Creator.

Theologian Myron Augsburger counters the idea that science is the answer. He wrote ". . . we've made a god of scientific achievement. But even now we are recognizing that it takes more than technology to provide men with meaning and values."[37]

While psychology is a growing and important science, Christian psychologists would agree with Augsburger that ultimately man's problems will not be solved by a psychological perspective divorced from a biblical one. Religion need not be incompatible with psychology when religion is based on the Bible and psychology adheres to a strictly objective and unbiased view.

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Science and Spirit: A Regress Report

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Walter R. Hearn:

Some ASA members feel that although our Christian commitment deeply affects our personal participation in science, we want science itself to remain an essentially impersonal enterprise. Particularly in the publication of scientific work we support efforts to maintain the greatest possible objectivity, even though publication in that format renders our work indistinguishable from work done by non-Christians. If that makes published science seem philosophically barren, so much the better. An objective, mechanistic science makes a less attractive idol to worship, and leaves a spiritual vacuum for us to fill with our testi-

mony of wholeness we find in Christ but not in science. Science without philosophical trappings may be more capable of being put to destructive use. If so, then theology and philosophy must be strong in their own right to cope with science. But at least an uncluttered science will also be strong and reliable when we want to put it to constructive use.

On the other hand, some believers yearn for a kind of "takeover" of science by Christianity. Truth is one, they emphasize, and should not be fragmented. They feel that scientific work done by Christians should be intrinsically different from that done by non-believers. To examine our motives and dedicate our abilities to God, and to reflect on the significance and application of our research, are not sufficient. In this view, science should be distinctly Christian in its content, not merely in our contemplation of it.

In one of these views, science, philosophy, and religion are woven into one rope of truth as independent strands. The other wants to see philosophy and theology woven into the science strand at the beginning, or perhaps wants truth to consist of only a single strand.

In the early days of science, papers were dedicated *Ad maiorem Dei gloriam*. Perhaps the greatest scientific papers written in those days expressed Christian commitment or at least theistic bias. But more recently I recall reading Russian biochemical literature of the Stalinist era, with its testimonials that must have made communist hearts swell with pride. The scientific work thus glorified by association was sometimes so poor as to make me wonder if scientific quality were not inversely proportional to ideological content.

Today one need not go back to an earlier period, or learn to read Chinese, to see efforts to "colonize" science in the name of philosophy or theology. Occultism and psycho-spiritualism, recognizing the rationality and objectivity of the scientific mind-set as a barrier to their advance, now seek to join and subvert what they cannot overcome. Theosophy and anthroposophy from European roots, American parapsychology, and Eastern religious movements all seem anxious to show that "true science" supports their claims.

Further, they seek a kind of metaphysical enlightenment of science by spirit. For example, Rudolf Steiner, founder of the Anthroposophical Society, taught that "psychic powers could be used with scientific precision to restore humanism to a materialistic world." According to the Society's literature,

> competent scientists who have trained themselves for the pursuit of inquiry, not only through natural scientific research but also by the spiritual scientific method, may discover solutions of problems that cannot be completely solved by either method alone. Such scientific research, conceived in the light of anthroposophical conceptions of the realm of nature, is being conducted at the Goetheanum and by individual scientists throughout the world.

(The "Goetheanum" is anthroposophy's international headquarters in Switzerland.)

My introduction to anthroposophy (which I still have trouble pronouncing) came when I gave an ASA lecture on "Science and Reality" at U.C. Berkeley in February 1973. I compared my scientific way of looking at the world with my Christian perspective, arguing that a scientist who is a Christian has an advantage in seeing the world from two different viewpoints complementary to each other. A young "evangelist" for anthroposophy in the audience expressed surprise that any educated Christian still thought there could be two ways of looking at the world: after all, Rudolf Steiner had brought science and spirit together in his writings before his death in 1925.

Recently I have also become acquainted with the founder of "Basic Energy Concepts," an offshoot of the "Inner Peace Movement." Charles Mulcahy left an engineering career to travel around giving lectures on techniques for stirring up such psychic phenomena as precognition and clairvoyance. To hear him discuss "spirit" as an analogy to "energy," one could get the impression that science has established our psychic oneness with God and the cyclic reincarnation of human beings on earth, in which he firmly believes.

University scientists, government agencies, and business executives have begun to dabble in "psychic research." This is documented in a three-page article, "Why Scientists Take Psychic Research Seriously," in *Business Week* (26 January 1974, pp. 76-78). The researchers interviewed are convinced that everyone possesses some dormant psychic powers that can be developed. A lot of other people with various theological axes to grind are convinced of the same thing.

Believers in false religions may misuse science. In my opinion, if believers in "true religion" try to commandeer science for our own ends, we risk ending up with a pseudo-science. Even when making valid theological or philosophical points, we must be careful about using analogies from science, lest we "swear falsely" in the sense of Matthew 5:33-37. When those who oppose our faith stretch science to fit their own presuppositions, we legitimately cry "foul!" Let us not be guilty of the same kind of distortion. Perhaps as we Christians see science being misused by other "faiths," the Lord will help remove the beam from our eyes so we can go after the speck in theirs. (See also "Pseudo-Science and Pseudo-Religion" by R. H. Bube in *Eternity* 1974.)

When posters appeared all over the Bay area announcing "SCIENCE AND SPIRIT EXPOSITION: Two Days of Astounding Films, Lectures, and Exhibits," I asked David Haddon of Berkeley to attend that "exciting, informative introduction to world-wide scientific inquiry into parapsychology, ESP, and the occult," and to report what's going on to *Journal ASA* readers. Haddon's undergraduate work at U.C. Berkeley and Santa Barbara earned him a B.S. in civil engineering, but he also has an M.A. in politics and literature from the University of Dallas. He is currently on the staff of the Christian World Liberation Front, researching, writing, and counseling on various forms of occultism. He is the author of two extensive articles on Transcendental Meditation: "Thou Shalt Not Think" (*His*, December 1973) and "New Plant Thrives in a Spiritual Desert" (*Christianity Today*, 21 December 1973).

David Haddon:

Believers in false religions may misuse science. . . . . If believers in "true religion" try to commandeer science for our own ends, we risk ending up with a pseudo-religion propped up by a pseudo-science.

Exhibits at the Science and Spirit Exposition hosted by the Theosophical Society at San Francisco's Palace of Fine Arts, November 24-25, 1973, covered a wide range. Schematic diagrams of "Kirlian" photographic equipment and finished photographs of "auras" taken by student researchers at U.C. Berkeley were on sale. So were slick commercial occult objects like the Pyramid Energy Generator and the $25 Cheops Pyramid Tent for meditating, by Pyramid Products, Inc., of Glendale, California (see "Modern Living," *Time*, 8 October 1973, p. 104). But the standard occult practitioners of palmistry, astrology, and the Tarot were also represented.

Lecturers included Roy Eugene Davis, an American disciple of Paramahansa Yogananda; Dr. G. Patrick Flanagan, 28-year-old electronics whiz and pyramidologist; Dr. Marcel Vogel, ex-IBM materials scientist turned man-plant communicator. and Kendall Johnson, researcher in Kirlian photography at the UCLA Department of Medicine. Most of the other participants represented Eastern religious and occult therapy groups.

Films shown at the Exposition included the TV documentary, "In Search of Ancient Astronauts," produced by Erich von Däniken, author of *Chariots of the Gods*; a Soviet film, "Psychokinesis in Russia"; and the Academy of Parapsychology and Medicine's "Introduction to Acupuncture" and "Faith Healing and Psychic Surgery in the Philippines." Ex-astronaut Edgar Mitchell's Institute for Noetic Sciences provided two significant films: "Inner Spaces" and "Ultimate Mystery."

There were exhibits by yogis and other overtly religious groups. Representatives of Sun Myung Moon's Re-education Foundation (Unification Church) and of Maharishi Mahesh Yogi's Student's International Meditation Society/International Meditation Society (SIMS/IMS) were notably present although they took no part in the formal program. SIMS in particular uses scientific studies to present a system of yoga as a non-religious technique of self-improvement. Their approach reflects the general attitude of the Theosophical Society sponsoring the Exposition. The theosophists seemed eager to seize upon any research by scientists into the area of parasychology as verification of their traditional pantheistic position outlined in the books of Madame Blavatsky and C. W. Leadbeater.

During a lunar mission, Apollo astronaut Edgar Mitchell performed mental telepathy experiments (not authorized by NASA) in collaboration with some ESP enthusiasts on earth. In the film "Inner Spaces," narrator Mitchell advocated the intuitive power of mind as a direct way of gaining knowledge. The movie recounted observations made on the ability of successful business executives to predict computer-generated random numbers, the effectiveness of water dowsers in discovering underground pipes and deposits, unconscious telepathic communication, and astral projection. Following all this "evidence for the existence of a realm of spirit" came scenes of the paths to religious experience of the Orient: meditation, chanting, and ecstatic dancing. Mitchell asserted the universality of this kind of experience in world religions, concluding on the note that the objectivity of science and the subjectivity of religion must now merge.

Mitchell's other film, "The Ultimate Mystery," began with a statement of the purpose of his research on noesis, which is to "gain new insights into that ultimate mystery of the universe, the nature of consciousness. I believe we will discover that through consciousness, feelings and thoughts connect all living beings." Mitchell is refreshingly frank to state the expected result of his investigations before they are completed. But selection of the nature of consciousness as the "ultimate mystery" itself virtually implies the expected answer: the ultimate nature of the universe is the impersonal consciousness of pantheism.

The content of "The Ultimate Mystery" was accurately described in its billing:

> A look at recent scientific data supporting the age-old claim of mystics that there is a oneness in all things. Sequences include demonstrations of consciousness in plants and bacteria, acupuncturists and healers at work, enzymic changes caused by healers' hands, and new visions of the powers of consciousness.

Among the lecturers, the real crowd-pleaser was Patrick Flanagan with his account of using pyramidal-shaped devices to preserve food ("by mummification"); to improve the flavor of food, wine, and tobacco; to sharpen razor blades; and to improve the meditations of meditators. Flanagan said he discovered a physical explanation for the "bio-cosmic energy" properties claimed for the pyramidal shape. His forthcoming book would reveal the explanation and spell out applications of his discoveries for food preservation without energy expenditure. Acording to Flanagan, the Egyptian pyramids were primarily initiation and meditation chambers for occult religious practices.

A lecture by Marcel Vogel illustrated how Exposition participants in general regarded scientific verification of spiritual hypotheses. "Man-Plant Communications" was described in advance as covering "the fusion of science and religion: the use of plant forms in developing expanded awareness of consciousness." Vogel rejected the idea of anthropomorphic consciousness in plants—unless projected there by man. He understands clearly what science is about: "precise measurement with known series of variables." What he is doing is not science "in any accepted sense" because "the compexity of consciousness always leaves the variables pendant or changing." He has become less concerned about the repeatability of the experiment than about the effect of the experiment on his own consciousness.

It does not disturb Vogel, for example, that the U.C. Santa Cruz physicist who tried to duplicate his experiments in man-plant communication failed until

he came to work jointly with Vogel. "I have not tried to repeat these experiments that were done in 1971, and deliberately so," said Vogel, "because I've realized the significance of the experiment, which produced 'the first explicit pictures in graphical form of thought spectrograms.'" Vogel has been "assiduously studying ever since to build a storehouse now of physical knowledge of past minds in my own brain case." The past minds Vogel cites include the Austrian occultist Rudolf Steiner and theosophists Blavatsky and Leadbeater.

> The primary lesson I have learned these last years is that in order to do any form of research along this line one must learn to clear one's conscious, rational, reasoning mind. This, of course, is the primary teaching of meditation. For this reason I took up yoga and learned the practices of yoga . . .

From this point, Vogel's lecture declined (or ascended) into an account of his projecting himself into plants, and of his admittedly dangerous experiences working with Indian charmers calling down nature spirits.

Perhaps few fellow scientists would take Marcel Vogel seriously, but essentially the same viewpoint was presented in more credible form in the Edgar Mitchell films. Indeed, the self-consciously scientific approach of the Student's International Meditation Society to the yogic technique of clearing the mind of rational thought (Transcendental Meditation) has gained considerable acceptance among scientists and other academics. Maharishi Mahesh Yogi himself, with his bachelor's degree in physics and his status as Yogi (i.e., one who has attained union with God), stands as the prototype for the convergence of Western science and Eastern religion proposed by Mitchell. In the Maharishi's own words:

> The discovery of the field of this one basis of material existence will mark the ultimate achievement in the history of development of physical science. This will serve to turn the world of physical science to the science of mental phenomena. Theories of mind, intellect, and ego will supercede the findings of physical science. At the ultimate or the extreme limit of investigation into the nature of reality in the field of the mind will eventually be located the state of pure consciousness.—*The Science of Being and the Art of Living*, p. 32.

Common to most participants in the Science and Spirit Exposition, then, was the conviction that universal consciousness unites all things, that man's purpose is to attune himself to this consciousness by altering his mind through meditation, and that science has already verified, or soon will verify, the existence of this universal consciousness. The tendency of scientists ond others who begin the spiritual discipline of Eastern meditation in any of its manifold varieties, and then adopt its pantheistic world view, is to seek its verification in scientific research.

That no amount of empirical research can verify any interpretation of the infinite and the impalpable seems to escape the altered consciousness of researchers who adopt the experiential practices of Eastern religion.

Scientists who are Christians should be aware of the tendency to colonize science for essentially religious purposes by those committed to the pursuit of the Absolute by means of the powerful techniques of oriental mysticism.

***Walter R. Hearn*:**

The 1973 "Science and Spirit Exposition" described by Haddon recalls some of R. H. Bube's observations on the decline of scientific prestige.[1] False claims for science (as the only road to truth or way of salvation) and the aloofness of scientists towards humanistic and ethical concerns, Bube said, are driving people away from a rational approach to life, toward non-rational or even irrational approaches. He cited growing interest in astrology, scientology, witchcraft, drug-use, and Eastern religions as evidence of the drive toward the non-rational and irrational.

The intensity of this drive strikes us forcefully when we see it grip someone with extensive scientific training and experience. Haddon's report on what is happening to Marcel Vogel is a clear-cut example. Making sense to other scientists while he communicates with plants is no longer of much concern to Vogel.

An attempt to introduce the irrational into scientific thought itself can be seen in a paper by Charles T. Tart, an associate professor of psychology at U.C. Davis.[2] Writing in *Science* (16 June 1972) on "States of Consciousness and State-Specific Sciences," Tart chides scientists for almost totally rejecting "the knowledge gained during the experiencing of altered states of consciousness." The altered states of consciousness (ASC's) of interest to him include those of auto-hypnosis, meditative states, lucid dreaming, marijuana intoxication, LSD intoxication, self-remembering, reverie, and biofeedback-induced states.[3]

Tart wants more scientists to get into these states and putter around developing "state-specific sciences" while there. He seems to be especially interested in the marijuana-induced state.[4] Tart is sure that "many young scientists" who have experienced certain ASC's will be capable of investigating the phenomena of ASC's in a manner "which is perfectly compatible with the essence of scientific method."[2]

Tart argues that if a meditating or stoned scientist talks nonsense, the rest of us shouldn't conclude that he is not making sense in his own state of consciousness. To Tart, physicists don't make much sense talking about "numerous invisible entities" that sound mystical to a psychologist. Since it generally takes four to ten years of training to produce a physicist who can make sense out of physics, we shouldn't be surprised if replication is slow in coming to state-specific sciences. It may take many "trips." And even if we could observe two scientists simultaneously stoned into the same state and communicating their science to one another, the shift in "logical framework" from their ASC to our state of consciousness might make their communication seem "deteriorated."[2]

There are other problems, the author admits. When stoned (or meditating, or dreaming), the scientist may give up the questioning attitude necessary for scientific investigation; in such a state, "one's experience is that one is obviously and lucidly experiencing truth directly, without question." Enhanced vividness of perception may also cause problems: "If one can conjure up anything one wishes, how can we ever get at truth?" Bad trips may produce "pathologies of cognition." But

exceptionally good trips may also hinder scientific activity if the stoned investigator comes to prefer esctasy to analysis.

Furthermore, warns a footnote,

> A state-specific scientist might find his own work somewhat incomprehensible when he was not in that state of consciousness because of the phenomenon of state-specific memory—that is, not enough of his work would transfer to his ordinary state of consciousness to make it comprehensible, even though it would make perfect sense when he was again in the ASC in which he did his scientific work.[2]

A state such as alcohol intoxication might cause too much mental deterioration to permit development of science within that state. "There have been cases where scientists, after becoming personally involved with ASC's, have subsequently become very poor scientists or have experienced personal psychological crises," but Tart thinks such unfortunate consequences might be avoided by "proper training and discipline." Of course, "the ASC's resulting from very dangerous drugs (heroin, for example) may be scientifically interesting, but the risk may be too high to warrant our developing state-specific sciences for them."[2]

Tart thinks that "practically all the religions we know might be defined as state-specific technologies, operated in the service of *a priori* belief systems." He has nothing against religious and mystical groups, but he suspects them of developing "compelling belief systems rather than state-specific sciences." He is worried that "the immense power of altered states of consciousness" may be left in the hands of religious groups, when science alone can "improve our human situation."

(Even a stoned science? No doubt his unquestioning faith in science comes from Tart's own *a priori* belief system, which does not seem particularly compelling to me.)

It took a full year for other (stunned?) scientists to respond to this bizarre paper. Four letters to the editor and Tart's reply to them appear together in the 8 June 1973 issue of *Science*.[5] Albert B. Booth of Jekyll Island, Georgia, includes a fable about an animal in the jungle of life whose perceptions are distorted by eating "goofyberries." On seeing a lion, he unfortunately perceives it as a small, funny pussycat who wants to play with him. As the hungry lion crouches to spring, the hapless experimenter's last words are "Oh, this is such great fun!" From evolutionary considerations, Booth warns that "the probability is enormous that all altered states of consciousness are defective," citing the relation between drunken driving and highway carnage as a reminder. It is "suicidal" to handicap the senses and data processing equipment that enable us to see the world as it is. There are no "free trips." To this, Tart replies: A sensible animal should know better than to eat goofyberries in the presence of lions.[5]

(But will we still be sensible *after* eating goofyberries? "That's no lion! That's a friendly little pussycat. And the more goofyberries we eat, the friendlier he gets! Here, kitty, kitty . . .")

A strong *caveat* also comes from Chauncey D. Leake, distinguished pharmacologist at U.C. San Francisco's school of medicine. Leake argues that guidelines for scientific effort "generally agreed upon by scientists" are adequate for the rational explanation of altered states of consciousness.

I have generally held that science communicated by a Christian should be indistinguishable from ordinary science.

> Tart's proposals, however sincere, add merely confusion, fallacious reasoning, and semi-mystical hope to the orderly, though slow, process of reaching tentative explanations and understandings of how our complex brains function. Irrationality is incompatible with scientific endeavor, except as a phenomenon to be explored rationally.

To Leake, Tart's state-specific sciences imply "an esoteric in-group of specialists with an unintelligible jargon who would tend to indulge themselves in emotionally oriented irrational speculation."[5]

(Not a bad prediction of the stance of many participants in the Science and Spirit Exposition, according to the report by Haddon.)

In reply, Tart comments that it is only a value judgment that our "ordinary, normal, so-called rational state of consciousness is the best one for surviving on this planet and understanding the universe." He argues that the existence of nuclear weapons and bacteriological warfare gives reason to question that assumption. He thinks it is hardly scientific to define our own ordinary state of consciousness as normal "and that of everyone else whose behavior displeases us as abnormal or altered."[5]

Reading this exchange, I find myself immediately siding with Chauncey Leake. Then I find myself wondering how other ASA members would respond. For Leake, rational explanations, even of human phenomena, "tend to be in terms of physics and chemistry, since these scientific disciplines have optimum measurable precision." Tart says he doesn't think much of physics and chemistry for describing states of consciousness. Many Christians likewise seem suspicious of attempts to give biochemical explanations for human activity, particularly for mental or "spiritual" activity. And what of Christians who want "our" science to be different from worldly science? Tart's "state-specific sciences" would also be different from this worldly-science. What if he had been talking about Christian ("spirit-filled") science instead of Eastern ("meditating") science?

I have generally held that science communicated by a Christian should be indistinguishable from ordinary science. Perhaps that means that I don't expect my "spirituality" significantly to alter my state of consciousness or to shift my "logical framework." Do I thus give rationality undue priority over true spirituality? Christians should conduct themselves "wisely toward outsiders."[6] To me this means guarding against any deterioration of communication caused by a shift in logical framework. It seems to me that a Christian's science, even more than his Christian life, should make sense to ordinary people in their ordinary state of consciousness.

We expect our preaching of Christ crucified to be "folly" to pagan scientists.[7] But shouldn't our science make sense to them?

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A Commentary *On Being Sane in Insane Places*

Social Criticism and Scientific Responsibility

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A recent highly publicized article in Science *magazine takes a broad swiping attack on the mental health system. This article presents a technical analysis of the author's research. The analysis suggests that the author's conclusions are unrelated to his research as reported. However, evidence is presented to suggest that the author used his research material as an occasion to present a trenchant social criticism. The covert and unlabelled combination of social criticism in conjunction with and under the label of empirical scientific study is brought under question. This method of publication is potentially dangerous to the intellectual autonomy of science, and undercuts the recognition of moral responsibility for social criticism as a human venture.*

Introduction

An interesting, perplexing, and disturbing event occurred in the spring of 1973 that raises some basic issues in terms of scientific responsibility. A long major article was published in the January 19th issue of *Science*, on the topic of psychiatric diagnosis in mental hospitals, with the intriguing title, "On being sane in insane places".[11] Simply put, the author described a series of experiments in which eight subjects gained admission to twelve psychiatric facilities by requesting admission with a presenting complaint of bizzare hallucinations. In each instance the subject presented himself in the role of a psychotically disturbed patient, was admitted, received a psychotic diagnosis, was observed for several days on a ward, had his case reviewed by staff, and subsequently was discharged as a case of psychosis in remission.

The author admits that this sequence of events is not particularly surprising, although this admission comes in his subsequent rebuttal to letters to the editor some months later. The author says: "The issue is not that the pseudopatient lied. Of course he did. Nor is it that the psychiatrist believed him. Of course he must believe him. Neither . . . whether admitted . . . (which) was the only humane thing to do."[12] So what is at issue, that should stir an article written and presented in stirring polemic fashion? According to the author it is simply: "the diagnostic leap between the single presenting symptom . . . and the diagnosis."

To those outside the field of psychiatry this might seem like a topic hardly scintillating enough to stir controversy. And indeed within the field of psychiatry this issue has been the topic of many sober studies. So we are left wondering why the sensationalistic publication in a general journal such as *Science*?

Before attempting some speculations and reflections, I should like to present a brief critique of the research methodology and conclusions of this study from the standpoint of empirical research. Although this may be a bit technical for the reader, I wish to illustrate

the serious methodological, conceptual, and logical flaws of the author's report.

A Critique of Method

The recent article by D. L. Rosenhan, "On Being Sane in Insane Places", has received widespread notice in the public press. These reports proclaim that psychiatrists are unable to differentiate normal persons from those suffering from severe emotional disorders, thus implying serious question as to scientific procedure and professional competency. The fact that the press may have sensationalized this report does not negate the fact that Rosenhan has published a very ambiguous piece of research that is open to serious scientific criticism.

The exact intent of the Rosenhan research is impossible to divine, for he makes allusion to just about every major issue in the mental health field with a lick and a promise. Yet an adequate rejoinder would have to deal with several major conceptual issues that Rosenhan never clearly delimits as arenas for discourse.

Moreover, his scientific methodology is open to serious question. He does not test his alleged major hypothesis, his methodolgy is irrelevant to the test question, and his data are tangential to his hypothesis. Therefore his conclusions can only be taken as assertions of his opinion, rather than tenable interpretations of his data.

Does Rosenhan present new findings? We must answer, no. To begin at the ending, I have no cavil with the *observations* and *experiences* reported by Rosenhan and his colleagues. In fact, I would strongly validate the reality and pervasiveness of many such hospital situations. But he describes nothing new. His observations are already immortalized in the work of his fellow Stanford colleague, Ken Kesey, who authored the best seller, *One Flew Over the Cuckoo's Nest,* which became a sell-out theatrical production. For those not familiar with the story (based on Kesey's experience as a ward attendant), a basically sane hero attempts to organize the psychotic patients on a hospital ward to oppose the malignant behavior of the treatment staff. Our sane hero is promptly diagnosed as a trouble-making psychotic who is eventually therapized to literal death. Thus the fact that sane persons can be labelled and treated in insane fashions has entered the common knowledge of public domain.

Does his work possibly lead to new solutions? Again we must answer, no. Rosenhan calls for more research. Yet the social psychology of mental institutions has been a major field for over twenty years. We have known what Rosenhan describes in exquisite theoretical and practical detail for over a decade. But he ignores the psychology of institutional change. Knowledge, *per se*, does not produce change. The ultimate irony of this regards Goffman. His classic research on total institutions was conducted at a famous hospital. When I interviewed staff at that hospital some ten years after Goffman, most knew of his book, most did not know it was a study of their hospital, and nothing had changed in the hospital in ten years post-Goffman.

Rosenhan suggests that if we do not send people to insane places, our impressions of them are likely to be less distorted. Here he assumes that psychiatric hospital units are inevitably bound to a gross distortion process. That is an assumption that can be empirically tested. There is abundant evidence to indicate that organizational change is possible to redress the distortions Rosenhan describes.[13]

Rosenhan has published ("On Being Sane in Insane Places") *a very ambiguous piece of research that is open to serious scientific criticism.*

The Rosenhan alternative is to retain disturbed persons in their community for treatment, because their community is a non-pejorative environment. His support for community treatment programs is certainly consonant with our theoretical and therapeutic concepts of the day, but his rationale is not supported by evidence that the community is non-pejorative. The disturbed or deviant person is not labelled as such *after* he comes to the psychiatric hospital, but rather *before* he comes to the hospital.[6, 14]

Furthermore, the whole community treatment process in the community is not devoid of labelling and social role assignment.[2, 9] It is only more covert, and thereby might even be more noxious. I am not arguing in support of the sad state of affairs in many psychiatric hospitals. But we will not escape the same labelling and dehumanizing processes by merely moving into the community.[2] For example, Cumming[1] has done a brilliant social role analysis of the total human services system in a community which demonstrates the same phenomena Rosenhan describes in the hospital.

Does he formally test a hypothesis? For the third time we must answer, no. This leads us back to the central thesis of the Rosenhan piece. The stated hypothesis to be tested is one of *clinical judgment.* Can the psychiatric clinician distinguish—I cannot finish the sentence. Rosenhan never states a clean hypothesis. Nor does he state which variables he intends to deal with in his research on clinical judgment.

Harty[4] proposes five classes of variables involved in the assessment of clinical judgment:

1. The nature of the judgment task; type of judgment required, and response alternative open to the judge.
2. The nature of the input which provides the judge with his data.
3. Characteristics of the judge which enter into the process; the types of cognitive operations performed, and individual traits which affect these operations.
4. The nature of the context in which judgments are made.
5. Interactions among these classes of variables.

In terms of the first variable, Rosenhan fails to specify the nature of the judgment task. He uses terms such as sanity (a legal term), mental illness (a term of social convention), and schizophrenia (a technical diagnostic term) as synonyms. Then normality is thrown in—a notoriously ambiguous term—along with the issues of cross-cultural norms.

A careful reading reveals that a judgment is being required that Rosenhan does not specify. The task is this: Will judges (hospital staff) agree with a self-definition of the psychiatric patient role, and thereafter continue to judge the person in a consistent fashion according to the initial labelling definition despite contradictory behavioral and intellectual data?

Thus his study turns out to be research on *role behavior*, not research on clinical diagnostic decision making. Central to role theory is the process of *role-assumption* and *role-assignment*. The data reveal that his subjects enter a role-assuming pose and receive congruent role-assignment. They claim to be patients, and in turn they are accepted and treated as patients. These are recurrent distressing data, but not novel findings. The research data do present some provocative questions related to *role-theory* (not clinical diagnosis). For example, what social characteristics lead to role assignment on the basis of inadequate and/or inappropriate data? Or, what types of data must be introduced into the social transactional world to change role assignments, etc?

Although Rosenhan is dealing with role theory and labelling theory, he fails to relate his research at either a theoretical or applied level to the corpus of relevant research in medical sociology.

Rosenhan fails to provide substantive data on variables 2. and 3. while he does dwell on variable 4. and ignores variable 5.

Nor does he deal with any of the relevant empirical studies that deal with variables 2. and 3. For example, Gauron & Dickinson[3] have shown that cognitive closure may lead to a diagnostic label unrelated to substantive data input. On the other hand, when one deals with scientifically competent judges, a high level of validity and reliability can be obtained on clinical psychiatric judgments.[5, 15]

Reasons for diagnostic disagreement have been summarized by Ward, et al.[9]

A. Inconstancy on the part of the patient: 5%
B. Inconstancy on the part of the diagnostician: 32.5%
C. Inadequacies of the nosology: 62.5%

It is clear that diagnostic problems reside primarily in the issues of theoretical constructs, rather than the ability to accurately observe and make *clinical* deductions.

Rosenhan deals with none of this research, nor any of the conceptual issues involved. *If* his research were a study of clinical diagnostic judgment, then it would be incumbent upon him to propose some rationale for the fact that his conclusions are totally opposite to the empirical research in the field. But in fact, he has not conducted a study on clinical judgment, and therefore his conclusions in regard to the failure in psychiatric judgment are irrelevant.

This is the central theoretical issue at stake. For the distinction must be made between the scientific capacity to make reliable and valid clinical deductions resulting in a conceptual diagnosis, versus the *use of diagnostic labels* in the service of social role transactions.

It is possible to construct a research methodology that would address the stated hypothesis. Subjects could be presented to a panel of judges apart from the social role transactions of a treatment setting. Then we would study whether the judges could differentiate between those subjects who claimed to be emotionally disturbed but were not (the pseudo-psychotic, if you will) and those who were in actuality emotionally disturbed. Of course, this purely experimental situation does not address a second theoretical issue, namely, how do social, cultural, contextual, and transactional variables influence the processes of data collection and data evaluation. Here one would perforce deal with a complex matrix of interactive variables, requiring a quasi-experimental multi-matrix methodology.

These issues are by no means academic, for in many clinical settings, most notably in forensic psychiatry, the psychiatric clinician is requested to differentiate between feigned illness and actual illness. From personal clinical experience this is often a vexing problem if one approaches the task with scientific objectivity. For example, the Ganser syndrome allegedly describes a person, usually in a legal setting, who claims mental illness to avoid legal penalties. The long history of controversy about this syndrome illustrates the difficulty involved in assessing a person in that social role. Thus the questions which Rosenhan raises are by no means trivial. One possible argument might be that social role assumption and role ascription are central variables in any assessment of a person. As one thinks he is, so he is. Which immediately leads us into issues of phenomenology and philosophy as Rosenhan hints.

Inhumane institutional practices in part reflect the demands and expectations of society.

As the Rosenhan report exists, it suggests that the problems lie solely with the mental health professions and psychiatric institutions. However, institutions and professional practice exist in reciprocal relation to public attitudes and public demands. Inhumane institutional practices in part reflect the demands and expectations of the society. The rejection and dehumanizing of the psychiatric patient within the institution can be seen as a projection and acting out of the community rejection and dehumanization of the labelled deviant.[1,2,8]

However, solutions do not come from blaming the public, the institution, nor a profession. For blame demands punishment. And while punishment may appease it will not necessarily produce change. Our humanistic desire for fundamental changes in our response to deviant behavior requires that we not be defensive nor protectionistic about basic problems in our society, institutions, and professions.[9] Therefore, the conclusions and recommendations that Rosenhan proposes miss the central issues and end up as scapegoating observations rather than as catalytic clarification. In my opinion, Rosenhan ends up doing what he decries. He labels behavior instead of conducting an accurate assessment.

Implicit Social Criticism

Having stated my critique, I return to the author's assertion that his study was *merely* a piece of research on the diagnostic leap from single symptom to diagnosis. If the critique I have made has validity, we must conclude that Rosenhan either engaged in some incredibly sloppy research in which his conclusions were

unrelated to and unsubstantiated by his research data; or that he ignored a substantial body of research that totally contradicts his method and conclusions; or that he had other purposes in mind, not reflected in his stated research aim.

Inasmuch as Rosenhan is a respected scholar who has published well known material, it seems implausible that he would tolerate uncritical research or ignore substantive research publications relevant to his work. On the other hand, there are several indications that Rosenhan may have had other implicit goals in mind in his publication. First, he presents simplistic attacks on every complex issue in mental health in his original article. Why attack every issue—with no suggestions or discussion, in a research article? Second, he concludes that mental hospitals are bad and should be abolished. Granted the deplorable state of some institutions, why the desire to throw the baby out with the bathwater? Third, he repeatedly attacks psychiatrists for being presumptuous, or at least disdainful of scientific data. This is the facet of psychiatric research data directly relevant to his research. Who is he attacking? These are observations on the implicit tone of his article.

In his subsequent rebuttal to letters, he comes more directly to his implicit concerns. Basically, he is concerned about how we study man. To his mind man can be studied only in terms of objective external tests and measures. What man says and does—man's testimony of himself does not constitute scientific reliable and valid data. Rosenhan says: ". . . (diagnosis) . . . is not independently verifiable beyond what a patient says and does."[12] Thus Rosenhan is back arguing a type of Logical Positivism philosophy. He wants a laboratory operational approach to the study of man.

I suppose this approach to the study of man might fall under the now popular category of behaviorism. One need not quarrel with Rosenhan for taking this position, which is certainly a tenable way to study man, albeit only one view of man. But since this argument is an old one, argued many times in the psychological literature, why should Rosenhan raise this issue in such a covert and tangential manner?

Should social criticism and empirical research be combined? . . . It seems most necessary that we do not subvert scientific research and publication as propaganda for a social position.

Let us pursue the matter one step further. He is opposed to the use of psychiatric diagnosis. Ostensibly because it is scientifically inaccurate and based on subjective patient self-reports rather than objective laboratory data. But why are psychiatric diagnoses disturbing to him? In his original article he states: "Psychological suffering exists. But normality and abnormality, sanity and insanity, and the diagnoses that flow from them may be less substantive than many believe them to be." This quote may not seem very clear, and Rosenhan does not exegete his concerns that flow from the use of diagnostic labels. But I should like to suggest some issues currently in hot debate in our society which I believe Rosenhan ultimately wishes to address.

(1) There is the real concern about the potential role of the psychiatrist as an agent for political social control. Recent cases in Russia suggest that political foes have been declared insane and imprisoned in psychiatric hospitals as pseudo-patients. Such allegations have not been fully investigated, but it raises similar concerns in our American society. (2) Over the past ten years there has been increasing concern for the civil rights and civil liberties of the patient admitted to a psychiatric facility. A joint task force of the American Bar Association and the American Psychiatric Association met to draft model legal code revisions for admission procedures and civil rights of hospitalized patients. Many states have since adopted versions of this model legislation, although there are continuing inequities in many parts of the country. (3) The liberation movements of the 1960's were reflected in a "radical left" movement in American psychiatry, led by Thomas Szasz in America and Ronald D. Laing in England. In effect they proclaimed the "myth of mental illness". To them and others in the movement, mental illness was the product of social oppression. Thus society was sick and made unrealistic demands for conformity, or labelled those who deviated from traditional social convention as "mentally ill" in order to control them. This position has been joined by certain sociologists such as Thomas Scheff, who argue for a social role theory of mental illness. In brief, these sociologists argue that mental illness is nothing more than a deviant social role created by society. The radical left therefore demands the elimination of psychiatric diagnoses because such diagnoses are means of social manipulation that hurt people.

In this light we can see that Rosenhan's concern for psychiatric diagnosis fits with a certain *zeitgeist*. He is raising an argument, in line with other social critics, of the possible social misuses and abuses of the mental health system in society. At this point I can now note that Rosenhan is not only a psychologist, but is a law professor. This is potentially significant in that lawyers take a leading role in much of the social criticism I have alluded to. These admittedly loosely connected observations, taken as a whole, suggest that Rosenhan is not concerned with a narrow research question on psychiatric diagnostic method, but rather is assuming the role of a social critic.

Now it should be stated that in my opinion there is considerable reason for concern in each of the three areas of social criticism outlined above. Thus one cannot fault Rosenhan for being a social critic, nor can we fault him for raising issues relevant to any of these social concerns. But if my major thesis stands, namely, that Rosenhan has published a highly visible piece of social criticism, then several issues present themselves.

Scientific Responsibility

I have taken considerable space to present a rather technical analysis of this piece of science publishing to illustrate how social criticism can be embedded in empirical research. I have concluded that in this instance we have a confusing combination of the two. And this type of combination raises serious questions in

my mind.

(1) Should social criticism and empirical research be combined? I would answer a qualified yes. Particularly in the social and psychological sciences it is often impossible to separate empirical research from basic social positions. Indeed the separation may not be desirable, for research in relation to social positions is critical to social evaluation. However, I consider it poor science and potentially destructive to science and the larger society to confuse a position of social criticism with the research pertaining thereto.

The dangers are twofold. (a) It may preclude a clear analysis of the empirical data. (b) It may lead to dismissal of the data because of the social position it supports or negates; or conversely the data may lend undue credence to a social position solely on the merits of the present data of the study.

(2) How should social criticism and empirical research be combined? When no distinction is made between the two in a report, then the above dangers are encountered. Those dangers are in a sense logical and technical problems of accurate reading of a report. But an unclear combination also confuses the basic distinction between science and social policy. Science cannot determine human attitudes or define social policy. To my mind social criticism and the ensuing debate over humane and moral directions for social action cannot be resolved by appeal to empirical data alone. More social action is a uniquely human responsibility.[9, 10]

Therefore, it seems most necessary that we do not subvert scientific research and publication as propaganda for a social position. Conversely, we should not shirk the responsibility to engage in forthright social criticism and social moral dialogue. To confuse the two can lead only to discredit of intellectual autonomy in the scientific enterprise—as in the Lysenko science of the Stalinist era. And just as important, it makes social criticism an objective amoral affair, rather than the moral responsibility of all of us in a human society.

On these counts, then, the Rosenhan publication presents an example of dubious procedure that should be cause for concern for both the scientist and the social critic. In fact I happen to agree with much of the Rosenhan criticism and I am largely in sympathy with his social positions. However I strenuously object to his perhaps unwitting subervision of both science and social criticism. For in this instance we all lose rather than gain.

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A man who has decided to submit his life to God's authority does not look to Him for guidance only when he has some great decision to make, such as the choice of a career or a wife. Day by day he finds in meditation fresh inspiration for his daily work, his personal behavior, and his attitude toward those about him. . . When God's guidance is sought in this way, those conditions of life which are most favorable to health are gradually established.

Paul Tournier
The Healing of Persons, Harper and Row, p. 268 (1965)

Those people are twice unhappy who live over, from morning to evening, the bitterness of their grievances. . . . This whole tide of grievances which submerges our present world is useless. It does not achieve its goal. Am I exaggerating when I say that never was there so much injustice as there has been since so many people have gotten mixed up trying to bring about justice through their protests?

Paul Tournier
Escape from Loneliness, Westminster, p. 122, 125 (1962)

Limiting Factors in World Food Supply and Distribution

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Improper distribution of food is the cause of hunger in the world. Food production can be increased to meet world needs but is controlled more by cash demand than human need. Poor people are hungry because they have no money to buy food rather than because there is not enough food. Lack of a minimal education is the usual cause of poverty, so removing that limitation would shift purchasing power, which in turn would cause shifts in food production and distribution. Food production potential far exceeds the need in the foreseeable future, even assuming a continued increase in population. Man's increasing dominion over the earth makes him more responsible for the proper use and conservation of its resources, if he is to pass on to his children a livable planet.

Introduction

Hayes' recent review of Ehrlich's book, *The Population Bomb*, and earlier discussions in the *Journal ASA* concerning Ehrlich's predictions and those of other prophets of doom, leaves me as an agricultural scientist a bit uneasy. Many of the "authoritative" statements being made on population and food supply these days are by non-agriculturists or instant ecologists. Christians are getting the blame for domination and exploitation of the earth by their implied interpretation of scripture. This is not my interpretation of scripture, but rather the opposite. We have indeed dominated the earth and subdued a portion of it, but as Christians we must conserve and protect as well as use its resources and try to pass along a better world to our children. The assumption that population *per se* causes an irrevocable reduction in environmental quality is utter nonsense. For example, London with its 12 million people has possibly the cleanest environment of any big city, yet only a dozen years ago it was one of the dirtiest. The environment was improved not by reducing the population but by a commitment to changing the specific human activities which were causing the problems. The further assumption that hundreds of millions of people will die of starvation during the next decade is based on unwarranted extrapolations of current increases in population and world food production. The fact that food production never greatly exceeds the cash demand does not mean that production *could not* be increased dramatically. And since food increases are required for increases in population, only those countries which can increase food supply will increase their populations. Those which cannot increase food supplies will have starvation during this rather than the next decade, but at a level far below the predictions.

The fact that there is hunger in the world is ample evidence that either food supply or distribution is inadequate. To get at the causes and suggest solutions requires a careful and orderly study. We must first know the facts about the situation; then, on the basis of these facts, we must identify as clearly as possible the major problems. Finally we must examine the alternatives for possible solutions and decide which alternatives are most satisfactory.

Borrowing from Blackman's restricted concept of limiting factors for plant growth, a more generalized view of the concept can be made to apply to any system or process, either physical or biological. My generalized restatement of this principle of limiting factors is as follows: The operation of a process, reaction, system or organization proceeds at the rate imposed by the most limiting factor essential to the overall process. When the principal limitation is eliminated, the process proceeds at nearer optimum but may in turn be limited by some new factor which now

becomes critical. Methodical elimination of all limiting factors whch can be altered results in an optimized system. If two factors are nearly equally limiting, then both must be altered to obtain a rate change in the process.

Food Distribution

To apply this principle to food supply and distribution, the basic facts of the situation should be stated:

1. Most of the hunger in the world exists where the people also are the poorest (Asia, Africa and South America).
2. Population density *per se* is not related to hunger. High density countries such as Japan, Netherlands and U.K. are not hungry, while some low density countries of Africa and South America are hungry. Seventy percent of the world's people live in urban areas on about 3% of the land.
3. Large food surpluses exist in North America, Europe, and Oceania and some surpluses exist in other areas of the world.

From these gross facts we must now identify the problem, i.e., decide what ought to be as contrasted to what now exists. Obviously, the problem is unequal distribution of food as related to people. Let us assume that it is easier to transport food than people to achieve an optimum balance. The facts listed above also tell us that *poverty* and hunger are related, as was pointed out by Simpson[12] in an article "The dimensions of world poverty." He states that distribution of food both within a country or between countries is limited by the purchasing power of the people. This last is important because it identifies one of the *causes* of the problem.

If poverty rather than food supply or land resources is the cause of hunger, these are the alternative solutions:

1. Get money from the rich and give to the poor (e.g., "free" food programs).
2. Teach poor people how to produce more food locally.
3. Find and eliminate the cause of poverty.

The last alternative seems best because it gets to the *primary* cause of improper food distribution. We are still seeking specific limiting factors, the elimination of which would optimize the balance between food supply and people. Of the factors related to poverty, those political, sociocultural, religious, or educational origin are most evident. All of these may have a bearing upon poverty, but the lack of education appears to me to be the most important. In the countries of Asia, Africa and South America where hunger is greatest, illiteracy rates are also very high and are the probable cause of much of the poverty. The long run solution through education, however, awaits some changes in political, cultural and religious areas, because these institutions in many cases are responsible for illiteracy and poverty in the first place. But given the proper climate for self-determination, these people still must be fed until they can gain the education needed to obtain earning power. In this regard the Food and Agricultural Organization of the United Nations recently made the excellent suggestion that surplus food from affluent countries be used in place of money to help pay for development projects in countries which are not able to import food. The use of food as currency to build roads, schools, irrigation dams, etc. would be a lasting monument to the food eaten. The effect of such a program would be increased self-sufficiency both in food production and technology in the poor nations.

The assumption that population increase per se *causes an irrevocable reduction in environmental quality is utter nonsense.*

Thus the imbalance between food and people is largely one of economics governed by the law of supply and demand. Human need, however, must be distinguished from cash demand, the latter of which regulates world food supply. Most or all of the hungry nations of the world use part of their agricultural land to produce non-food crops for cash export. Ceylon exports rubber and tea, grown on land that could feed some of its hungry people. In talking recently with a graduate student in Economics from India, I learned that he had written a master's thesis on the economics of san hemp, an important export crop of India. When I asked him why Indian farmers were not using all of their land to produce food, he replied that they could not sell that much food. He candidly admitted that many of his Asian brothers were hungry, but since they had no money for food, their farmers could not afford to grow crops to give away. They therefore raised crops for which there was a cash market.

Several factors should be mentioned as they relate to education and the food problem. It is widely known that in India cattle and other animals eat plants which could be used for human food, yet these animals are not used as food. This is a problem stemming from religious beliefs, but there is evidence that education is changing this view. Another indirect effect of education is that it will dramatically increase the effectiveness of voluntary population control measures. It has been erroneously assumed that population control in rich affluent nations would release food for the hungry nations. Only population control in a hungry nation will help the food supply there. Reduced population growth in a rich nation simply results in a reduction in the food produced there. Education of the hungry and poor can bring about important changes in the economic concept of family size, which in turn can facilitate population control. For centuries farmers in Asia considered a large family an asset because of the hand labor required to plant and care for the crops. Recent research, however, showed that direct mechanical seeding of rice was as good as transplanting individual seedlings by hand. This single innovation plus some education to put it to use could be a significant incentive to reduce family size throughout Asia.

Recent articles in the *Journal ASA* and elsewhere indicate needed limitations on human population growth in the generations ahead. The main thrust of these pronouncements hinges on these assumptions:

1. Food supplies are running short and will be critical before AD 2000.
2. Water will be critically short, both for agriculture and domestic use.
3. Environmental pollution on a world-wide scale is threatening many species including man.
4. The combined effects of the above listed items will mean starvation and misery for hundreds of millions of people beginning early in the next decade.

Implicit in many of these writings edged in black is that man is multiplying faster than is the knowledge with which to solve his problems. Yet with each population doubling we have a 16-fold increase in technology. The tacit admission that Malthus was right is to admit that man has no better equipment to solve his problems than have the animals of the forest.

Regarding world food potential, *Journal ASA* readers deserve at least one opinion from the field of agricultural science. After all we in agriculture who are solving current problems should be in a good position to anticipate and thus avoid future problems.

Consider these facts. U.S. production of foods could increase by 60 million tons merely by putting to work land already developed but not in use. India now wastes 40% of its food through preventable losses betwen harvest and final consumption. Elimination of this loss would add nearly 40 million tons of food grains annually. China appears no longer to have widespread hunger. Developing countries such as Pakistan, Turkey, Mexico and Indonesia have made dramatic gains in production in recent years to the extent that some crops are available for export for the first time. Historically, the Philippines have had to import 600,000 tons of rice to feed its people, yet today they are exporting rice to other nations.

The gloom and doom statements of non-agriculturists such as Borgstrom, Ehrlich, and the Paddock brothers are part fact and part fiction and they fail to distinguish between the two. Their estimations of agriculture's capacity to produce food is grossly in error. The following statement on potential production was prepared in 1969 for a talk given before the O.S.U. Chapter of the Human Ecology Society.

The imbalance between food and people is largely one of economics governed by the law of supply and demand.

World Food Potential

Poverty and food distribution. The relationship between poverty and food supply was pointed out by Simpson[12], who arbitrarily set the poverty level at below $300/cap./yr. On this basis, 64% of the world's people are in poverty, ⅔ of whom live in India, Pakistan, Indonesia and China. He asserted that distribution of food within a country or between countries depends upon transport facilities and also is limited by the purchasing power of the people. World food production stands at about 102% of minimum caloric need[12]. Thus, distribution rather than production is the main problem. It is unlikely that production will greatly exceed cash demand because of the severe depressing effect which surpluses have on prices.

Food increase in hungry nations. As stated by Brady[4], the primary elements are technology plus social, political, economic, cultural and religious factors. While technology won't work without a balance of the above factors, the world cannot feed itself without a balanced agricultural technology. Our western technology can't be directly transferred to other nations, but our *techniques* for getting facts and solving problems can be exported[4]. Putting together a balanced "package of practices" has worked well, in which varieties, fertilizers, weed control, machinery, etc., plus a good agricultural extension service have resulted in dramatic increases in yield. For example, Turkey bought 20,000 tons of a new hybrid wheat from Mexico and asked A.I.D. for help in growing it. Twelve extension specialists from Oregon State University were sent over to work on the project. The yields were so remarkable that it is cited as one of the most successful production increases ever obtained through Extension demonstrations in so short a time.

New varieties of short-straw, high-yielding wheat and rice, together with better practices and more fertilizer, resulted in record yields in Pakistan, India and Ceylon in 1969. In a recent news release, India's Prime Minister, Indira Gandhi, said, "I feel confident that India will be able to stop importing wheat in about three years." In fact, food shortages could be eliminated in most countries today if losses in handling, transport and storage could be saved. Carter[5] cites the case in which India presses the oil from soy, cotton, and peanuts, leaving a residue containing 50% protein. The 2.5 million tons of this residue is *not*, however, used as human food. This potential should be used.

Between 1960 and 1967 world food production rose about 20% and per capita production rose slightly overall. Yet per capita production in underdeveloped countries dropped between 1964 and 1966 causing concern that the food battle was lost. However, during the last few years, dramatic increases were achieved in many of the hungry nations, increases which were directly attributed to better varieties along with good farming practices.

Present production capacity. Production in developed countries can be easily doubled by multiple cropping and by optimizing other inputs[1,9,13]. Underdeveloped nations can achieve 5- to 10-fold increases by using presently available thechnology. The tropical crop, coffee, was recently found[3] to produce more than 10 times the usual yield by using superior varieties, high density spacing, fertilizers and other good practices. In Oregon, high density plantings of vegetable crops and fruit trees have resulted in 5- to 8-fold yield increases.

Much protein food can be produced by feeding ruminant livestock on straw, using urea as a source of nitrogen[11]. The use of 127,000 metric tons of urea in this way was equal to 813,000 tons of soybean meal as stock feed. This type of protein production is of great value because primary human food is not used as animal feed.

The gloom and doom statements of non-agriculturists are part fact and part fiction, and they fail to distinguish between the two. Their estimates of agriculture's capacity to produce food is grossly in error.

Underveloped potential. The breeding of high-yield, high-protein grains and seed crops has great potential for providing people with more and higher quality food. For example, a wild oat species has been found[2] that contains 10 to 12% more protein than standard varieties. Corn with a high lysine endosperm is being bred in Mexico for tropical climates and is being tested in South America, India, Thailand, and Africa. Another potential source of high quality food is from leaf proteins. Hodgson[10] points out that the yield of leaf protein per acre greatly exceeds that of seed protein and that leaf protein also is of higher quality. Research shows that leaves of some species already have the desired quality without an extensive breeding program.

The oceans still remain to be tapped for food. At present, only 1.1% of their potential is being used[8]. World value of sea foods is only $4.65 billion, compared to $236.00 billion for land food[8]. Whether a significant increase from the oceans is economically feasible is being debated.

Much research remains to be done to bring the billions of acres of humid tropics into production. This will come slowly but recent work indicates promise. One big advantage of the tropics is that 5 to 7 crops can be grown annually as compared to 1 or 2 in temperate zones.

Despite many problems, the world's people can be fed. A recent report (December, 1968) by the Organization for Economic Cooperation and Development indicates that by 1985 the developed nations will have massive surpluses which they cannot use and which the developing nations will not absorb. Some obvious adjustments are needed. In 1971 our own U.S. wheat acreage was cut by another 8 million acres to prevent piling up more surpluses.

Unequal distribution of food will be corrected ultimately by educating the poor. Both hunger and poverty appear to be related to lack of education. Education would accomplish two major things: a) It would provide better earning and purchasing power so that these hungry people could buy more food, and b) it would provide them with the knowledge needed to implement birth control and other community self-help programs. Such a program is not inconsistent with the biblical admonition to multiply, fill the earth and subdue it. Scripture also tells us to be good husbandmen and conservationists.

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Now that we know the intricacies of the genetic code and its associated structures, we are again faced with what appears to be an extremely fortuitous hierarchical organization with no obvious process for its spontaneous origin. . . .

A physical theory of the origin of hierarchical control levels would be a derivation of these principles from a combination of the existing fundamental laws, both dynamical and statistical. It would explain how complex collections of interacting elements spontaneously separate out persistent and coherent descriptions and functions under the constraints that relate them. The origin of life is the lowest level of this process where the genotypes (descriptions) and phenotypes (functions) are generated by the constraints of a genetic code. As yet such a physical theory does not exist.

Howard H. Pattee

"Physical Basis and Origin of Control," in *Hierarchy Theory,* H. H. Pattee, Ed., Braziller, N. Y. p. 103, 107 (1973)

An essay on social thought as understood and practiced by the Hutterian Brethren

The New Jerusalem

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In the New Jerusalem, religious education is of prime importance. This religious education is managed primarily by the elders, exceptional men who have been chosen by the community on the basis of wisdom and love of religion.

The overseeing of religious education takes many forms. The elders must test the children to find out what they are best fitted for and they must choose those men and women who will be well suited to raising children. The elders also guard the sacredness of marriage to see that the strict safeguards covering it are observed.

The elders attempt to assure correct religious education by keeping the community from becoming rich or poor. A poor community does not have the means to train itself and a rich community becomes lazy. The elders also act as censor—keeping the community free of television, radios, and dirty books. In this way they are guarding against sin.

Religion is the basis of the New Jerusalem. Belief in God leaves no room for impiety and prevents a man from turning back towards selfishness.

From what little we know about Christ's early ilfe and training, it is clear that the weightiest factors were the life and teachings of the Hebrew prophets. The strong prophetic strain in the Judaism He knew left a deep mark upon the thought-life of Christ. As a young man, Christ doubtless became, like most Jews of the time, greatly interested in Judaic social and civic life. A few years before His birth, the so-called "Pax Romana" had come to Palestine. The attempt of the Empire to rule by force the freedom-loving People of God of course made for feelings of disgust in the mind of Christ. As He grew in wisdom, the ruthless way in which Roman forces put down any show of fighting back aroused the bitter antagonism of Christ toward those, like the Saducees, who worked with Rome by serving as its lackeys. In the years which followed the rise of the Idumeans to the throne in Jerusalem, indirect rule made for loose and licentious social conditions. Going into the desert for prayer, He was told by His Holy Spirit to turn to the realms of the spiritual to find a faultless Kingdom. Because He was in touch with everyday life and government, and because of the inspiration of His Divine Nature, Christ worked out in His Mind an ideal way of life.

The prophetic principle that knowledge of God is virtue was strengthened by Christ and is a part, therefore, of His New Jerusalem. Religious education, therefore, is the most important thing in the world. Upon this doctrine more than any other, true Christian influence in the twentieth century must be founded.

What is the nature of religious education? Theoretically, Christ implies the answer in His epistemology. The Will of God is the ruling Force of life. Over against the uncertain changing sense world, Christ set up a realm of the eternal, changeless Will of God. Man is but an image of God. Unchangeable reality is found in God. His Will alone lasts forever and is worthwhile. It is His Will alone which man must seek to know and understand.

Because of His "chosen-people" outlook and of His early disgust with the politics of His day, Christ turned away in His social philosophy from the direct study of the people, such as had engaged the attention of Socrates, to a search for a just Kingdom through

studying the Will of God. This line of thinking finds expression chiefly in the Gospels. A long discussion of his teachings is found in Paul's letters. Because they look at nearly every side of social life from one viewpoint, the Gospels, the Acts, the Letters and the Apocalypse, taken together, may be called a treatise in social philosophy.

Christ's thoughts on the beginnings of human life come down to us in simplified form. He begins with God. To meet man's needs, God made for him woman, and thus began the first human group. But instead of seeing why they should obey God, they were proud and rebelled. Christ sought to get man back to his original state. The New Jerusalem is thus paradise regained.

Christ teaches that man should be temperate and self-controlled. He sees man as having a free will, and does not hesitate to make value judgments. There are two sets of forces vieing for the mastery of man, a better and a worse. One leads to mastery of self; the other to self-slavery and unprincipled behavior.

An Ideal Community

Inasmuch as Christ had turned away from an inviting career as a worldy King to a private life of religious thought, the instruction of a few disciples, and a series of occasional public addresses punctuated by miracles, His spotless bride took on marks that were far from worldly. His teachings seem to have in mind a group small enough in size so that everybody could know everybody else. Early Chrisitian communities indeed typically could live together in a single house. Consequently, one cannot apply Christ's social ideas rightly to a modern metropolitan center of 5,000,000 people, or to a nation-state of 200,000,000 people. The New Jerusalem is an intensional community, or a series of intensional communities.

In this New Jerusalem there is a hierarchy of rank, which includes three divisions of people: the elders, the other baptised men, and the women. Children and other dependents might be viewed as a fourth class, but they are not an integral part of the community as such. Thus for His ideal community Christ uses grown men and women. Out of the needs and through the doings of fully developed persons committed to unconditional compliance with the Word of God, Christ builds an ideal commonwealth.

Social Divisions

No man is an island unto himself. Each has his own strengths and weaknesses. By coming together all will be better off. There are not only specialized divisions, but there is specialization within the divisions. A first rule for the building of a just community is that each person shall find his place in the social order and shall fulfill his special function. The New Jerusalem sees the need for having each man do what he is best fitted for.

The people work at the foundational occupations as skilled artisans and farmers, mostly. The advantages of a special education are, as a rule, not open to them. They get the common education, including plenty of exercise, and singing. It makes no sense to try to give a higher education to that large part of the people who can get little good out of it, the more so in that such a *Gemeinschaft* has little need for such higher education.

The baptized men keep order at home, deal in behalf of the community with the outside, and help the elders in this and other work. They defend their way of life by word and deed, but never with violence. As a last recourse, the community may move away, but it may never make war, either in offense or defense. We will never escape, however, either from war or other evils. and Christian community life will thus always be a utopia in theory and a cross in practice.

The New Jerusalem is paradise regained.

Every member of the community is to be a metaphorical soldier for Christ. This needs years of training. The chief trait of a true Christian "soldier" is spiritual courage. The social psychological meaning of this is that the members are always trying to make converts, among their own children and among outsiders. Such a regime raises up enemies against itself, many and mighty, and results in either making the community or breaking it. On the other hand, if the Christians lose their militancy, seeking only to lead a peaceful life and to carry on their affairs quietly, they may in the end even discourage outsiders from joining. Little by little, they go to pieces; their children get that way too. At last, they find themselves at the mercy of the world and Christian witness comes to an end. We have seen this happen many times.

Among the members of the community there will be a few outstandingly able ones, meant by age and helped by training, to be elders. They are to be lovers of wisdom and religion. Weakness of character, drunkenness, or selfishness are unbecoming to them, as is selfish living. The elders should be characterized by the greatest eagerness to do what is good for their community. They will have nothing to do with anything that is against the best interests of the group.

The elders, however, rule aristocratically. They do not seek the will of the common members on every little thing, for the same reason that a teacher does not always ask the wishes of his pupils. They lead the way in showing that they do not care about earthly or material things and always seek social righteousness. The three divisions, the elders, the common brothers, and the sisters, come to have an occupational psychology. Each comes to have occupationally conditioned feelings.

Leadership

All members of the community get the elements of a basic education. At around twenty years of age they must pass an overall religious test, in order that they may become full members through baptism. They may then get practical training in leadership by being chosen head of some enterprise. During middle age, those who have shown fitness may be named to the board of elders. We may say they have passed a practical test lasting several years. It is at this time that they become fully responsible for the everyday life of the community by holding offices. Only at this time are they allowed to be ever seriously exposed to the temptations of the world.

Prospective elders are watched by the community at large for many years. This watching, or informal test, is threefold. The first test is that of logic; they must be able to argue successfully that it pays one to serve the community. The second test is that of fear; they are faced with dangers, for example, the dangers to life during times of persecution, or simply the spiritual dangers which beset those who undertake to rule without favoritism and without compromising their principles when confronted with the wants and wishes of powerful vested interests. The third test is that of pleasure; they must show they can resist all the pleasures which thrill the heart of man.

In other words they must show proof that the highest interest of the community is to be the ruling interest of their lives. Neither pain nor threats must affect their loyalty. The temptations which come from pleasures or the like must not disturb their self-control nor weaken their qualities as elders. From this it will be seen that there is a long period of in-depth training for the elders. This varies greatly from the ancient theory of the divine right of kings and from the current practice of passing out political spoils to friends.

Though the spirit is willing, the flesh is weak. The rulers once chosen and put in office will therefore be tempted to become greedy at the expense of the community. Instead of becoming and staying democratic they will be prone to become tyrannical. It is not always easy, after good elders have been chosen, to keep them so. In order to keep their goodness as elders and to take away the powerful temptation to wink at the ingathering of wealth by the few, some protective devices are built into the plan of the New Jerusalem. The elders, like the common members, may have no private property beyond a few incidentals. They shall, like the common members, not live in their own houses, but shall dwell and eat together. They shall, like the rest, get from the community all they need, but no more. They shall, like the common members, not buy and sell for profit, nor adorn themselves with gold and silver. Like all the members, they shall be taught that they are living in the New Jerusalem, with streets of gold, and therefore shall have no need of earthly wealth. They shall not be subject to pollution from being in touch with outsiders, but as shall be needful to sell or to buy from what the community cannot raise or make for itself, to help the poor with alms, or to convert the unbelieving. If the elders should get any rights not had by all the members, in the way of lands, moneys or homes of their own, they would be unable to give their whole attention to the community, and they would not become guardians of the welfare of the members, but tyrants, plotting and being plotted against. In zealous care that the rulers not be distracted from guarding with undivided attention the interests of the community, the New Jerusalem practices strict community of goods, with no distinction made in this way between the elder and the common brother.

Christian social philosophy is founded upon truthful propaganda.

Public Opinion and Education

The question may be asked: Will the people accept the division of the population into hierarchal divisions? The reply is that the power of public opinion be utilized, and that all who live in the community be taught that they are brothers, that is, children of their common Father, God. This serves to keep members feeling humble. Further, the members are told that different talents have been given by God the Father to His several children. Some have more talents, others less. Those who have more have the power of command and may become elders. Those who have less may stay as heads of departments. Others must be content with no special distinction at all. But all are alike dear to God, and none have any rights not needed in their work.

The objection may be raised that this is but an "opiate", one which a smart man will not be taken in by. That many will disbelieve, is admitted, and a solution of the problem is offered. Teach the children when they are young, and when they are old they will not depart from God's Way. When they grow up, furthermore, they will tell their children, who in turn will teach it. Posterity, thus, will believe it. Others, from the outside, will, from time to time, believe the Good News because of inspired preaching backed up by Godly lives. In this way Christian social philosophy is founded upon truthful propaganda. Any kind of social or economic theory can be foisted upon a whole folk through the utilization of the schools. A few godless exploiters, by controlling or neglecting learning, can ruin a community in a generation.

Vocational Selection

The elders are to test the children in order to find what they are best fitted for. The New Jerusalem holds to a democracy of talent in the sense that talent is believed as likely to show up in the children of the common brethren as in the children of the elders. If a talented child is found, he is to be encouraged and trained in line with that talent. If a child is not talented, a meaningful place should be made for him, too, and he should be helped to fit into that place. Geniuses are born among all classes of society from the highest to the lowest. Therefore, the community should seek out potential genius and give it opportunities commensurate with what it can do and not let its God-given spark of life be snuffed out.

Furthermore, in the Christian Way, men and women well suited to the raising of children should be chosen, and the children of the community should be given over to them, not necessarily their own fleshly mothers and fathers. This makes it likely that children will be raised in a loving, but fair way, and makes it unlikely that children will be spoiled, or battered.

The elders are to oversee marriage. It is too bad that almost all choose their life-partners on the basis of things which have little to do with their later married life. The marriage tie should not be firstly an individual affair, but should be ruled by the thought of the children not yet born and also by due thought to the welfare of the family and community. The true end of marriage is not found in wealth or power or rank, but in the begetting of healthy-minded children. Marriage is sacred in the highest because it is a needful part of

God's plan. Marriage between unlike persons is to be deplored. Marriage is sacred, and hence should be covered by strict safeguards, including the eugenic one that those who are close kin by blood should not marry.

Poverty and Wealth

The elders shall keep the community from becoming either rich or poor. Poverty is the father of meanness and viciousness, and wealth leads to luxury and laziness. Both make for restlessness and both cause the breakdown of true religion. The poor community cannot rightly outfit or train itself, the rich community will grow careless and no longer work hard when it comes to the getting of new members.

In the getting of wealth the law of "monkey see, monkey do" works powerfully. One man gets goods; others are right away moved to do likewise. Therefore, all the members may become lovers of money. But a money-loving membership would be the downfall of the community.

The more wealth that a man gets, the more he will want to get. The push of greed pulls men apart from one another. The more a man is taken in by the wealth-getting lie, the less does he work at staying good. When the wish to be good is working against the wish for wealth, the first wanes as the other waxes.

When the community becomes founded on private property, the wealthy have power and the poor are kept from it. In quiet times the wealthy care as little for the welfare of the poor as for becoming good. On this and other grounds, private property has no place in the Christian community.

Where you see a community that has become poor, you may safely believe that somewhere there are also thieves and other sinners. The causes of pauperism are (1) a lack of proper education, (2) ill-training, and (3) unjust ordinances or an unjust rule by the elders.

The two big economic evils are wealth and poverty. Therefore to be poor in spirit means to share worldly goods, not do without them, as a rule.

In the true Christian community, there are two ways of getting away from great wealth or poverty: legislation and education. Each person is guaranteed a small amount of goods, such as furniture, clothing, books, and the like. He may get more, but not so much that his life-style differs from the other brethren. The community quite properly insists that, beyond trivia, a member if moved by the right spirit will freely share what he gets, from any sources, with all, unless he has gotten it from the community itself.

Censorship

The elders are censors. They make sure the community is free of radios, televisions, dirty books, etc., in order to keep the children from seeing filthy sights and hearing unseemly sounds. Particularly fiction shall be censored in order to keep the children from reading and taking over bad thoughts. Vice and intemperance shall be kept from being shown, in order that the elders of time to come may not grow up with images of moral illness, and in order that the children may grow up around fair sights and may get unhindered and unhampered the good in everything.

The elders guard against sin. Since the plan of the New Jerusalem is faultless, any change would be for the worse. Hence, the elders carefully guard the customs, letting in nothing new not needful to stay alive in a changing world. If changes are made in small things, there may be no stopping the spirit of change, and great things may be lost sight of too.

The New Jerusalem rests upon the education of wise leaders. Their judgment is better even than rule by ordinances. Ordinances should be as few as can be, for they tend to be too unbending. In view of the changeable character of man's life, no last nor absolute ordinances can be laid down. The good things about ordinances, however, is not that they make men honest, but that they make men act the same and hence in a socially reliable way. Ordinances are to be looked up to because they stand for the ripe fruits of much learning and because they give a man a way of showing his yieldedness to the community and to God.

Inasmuch as the New Jerusalem is the Bride of Christ, without spot or wrinkle, any change would likely be for the worse.

Punishment for sins are a part of the ordinances. In view of the sanctity of custom and of the needfulness of ordinances, obedience is a highly important Christian virtue. Punishment in the New Jerusalem is not a vindictive, but a preventive and reformatory measure. Reformation is the true aim of punishment. It is, nevertheless, sometimes needful, for the good of the whole, to be firm, even harsh. For example, he who will not work shall not eat. There is a division of labor between the sexes, but both sexes enjoy the fullness of the priesthood of Jesus Christ. Men are stronger than women, and, both by training and inclination, different in mind and heart. Hence some jobs are more fitting for men, others for women. There is nothing more degrading in this for either sex; each sex is looked up to for what it is.

The great importance of child-bearing is understood, and it is therefore fitting that woman give much of her life to the rearing of children. But all women, as well as men, should be able to grow in sanctity, the first aim of all the members. Those women who have talent for this or that are free to develop it, consistent with their duties to family and community. This, of course, is true of men as well. Members of the New Jerusalem are conservative Christians, conserving the rights of both men and women, different though the rights of the latter be from the former in some cases.

Women are to prophesy and warn, and it is therefore fitting that they be knowledgeable and well trained. Hence they get the same opportunities for schooling as men.

Role of Education

Training is strongly stressed. This educational system, however, is definitely run by the elders, in a fatherly way of course. Common education is of two kinds: vocational and religious. Vocational education enables the community to support itself, a means; religious education enables it to grow in the spirit, the end. The first without the other makes for a clever

brute; the other without the first brings poverty with all its evils. The two together make for the moderate, practical man of God.

Education is not brain washing, but growth of the powers of knowing God's will within man. It is life-long; it begins with birth and goes on until death. However, it slows up as one grows old. An aged man cannot learn much, any more than he can run much. But mostly he need not learn much, for he has gotten wise, and he need not run much, for there are younger men at hand to do such things. As a child is educated, so will his future be determined. A child should be taught early to honor his mother and father. Great care should be given to the first years of life. From three to six years of age the children in the New Jerusalem come under the care of chosen women.

Schooling is for everyone, but, above childhood, not compulsory. The laws of imitation are to be utilized; the teacher shall be himself what he tells others they should be.

A well-trained man is another Christ. Religion, then, plays a basic role in the New Jerusalem. Belief in God leaves no room for the belief that might is right. Impiety undermines the strength of the Kingdom. God and community are one, for the community is the body of Christ. God made man for himself. It therefore follows that God created the one for the many, but not the many for the one. The worship of God is needful for a man to keep him from going back to swinishness and his love from turning into selfishness.

Social Change

Inasmuch as the New Jerusalem is the Bride of Christ, without spot or wrinkle, any change would likely be for the worse. But even Christians who have separated themselves from the world, the flesh and the Devil are not safe from the wiles of Satan. The elders are not proof against the temptations of power. To take away stirrings of self-interest in the minds of the elders, they are to share and share alike with the common brethren.

In spite of good safeguards the wisdom of the best elders will from time to time fail them. Sooner or later they will err. Communities will weaken and even fall apart. But the Holy Spirit will always come to save and renew or refound. There will always be a remnant of the New Jerusalem somewhere until the end of the world. We Hutterians believe we are that remnant today, and welcome inquiry into our way of life.

The Student Corner

Each of the next three papers was written recently while the author was a college undergraduate.

Evolution: Before and After

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The Controversy

It all began with the fierce battle between William Jennings Bryan and Clarence Darrow in the Scopes Monkey Trial Case: the Bible beaters against the godless heretical scientists. The issue remains unsolved today as we continue wrestling with the issue of teaching "creation theory" in the public schools.

The origin of the human species has caused a great deal of controversy for a long time. This "debate" on human origins has been carried on in my own mind for some years and has recently taken a strong turn, undoubtedly not its last. Being both a devout Christian and an interested science major, I felt the need to reconcile these two descriptions to a rational composite view. Obviously the radical extremes of any argument are wrong. Exactly what position on this controversy reflects reality I may never know, yet I have at least set my mind at ease for the present. I will attempt to put forth here both the inputs from science and religion on this topic and relate the conclusions drawn from these inputs which determined my former and present attitudes.

Before

My original position held Darwinian evolution in some contempt and was based primarily on my own "Biblical interpretation." As I looked at Darwin, certain negative points stood out. Darwin's theory of natural selection depends upon the selection of those gene pools which reproduce more efficiently over those gene pools which have fewer progeny and subsequently die out. Beneficial changes in the genetic makeup of a given organism come about by gene recombination or mutation, according to Darwin. This theory, it seemed to me, could never account for man being anything more than the best animal on the earth. If man were just an animal, then we might possibly be controlled by nothing more than instinct and surroundings. This possibility gives support to the theories of behavioralists such as B. F. Skinner. These behavioralists assume that men are completely controlled by their environment[1] and can therefore in no way be influenced by a supernatural God. They hold that God is dead and that man is a social, but not a spiritual, being. My Christian faith could obviously never tolerate these assumptions; therefore, I began to dismiss the theory of evolution. It was also apparent to me that natural selection was not actually creative, merely selective, and I felt it was necessary for God to create a spirit in men, so that we might know God personally as no other animal could. The animalistic picture of man, the control of man by his environment, and the lack of creativity in natural selection all pointed me away from confidence in Darwin's theories.

My former position was mainly formulated from my interpretations of Scripture and personal feelings on the nature of man. The Bible clearly speaks (Genesis 1:26,27) of God creating a very special creature in his own likeness, a creature who can know God personally, a spiritual being. To my thinking, this spiritual quality of man could never have come about by natural selection, but only by a special act of God. Also, as a Christian with feelings, concerns, and an active faith, I did not like to think of myself as merely the "end of the line" of primate development. I considered myself to be the special creature molded by God's own hand described in Genesis, and allowed this prejudice to affect my judgment of evolution.

My original stance held that Darwin was probably wrong. I felt he may have been partially correct, but was certainly wrong about man himself. The mere initiation of evolution by the formation of one protein from free component particles was extremely improbable,[2] and I considered this additional grounds to reject Darwin partially. Darwin apparently left man as merely an intelligent animal, at the mercy of Skinner and his associates in behavioral psychology. I could never tolerate Skinner's approaches, which completely ruled out God's existence, not to mention his sovereignty over men's lives. Scripture seemed to me to point to a special creation of the only truly spiritual creatures on earth. This attitude along with my feeling of being personally special to God and not wanting to fit into any Darwinian pigeon holes, directed me away from the popular scientific explanation of man's origin and toward a more literal conservative position on Genesis. Exactly how much of Genesis was plain fact and how much was Biblical symbolism I had no idea, but I had adequate confidence in my own understanding to contend with certain conclusions drawn from evolutionary theory.

I had asserted that God could have used evolution to a point, but that evolution could not explain spirituality in terms of natural selection and genetic alterations.

After

My original position on evolution was not the strongest of my convictions and I was open to new ideas. My feelings have recently altered primarily due to new evidence, which might be classified as "scientific," though not "scientismic." New inputs came as a result of enrollment in an Undergraduate Seminar on "Issues in Science and Religion."[3] The readings and discussions in this seminar led to a clear change in my attitude. I realized that my former position rested on the necessity of a "God-of-the-gaps." Due to a lack of knowledge concerning the "how" of man's spirituality, I said that, "God did it," just as the Greeks accounted many things to mythological gods simply because of their own lack of understanding. I had asserted that God could have used evolution to a point, but that evolution could not explain spirituality in terms of natural selection and genetic alterations. This kind of thinking sounds much like invoking a god for "gap-filling." Was I not being contradictory by allowing Darwin a certain area in which he was correct, yet cutting him off at an arbitrary point prior to the emergence of man, without a sound reason? As Malcolm Jeeves wrote,

> there is in principle no conflict between Christian faith in general and the discovery of a scientific mechanism for creation. When people (both atheists and theists) say that evolution (as a scientific theory) undermines faith, they are quite wrong. In principle it cannot do so. . . . When we affirm that God created, we do not rule out the possibility that he did it via a natural process.[4]

Indeed, I was not permitting God to act in a process that could be naturally described; this limitation of God's power of expression in his creation is dangerous and should be avoided. God's ways are numerous and mysterious; therefore, we must be forever available to new insights which can point us toward a better reflection of reality. If man's spirituality did not come through evolutionary development, how did it happen? Was each man injected with a special cosmic "juice" at birth or at conception? How did this spiritual "injection" change a person's makeup? If it occurred during the gestation period, would the religious convictions of the mother have an effect on the child? These questions all help to reveal how nebulous is the idea of a special act of God in instilling each man's own spirit. There must be a more rational explanation. Possibly God acted in the way described as evolution to arrive at the physiology of man, and it was this unique physiology which overall gave man his spirituality. Not a single gene or chromosome, but the inter-

workings of the entire body, the makeup of the whole man, was designed by God in such a way that men could (and do!) know God in a personal, spiritual, eternal relationship. Who am I to limit God and determine that he could not have done this? How wise am I that I know the inner spirit of man to be definitely otherwise? Actually, it seemed more reasonable for an orderly God to work within the framework of orderly processes.

This new idea sent me back to the Bible to search again for a compatible medium between literalism and symbolism. In the first account of creation in Genesis 1, God proceeds by a seemingly rational, orderly procession of creative events: first light and dark, then heaven and earth, then small life and plants, then complex life and animals in the oceans, then land animals, and finally man. This order is one which no scientist would contest. The Genesis 1 account appears to be chronological when Gen. 1:1–2:3 speaks of the "first day," "the second day," etc. These are probably not 24-hour days, but they certainly point toward a chronological order. By looking again at God's word in the Bible and at his creation out my window, I could see how God's creation was not haphazard, but was orderly and could be described in terms of certain "natural laws." If man is the pinnacle of God's creation, shouldn't he be the most orderly and rational being in nature? To explain man's spirituality within creation makes much more sense than to force the Lord to be a "God-of-the-gaps," injecting infants with some nebulous "juice."

I now hold that the resounding truths of evolution and Genesis are compatibly true. Most importantly, *God created.* Whatever the actual method was, the creator was God, and this is the main point of Genesis. Evolution primarily calls for the development of the different organisms found in nature; this certainly does not conflict with what the Bible tells us. Our fault is often that we throw away any scientific evidence that has been used by scientists to come to an atheistic conclusion. We must ourselves take science's observations and correlate them with the Truth of God to come to a rational Christian conclusion. We must never dismiss what science *observes,* but should always be critical of what science *assumes* and *concludes* concerning the nature of man.

My Seminar has been an experience which definitely brought me to a much more comfortable, reasonable and acceptable position in my thinking concerning evolution. I am certainly still open to any suggestions and/or information that can help us to understand God's world better. We should not be terribly troubled by unanswered questions, but let us never stop seeking the whole truth. I Corinthians 13:12,13.

REFERENCES

[1]B. F. Skinner, *Beyond Freedom and Dignity,*

[2]I. Barbour, *Issues in Science and Religion,* Prentice-Hall (1966), p. 387. This calculation does not account for the possible favorable conditions present, and thus contributed to the weakness of my original argument.

[3]R. H. Bube, Professor, "Issues in Science and Religion," Undergraduate Special Seminar 116, Stanford University, Autumn 1972.

[4]M. A. Jeeves, *The Scientific Enterprise and Christian Faith,* Tyndale (London). 103, (1969)

Sir Isaac Goes Courting

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Once upon a time there was a small, all-male, beer-drinking community. It was the way of life in this community to spend a great majority of one's waking hours at the sole local pub with his fellow townsmen telling of and debating all those things which no one present had ever seen. And when discussions grew wearisome, or definitive conclusions were reached, or when for any other reason one was not occupied, he would proceed to the brewery to assist in maintaining the storehouses or travel to nearby towns to trade the excellent brew for the necessaries demanded for the community's day-to-day existence.

Now it so happened that on one of these excursions through the countryside the vision of one Sir Isaac Goodeyes, so named for his exceptional ability to describe so vividly things he had never seen, alighted upon the graceful form of the most beautiful maiden in all the universe, Physical World by name. Sir Isaac, unable to believe his eyes (having never had to trust them before), immediately decided that she warranted more thorough investigation. Whereupon Goodeyes spent the rest of the day, of which there was precious little left, and much of the night (or morning as the case may be) increasing his physical contact with

Physical World under the guise of testing the validity of his initial observation.

Sir Isaac arrived at the town bursting with his story and one day late with the food, which was not missed because of the lively war which had been waged all night over whether or not Goodeyes' delayed return signified that he was dead, or alive, or somewhere in between. Pausing for a moment to regain his composure just outside the tavern, he glided stately through the doors and the stormy debate, which continued to rage full force in spite of his presence, to the center of the floor. There he stood for several minutes—silent, but with a smile of self-sufficient authority firmly fixed on his lips. The suggestion was made that Sir Isaac be consulted in order to resolve the conflict as he had now returned. However, the debate immediately resumed over the question of whether or not Isaac's opinion could be considered authoritative in such a personal matter.

Nevertheless, Sir Isaac apparently had something to say and his self-satisfied look promised an especially juicy controversy. Those who held this expectation were not to be disappointed, for Isaac began to tell of his having seen the most beautiful girl in the world and to recall her appearance with astounding accuracy and detail. All assumed, of course, that Goodeyes was simply living up to his name, and chose to disagree with his description, saying that the most beautiful maiden in the world could simply not be as he conceived her. Each offered his own conception as the true one; those with similar tastes quickly joined into factions; and the controversy was under way. Isaac was not about to be brushed aside so easily, and so, exclaiming in a loud voice that this was not a subject that was open to question but that instead the maiden lived just down the road and anyone who wanted could come and see for himself, he left.

The confrontation ground to a screeching halt. No one in the history of the town had ever hinted that anything could exist that was not open to question. And the very idea that certainty could be achieved using the eye rather than the mind, by inspection rather than debate, was assumed preposterous. So some scoffed, and others suggested that they discuss the problem, but most, being stunned by his rocky logic, followed Sir Isaac Goodeyes down the road in a disoriented daze, apparently to "see for themselves".

Well, upon first hand observation, the agreement was universal that indeed Physical World was the most attractive maiden in the universe and that Sir Isaac's record of her features had been amazingly accurate. All congratulated Sir Isaac on the integrity of his observations and discovery; and for the first time everyone in the community held the same opinion concerning the same thing.

This utopian scientific peace did not endure forever, however, for disagreements soon arose as to the actual dimensions of her features since each man considered himself to be her perfect suitor, and her to be the perfect size to be his mistress. Then, just as the controversy began to erupt, a serendipitous bolt of memory struck the minds of all involved and they rushed off to Physical World's home armed with measuring tapes and bathroom scales.

It was not long after this, when the entire population of the town had become well versed in and thoroughly convinced of the validity of the Inspectional Method, that another fair maiden by the name of Human Behavior chanced to pass through the field of vision of the now well trained receptors of Sir Isaac Goodeyes. Although he could not put his finger on the reason, Sir Isaac found her exceptionally intriguing. So he whipped out his measuring tape and collapsible bathroom scale, courteously inquired if she would mind participating in a scientific survey, and, having made his initial observations, rushed off with his data to the Pub.

The Pub had since been expanded to an extensive laboratory, and the bar had been replaced by a snack shoppe equipped with frozen wienerschnitzel vending machines, microwave ovens, and distilled water On-Tap. It was to this environment with its admirable concern for accuracy, efficiency, and purity, that Goodeyes brought the data collected in his intriguing observation. No one else at the Pub, however, found the data to be very intriguing. In fact, at first perusal they considered it a quite mundane set of results. The statistical analysis found no significant difference between Human Behavior and the general population, and Goodeyes was dismissed as growing somewhat myopic with age.

Apparently Human Behavior was making the rounds that day or there were several women all with the same name in town, because men were coming into the Pub all afternoon with their measurements of a most unusual female. Some exclaimed that her beauty far surpassed that of Physical World while others found her ugliness so repulsive that they could hardly remain with her long enough to make the measurements. The most puzzling thing of all, however, was that what each man said did not always match up with his measurements of her and the data themselves tended to change with the area of the city in which they were obtained.

Now, *that* was an intriguing problem. So they sent out a group of random samplers to extract Human Behavior from wherever she happened to be and hire her as a research assistant.

Having captured her in body, they proceeded to weigh and measure everything about her of which they could, morally or immorally, get a quantitative description. Much to their dismay, they found that every time they moved from one thing to another, the previous one changed. She was as pliable as water. Every time the situation changed, she varied her appearance. And even when the surroundings remained the same she fluctuated slightly from moment to moment.

Frustrated and hamstrung by their inability to make exact measurements, they discovered that infamous stifler of variance, the average. They went virtually crazy with enthusiasm, cutting her capriciousness to shreds and putting in its vacant position a record of apparent peace and stability.

Their next move was to introduce facsimiles of all kinds of things in the real world to see how much effect the real things had on her. This was all done under the careful control of the laboratory setting, and she encountered each facsimile many different times so that they could get a real Liberty Bell distribution. They proceeded to average her variations, and average

the variations of her averages until they knew, beyond a shadow of a doubt, precisely where she might possibly be.

They now knew the relative importance of everything that could possibly impinge upon her existence. So they calculated how she would change if they took her outside, got their answer, took her outside, and lo and behold she wasn't anything like that. Everything together wasn't at all like everything alone; and the real things weren't anything like the facsimiles.

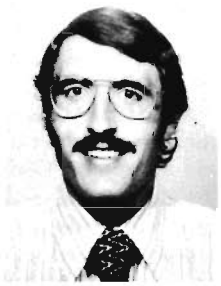
Well, some said that what they needed was a theory; and others called for more control; still others said they needed a more realistic situation. The solution was not at all clear from their observations. And so, a great debate began, with a fervor the likes of which had not been seen since the pre-Goodeyesian days. All the apparatus in the Pub was removed so all could join, and someone called for beer to drench the shout-parched throats.

Sir Isaac had been observing the course of events from the shadows and making no small use of the power of his good eyes. Seeing that Human Behavior had been forgotten by the crowd in its preoccupation with the controversy, he made his way to her unobserved and knowing exactly how she would respond, took her hand and led her away.

As they passed through the deserted streets and out across the countryside leaving the town behind, she turned to him and asked, "What were they seeing when they looked at me so closely?"

"That you were alive."

Free Will and Determinism



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Significance

The long standing debate over free will and determinism often seems like a useless intellectual battle. What relevance has it to our lives? This type of thinking is quite understandable, considering the complexity of the problem and diversity of opinion, but the fact remains that the question is of considerable importance. If man, his existence, actions and thoughts, are all determined solely and completely by the motion of atomic particles behaving according to set laws, then how can anyone be said to have responsibility? When there is no genuine choice involved in one's actions, both guilt and praise lose their significance. The criminal is not responsible for his crime, and the compassionate, socially concerned individual cannot be said to be responsible for his good deeds.

For the Christian the problem takes on special significance, for how can God be said to be just in condemning those who do not submit to His will? Also, if our rebellion against God is something beyond our control, then God must be said to be responsible for the human evil in the world. At stake is the question of whether man is a free agent or simply a complex biological machine, and whether God can be said to be just if indeed He does exist.

Attempted Solutions

There have been many attempted solutions to the problem, but as yet there is no clear-cut answer. This paper is not another attempt to arrive at a definite conclusion but rather it endeavors to set forth a basic foundation upon which any solution must be based. Some possible solutions are outlined and discussed, but these are speculations and for that reason must be considered lines of approach to the problem and not final solutions. We also consider the limitations of our reason as they affect any attempt to find a solution. Finally, in light of this, the relevance of Biblical teaching is considered, and a Christian response is set forth.

Any viable solution to the problem of free will and determinism must take into account the facts which are at one's disposal. One must not ignore either the scientific data or the experiences which we possess. The whole question arises as a result of what at times appears to be conflicting evidence.

On the one hand, man possesses something called consciousness by which he is able to reflect upon the nature of himself and to see himself as distinct from "the world outside" which is present in his perceptions. Regardless of what he conceives the nature of the world to be, he recognizes himself as a thinking and willing being. It has taken on such philosophical statements as that of Augustine or Descartes: "I doubt, therefore I exist," "I think, therefore I exist." We tend to regard ourselves as subjects, initiating action, having control of our thoughts and actions, being able to choose between various alternatives and then having

responsibility for those thoughts and actions.

Arising in apparent opposition to this are the findings of science regarding the nature of man. Evolution indicates that man has developed from lower life forms, and the advances in chemistry and biology indicate that the human body is composed of chemicals operating according to physical laws. More recently this has also been shown true for the operations of the brain. Although this is a new frontier, it is known that emotions, drives, memory, sensations, and thoughts all have bases in physical-chemical activities, which if altered cause changes in our conscious thought.

It is an assumption of many that, at least in theory, all of our thoughts can be described in terms of physical-chemical processes. All physical effects can be seen as arising necessarily from physical causes. This, at least has been the assumption of science and in fact has demonstrated its usefulness.

We therefore have here what seem to be two contradictory ideas. Man perceives himself as autonomous, not being pre-determined in his actions, but nevertheless our thoughts seem to arise from the physical structure of the brain which as far as we can tell follows the causal laws of physics.

Some people have concluded from this that our perception of ourselves as free agents is an illusion, consciousness simply being a characteristic of the particular arrangement of atoms and molecules in the brain. Man, therefore, is seen as being a complex biological machine and nothing more.

Is Man Only a Machine?

This conclusion that man is only a machine and that free will is simply an illusion does not necessarily follow. Some of the various possible alternatives are now considered. They can be placed under three general categories:

1. The incompleteness of physical description.
2. The completeness but not exclusiveness of physical description.
3. The limited validity of physical description.

The first of these takes note of the fact that although we know quite a bit about the functioning of the brain, it is still largely a mystery. We know where in the brain certain functions take place and that they are accompanied by electrical and chemical activity. We also know that people's thoughts are conditioned to a large extent by past behavior patterns and experiences. Nevertheless such basic phenomena as memory storage, perception, learning and consciousness are but very poorly understood. The belief that every thought will eventually have complete description and hence in theory complete predictability is based not so much on the evidence as it is upon the assumption undergirding science that all empirical phenomena are understandable in terms of physical causes.

Those who defend free will by resisting the physical determinist's conclusion may do so by postulating a gap or gaps in the physical description. There are commonly two approaches. The first approach postulates that as physiological psychologists gradually learn more and more about the brain, they will eventually come to observe physical events which have no physical causes. The reason why this is postulated is that the mind (which by this view is held to be spiritual) must in some way be able to affect the physical processes in the brain which give rise to thoughts. If there were a complete physical description, i.e., that every physical event necessarily follows from its causes according to the physical laws, then there would be no room for a spiritual mind to have any effect upon the activity of the brain. People of this view therefore see the human mind as supernatural (outside of Nature), and each physically uncaused thought can properly be called a miracle.

Man perceives himself as autonomous, not being pre-determined in his actions, but nevertheless our thoughts seem to arise from the physical structure of the brain which as far as we can tell follows the causal laws of physics.

The greatest problem with this approach is that it has no support from empirical evidence and must stand in a corner of knowledge (or more properly non-knowledge) which continually gets smaller. It is felt to be justified as an exception to the natural physical order by the fact of the uniqueness of man and his perception of his own personal autonomy. Although this is a possibility, it opens itself to the same possible fate as other "God-of-the-gap" theories.

The second and more popular gap approach rests upon randomness at the atomic level which is at times hypothesized from the Heisenberg Uncertainty Principle. The Heisenberg Uncertainty Principle states that it is impossible to know both the position and the direction of velocity of a subatomic particle. It may be that there is indeed randomness at the atomic level, but then again it may be that the present unpredictability of position and velocity is due not to randomness but is instead due to problems of measurement, i.e., in the process of measuring, we affect what we are trying to measure. Still another possibility is that the concepts of position and velocity may simply not have meaning at that level.

This approach has two problems. First it must be assumed that randomness does exist at the atomic level. Secondly, randomness in itself does not lead necessarily to the conclusion that we have responsible choice. Responsibility does not mean lack of predictability, for the action which doesn't utilize past information and follow lines of reasoning is said to be the opposite of responsible. Therefore if this approach is to be valid, it must be assumed that randomness at the atomic level merely opens the door for the spiritual mind to control, on a large scale, the motion of atomic particles and hence effect control of macroscopic events in the brain. If a non-material mind is not hypothesized then the randomness at the atomic level loses any effect on a larger scale due to averaging probabilities, and responsibility is lost. Indeed responsibility is the central issue at stake in the problem of free will and determinism.

Both of the above approaches, which assert the

incompleteness of physical description, are possible solutions to the problem, but they are not the only possible solutions. We now consider the type of solution which asserts the possibility of complete physical description but nevertheless claims that physics is only one of many valid and necessary levels of description.

Rejection of Reductionism

This type of solution to the problem is based upon the rejection of reductionism. It, unlike reductionism, asserts that the whole is more than the sum of the parts. With increasing complexity of an interactive whole, new and different levels of description are required, and these are not reducible to the atomic particles of which they are composed. This is not to say that different descriptive levels exist apart from matter and ultimately energy, but rather, it is saying that various configurations of matter viewed as a whole have characteristics which are not contained within the sum of the parts considered separately.

This can perhaps be made clear by considering a very simple example. When two hydrogen atoms are brought together, they form a hydrogen molecule. The two atoms interact and a vibration occurs. This interaction is not something we would call real in the same sense as is the matter involved, but it is not an illusion. Further, although we can think of the interaction being potential in the individual atoms, it is nevertheless not present in them individually. It is lost when we attempt to reduce the description of the hydrogen molecule to its constituent parts. For this same reason geology, biology, psychology, sociology, politics, etc. are not reducible to the level of description of physics. They are ultimately based upon matter, the atomic particles which compose them, but as we consider different and higher levels of interaction, new and unique characteristics arise which are irreducible to lower levels which form their basis.

Instead of postulating the control of a non-material mind through random atomic level activity, one can hypothesize that the control of the direction of one's thoughts arises from the character of man as a whole interacting being.

The point of all this in regard to the question of determinism is that, although a complete description may be possible on the level of physics, this does not mean that other levels of descriptions are invalidated. In brief, one can say that on the physical level of description one is determined, and yet on the level viewing man as an interacting whole, he can be said to possess freedom and responsibility.

It can, by means of this approach, be argued that those characteristics which are unique to man (self-consciousness, personality, developed rational potentialities, consciousness of God, and consciousness of moral standards) all arise from the structure and interaction of man as a whole person. These can be seen as having their foundation in physical description, but they themselves are unique in man and are more than the physical level from which they arose. This uniqueness of man enables him to rise above the sheer subservience to passion. He is able to evaluate his possible courses of action and their consequences and then act upon them. Therefore instead of postulating the control of a non-material mind through random atomic level activity, one can here hypothesize that the control of the direction of one's thoughts arises from the character of man as a whole interacting being. Everyone therefore can be said to have a basic awareness through his reason of what is right and wrong, and to have the potentiality to turn to what is right.

This formulation, however, does not completely solve the problem. It hypothesizes that, due to its complexity and structure, the brain, although following the laws of nature, does have genuine alternatives. This accords with subjective human experience, but goes against the general assumption of science, that effects can be fully understood in terms of efficient and necessary causes.

Limitations on Understanding

This brings us to the last type of solution to the question. Briefly stated it asserts that the problem lies in our inability to understand reality in anything more than a limited perspective. The fact that we are finite human beings means that our conceptions of determinism and free will are going to possess only limited validity.

The best-known formulation of this is that of Immanuel Kant. Like empiricists, he maintained that all of our thoughts and ideas must be founded on the data of sensation. Nevertheless what we perceive is not reality, things-in-themselves, but rather we perceive only what our mind has synthesized and made to conform to the categories inherent in the structure of the mind. Space, time, causality, and principles of science and math are all categories of the mind.

Therefore anything we perceive, we must of necessity perceive as being causally determined. This does not mean that things-in-themselves are causally determined, but rather that this is a category imposed by the mind. It is therefore, according to Kant, possible for man to be phenomenally determined and yet noumenally free, phenomena being things as we perceive them, and noumena being the things-in-themselves.

Kant may not be right in his radical separation of phenomena from noumena, but the fact remains that our perception of the world is *our* perception. The very act of perception sifts and orders the content of our perceptions. In addition, we use models as constructs for understanding our perceptions. Such is science. The lesson for us to learn from this is that we must avoid the temptation to equate our constructs with reality itself. This lesson is also coming to us in modern physics.

Newtonian physics had assumed that the world consisted of fundamental, irreducible particles which move and interact with each other according to certain natural laws, which at least in theory would enable a neutral observer to predict any future event, given complete knowledge of the state of affairs at a given moment.

Scripture, in what appears as paradox, is expressing profound truth.

This is the assumption of physical determinism.

Today we know that Newtonian physics has been shown to be sorely inadequate. We are confronted with the Heisenberg Uncertainty Principle and the relativity of time and space. Because matter seems to be convertible into energy we no longer know what "matter" is. We might say "static energy", but what is energy? We try to explain something like light, and we are forced to use conceptual models, which, if taken strictly, appear to be contradictory to each other i.e., waves and particles. The utility of Newtonian physics in most areas is obvious, but we know today that it is woefully lacking when its constructs and asssumptions are taken for reality-in-itself.

In the light of recent discoveries in science and recognition of the fact that we must view the world from a limited perspective, we ought to be humble before such a complex question as free will and determinism. We are beginning to see that we understand the world much less than we had thought. It may be that there is neither determinism nor free will as we conceive of them, and that both of these ideas have only limited validity.

Teaching of Scripture

With these things in mind the profundity of Biblical teaching is fairly obvious. Throughout church history people have twisted Scripture to try to deny either free will or determinism. The fact is, however, that Scripture clearly teaches both that all things are taking place according to God's sovereign plan, and that we have responsibility for the decisions we make. God does not lead us into temptation, and He does not cause us to fall. From one perspective this appears to be a paradox, but then we have only a limited view of reality. We are making a mistake if we think the world must be exactly as we conceive it.

Scripture recognizes both what we know about determination and free will. We are conditioned by our actions and environment. The command to keep our minds on those things which are pure and of good report is no idle statement. By the things we do, we develop patterns which may either be molding us into the image of Christ or be hardening us to God's will. Each time Pharaoh acted against God, his heart became more hardened. Scripture clearly indicates we are not free from determining influences; it recognizes the phenomena which we today call psychological conditioning. When we fail to appeal to God, we succumb to the power of our passions, losing the ability to become the sort of people that we should be.

In spite of our conditioning, we do in some sense have free will. Scripture clearly teaches that we have responsibility. We may not know exactly how this fits in with the idea of our thoughts being describable in causal terms on the level of physics, but from our experience it makes good sense.

In conclusion we see that Scripture, in what appears as paradox, is expressing profound truth. Its statements are found to be quite accurate in describing reality as we see it. Also as we are coming to recognize our limitations in conceptualization, we are beginning to see the necessity of paradox in our attempt to understand reality. The Christian therefore in his response to the problem of free will and determinism ought to be willing to recognize that he doesn't possess any clear solution, and yet he need not think that the Biblical teaching is in error. On the contrary its insightful statements, its consistency with reality as observable by us, its historical verification in Jesus, and its efficacy in the lives of believers, all give credence to a faith in its reliability as a source of truth.

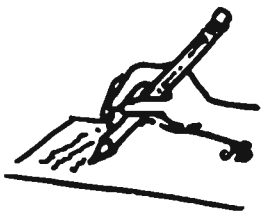
Hierarchical organization in biological systems is characterized by an exquisite array of delicately and intricately interlocked order, steadily increasing in level and complexity and thereby giving rise neogenetically to emergent properties.

Clifford Grobstein
Hierarchical Order and Neogenesis," in *Hierarchy Theory*. H. H. Pattee, Ed., Braziller, N.Y. pp. 46, 47 (1973)

Biological organizations can therefore build new structures from new descriptions, and undoubtedly the richness of the hierarchical levels in living systems depends to some degree on this special ability; but again we have no idea of the processes that generate new levels. . . . Beyond our traditional empirical knowledge of how such organizations have been run in the past, we are at a loss to design any part of a rational hierarchical structure from theoretical principles.

Howard H. Pattee
"Postscript", in *Hierarchy Theory*, H. H. Pattee, Ed., Braziller, N. Y., pp. 144, 145 (1973)

Communications



Ecstasy and Tongue Speaking: A Corrective Note

The so-called tongues issue is very much alive within evangelical circles, as can be seen by a quick perusal of articles recently published in many popular and scholarly publications. Often in these articles there is a recurring point which, as yet, seems to have been inadequately dealt with. This point is concerned with the *nature* of the tongues experience as it is found among those involved in the present day charismatic renewal. With almost predictable regularity the word "ecstatic" is used in conjunction with descriptions of tongue-speaking.

It is not difficult to understand how such a connection is made. The contexts in which glossolalic phenomena have been observed and studied promote it quite strongly. Both the theory and the practice of traditional Pentecostals lend themselves to an interpretation of tongue-speaking as an ecstatic experience. I would like to submit, however, the following thesis which introduces a refining distinction much needed for an accurate interpretation of the nature of tongue-speaking. *The experience of tongue-speaking, as found among those in the current charismatic renewal, is a purely voluntary verbal behavior which is neither ecstatic nor emotional in nature. A distinction must be made between the experience itself and the cultural and responsive patterns which occur with it.*

Note carefully the following points contained in this proposition. First, tongue-speaking is purely voluntary. The typical comment on this by those in the present movement is along these lines: "I can pray in tongues anytime I want and I can stop when I want also." There is no sense of compulsion, although the desire to pray in tongues may be stronger at some times then at others even as in prayer with the mind. There is no question of "possession", whether by the Holy Spirit or any other spirit, involved in tongue-speaking. Any experience which is at all suggestive of spirit possession is suspect and rejected by modern charismatics.

Second, tongue-speaking as an experience is not essentially ecstatic or even emotional. This may seem surprising to many in view of the testimonies often given and the observable phenomena in some contexts. There is often, after all, a context of joy, shouting, clapping, falling down, lifted arms, tears and other such evidences of ecstasy and deep emotion. Again, however, the typical experience and comment by those in the movement is "When I pray in tongues I am aware of where I am and what I am doing. Why, I can even drive a car and pray in tongues!" Larry Christenson, a prominent leader in the renewal, makes this point in these words[1]: "I do not pray in tongues because it gives me a continual thrill. . . . Regardless of what I feel or don't feel, the Bible tells me plainly that the exercise of this gift will have positive results. I believe the Word!" In other words speaking in tongues may or may not be accompanied by emotion or any unusual state.

The third point to note is that, though there is nothing inherently ecstatic or emotional in the experience of speaking in tongues, there is often a personal *response* to this deeply spiritual experience—a response which is relative to the psychological structure of the individual and to his cultural expectations. Emotion is responsive. In this case the emotional response is to an experience which is interpreted as being a supernatural and deeply spiritual one. Further, the psychological effects of praying in tongues are integrative and liberating. It produces changes in the individual which allow him more readily to recognize and to express emotional responses.

Precisely which types and levels of expression are found is a matter of the individual's basic personality structure and also of the ethos and expectations of the Christian community within which the individual is functioning. Here the influences of the social and educational background of the person are evident. The traditional Pentecostals have developed behavioral patterns suggested by their theoretical understanding of their experience and conditiond by their cultural background. The same is true of the new charismatics. Mainline theology and a higher degree of educational and social sophistication have produced an ethos of behavior and response which is as different from the traditional Pentecostals as it is from the typical forms of the mainline Churches from which the new charismatics come.

One further note should be made. Because of the deep spiritual and psychological changes which follow from the regular practice of praying in tongues a new dimension of experience is often opened up. An enhanced openness, expressiveness and sensitivity to spiritual realities can lead to experiences which have been generally associated with the mystical tradition. Unusual and significant dreams, visions, and the spontaneous overflow of emotions, whether of joy or compassion, are more likely to be found as a result of the tongues experience, especially if it is continued regularly and in community. Thus, though tongue-speaking itself is neither ecstatic nor emotional, it may open levels which are.

If persons on both sides of the tongues issue accept and keep in view these simple points a profitable service toward clarity and accuracy will have been accomplished.

[1]Larry Christenson, *Speaking in Tongues,* Dimension Books, Minneapolis 1968, p. 132.

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Huxley's Personal Views

Lest some readers use the Aldous Huxley quote in *Journal ASA* 25, 166 (1973), I think we should print a fuller extract which certainly sheds a different light on Huxley's personal view

if not on the basic thrust of the quote:

"No account of the scientific picture of the world and its history would be complete unless it contained a reminder of the fact, frequently forgotten by scientists themselves, that this picture does not even claim to be comprehensive. From the world we actually live in, the world that is given by our senses, our intuitions of beauty and goodness, our emotions and impulses, our moods and sentiments, the man of science abstracts a simplified private universe of things possessing only those qualities which used to be called "primary." Arbitrarily, because it happens to be convenient, because his methods do not allow him to deal with the immense complexity of reality, he selects from the whole of experience only those elements which can be weighed, measured, numbered, or which lend themselves in any other way to mathematical treatment. By using this technique of simplification and abstraction, the scientist has succeeded to an astonishing degree in understanding and dominating the physical environment. The success was intoxicating and, with an illogicality which, in the circumstances, was doubtless pardonable, many scientists and philosophers came to imagine that this useful abstraction from reality was reality itself. Reality as actually experienced contains intuitions of value and significance, contains love, beauty, mystical ecstasy, intimations of godhead. Science did not and still does not possess intellectual instruments with which to deal with these aspects of reality. Consequently it ignored them and concentrated its attention upon such aspects of the world as it could deal with by means of arithmetic, geometry and the various branches of higher mathematics. Our conviction that the world is meaningless is due in part to the fact (discussed in a latter paragraph) that the philosophy of meaningless lends itself very effectively to furthering the ends of erotic or political passion; in part to a genuine intellectual error—the error of identifying the world of science, a world from which all meaning and value has been deliberately excluded, with ultimate reality."
(Aldous Huxley, *Ends and Means* (1937))

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In Defense of Schaeffer

With all due respect to your testimony as a Christian and your labors in the scientific community, I must take issue with your review of Francis Schaeffer's books in the September 1973 *Journal ASA*.

It is unclear to me whether or not you are supporting the charges of shallowness against Schaeffer. But if you are, must it not be concluded by the same criteria that God's judgments and evaluations of the human race are also shallow? The scriptural record repeatedly overlooks those activities of mankind that at first glance we might take to be important and even crucial in history. Instead, the written revelation gives us detailed views of seemingly minor incidents and personages which are later shown to be an integral part of the grand motif of creation. Schaeffer's contribution to the Christian community (in my mind, at least) is his ability to discern those issues and developments that are truly basic in importance from a spiritual perspective.

Criticism of Schaeffer for basing his discussion of the ideas of Francis Crick and B. F. Skinner on reports in the *New York Times, Newsweek,* etc. is wholly unwarranted. Schaeffer is not making a technical evaluation of the research of these scientists. He is analyzing their personal views and philosophies which would not (hopefully) be found in the basic scientific sources.

The ridicule of Schaeffer's concern over Crick's statement about astrology is a sad testimony to how much we learn from the past. Only a generation ago, students and distinguished scientists alike were dismissed (at the very least) from universities simply because of their racio-religious background. The current circumstances of Sakharov, Yakir and Solzhenitsyn in the Soviet Union are a grim example of the point Schaeffer is making in connection with Crick's statement. Further examples of the legitimacy of Schaeffer's concern over the implications of such statements made in the context of a purely mechanistic *Weltanschauung* could be drawn from almost every part of the world.

You charge Schaeffer with espousing a kind of determinism not very different from that of Skinner, Crick, et al., but I fail to see how God's loving "determinism" as described in Romans 8:28-29, the first and second chapters of Ephesians, I Peter 1:3-5, etc., etc. is remotely related to the determinism of the above school.

The issue of "improving" the human brain seems to me to be vastly different from that of correcting a physical injury or disease. A man with a transplanted or artificial organ is still a man, but the very essence of a person can be modified or destroyed through manipulation of his brain. I have personally experienced something of this in the course of treatment following a stroke, and I can only describe it as utterly frightening. When a person's brain circuits can be skillfully tampered with, the outcome may well be murder (in the scriptural sense) even though the physical body remains functional and even useful to society. If I read Schaeffer correctly, he is not opposed to learning more about the brain, but rather is concerned that Christians be very much aware of the moral implications and consequences of such work and that they be able to articulate these to the world in the context of the Gospel.

The end of your review strikes me as being a defense of science in the spirit of Schaeffer's "modern" modern scientist. From a modest background in physics and astronomy, as well as the Scriptures, I would argue that the only basis for ruling out the possibility of *fiat* creation or a gap cosmogony is the *assumption* of uniformity of cause in a closed system. I am well aware of the cosmological and geochronological data presently at hand and the implications of these data under the current scientific postulates. But I am completely unaware of any hard scientific evidence that compels me to dismiss once and for all the possibility of a literal interpretation of the first three chapters of Genesis. The Christian experience has given me a decided respect for the claims and literal accuracy of Scripture. Seeming errors and contradictions have in the past been found to be the result of faulty understanding or wrong assumptions on my part. In light of such experience, I am becoming more and more persuaded that the choice of epistemologies is ultimately a moral decision.

Erich Sauer began his book *The Dawn of World Redemption* with these words: "Blessed are the inquirers who inquire not *concerning* the Eternal, but *for* the Eternal." This statement is, I feel, an appropriate measure for religious-scientific writing especially. The Spirit bears witness to the validity of Schaeffer's works because they proclaim a Person instead of a philosophy and because they encourage us to a closer walk with our Lord.

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Population Control

There has been much useful work in recent years attempting to a) predict the rate of future population growth and b) the impact of such growth on the quality of human existence. Such predictive attempts usually assume somewhat deterministic models of man's behavior patterns. Man is seldom viewed as a responsible, whole person capable of rising beyond the "machine" level of existence. Indeed, capable of making genuine free choices that will enable him to alter and adapt his environment in a manner that clearly respects and attempts to preserve the intrinsic goodness inherent in all of God's creation: other men, beasts, forests, plants, even inert rocks. Practically all such predictive models of the future assume as the central criteria for success the survival of the human species (with perhaps some measure of material comfort). Almost never, even by Christians (excepting F. Schaeffer), is man's attempt to come to grips with his environment viewed from God's "eyes." This man-centered perspective that we adopt may blind us to possible hidden dangers in uncontrolled population growth. The following thoughts are accordingly directed toward this question: Are there hidden dangers inherent in uncontrolled population growth?

1. It may well be possible to truly feed an expanding world population in a nutritionally sound way. Much can be done to utilize presently untapped food resources and eliminate such inefficient food sources as cattle grazing on large land

areas. We may have to learn to enjoy the taste of soy beans as much as that of beef. But, I believe that mankind (even Western man) is capable of this effort.

2. It may even be possible to supply an expanding world population's energy needs by utilization of yet untapped sources of energy. It is within the realm of finite probability that controlled thermo-nuclear fusion and/or the development of practical superconducting materials above liquid nitrogen temperatures may be possible before 2000 A.D. Either of these two possibilities would improve the world's energy producing capacity by orders of magnitude. There may not even be appreciable pollution side effects associated with these two very different possible new sources of energy and energy transport. There is much that still can be done with respect to finding new sources of energy and conserving existing resources; it is at least in the realm of possibility that an expanding world population may be able to find the means to meet its energy needs.

3. The capability of uncontrolled population growth filling all available living space is the possible hidden danger. For in doing so the living area of humanity will become so cramped that individual privacy is no longer possible and man's living environment will become entirely artificial, i.e., man made.

Even in purely inanimate many-body interacting systems, crowding, due to an excess number in a given space, leads to qualitatively new behavior frequently destructive to the original system. When radioactive elements exceed a critical mass, nuclear fisson results; when a gas of interacting particles is sufficiently dense, transition to a new state of matter, the liquid state, is observed. Similar behavior is observed for living interacting systems, plant, animal, and human. Crowding often results in a whole species dying out due to adverse interactions with the activity of other populations once a critical crowding level is reached. Even at the level of human encounter, excessive crowding, with its resulting loss of privacy, becomes destructive to physical, mental, and spiritual well-being as the testimony of the daily rides of a crowded subway will easily confirm.

But, on a far deeper level, man is made in the image of a personal God who has made him to live in harmony with a created, physical order that is distinct from, but nevertheless bears the mark of God's creative personality as He continually holds it in being. If man, by allowing uncontrolled population growth to lead to excessive crowding, becomes completely immersed in an artificial, man-made environment he thereby loses a vital contact with the God who made him. For this new, artificial environment reflects back upon man far too much of his own selfish ego. I am afraid, among other undesirable features, such an environment will impose upon modern man the far too hectic pace and random chatter associated with the "busyness" of our get ahead at the others expense, selfish society. Man needs for his spiritual well-being time for reflective contemplation, immersed in an environment relatively untouched by human activity showing fully the majesty of a complex, interacting harmonious system that bears the mark of God's personal creativity. Is it not significant that David, Jesus, and Paul all withdrew from continual human encounter to a wilderness area, to pray, to rest, and renew their vital contact with the Living God, their Loving Father? Man encounters God in the love shown him by other fellow image bearers of God, but man's God-given nature also requires contemplative encounter with God through experiencing the beauty, majesty, and order present in that part of God's Creation untouched by man. Christians must strive to help the world meet its material needs or we are indeed hypocrites, but man does not live by bread alone. To allow population growth to stamp all of God's Creation with man-made structure is to wipe out a vital channel of communication with God, contemplative communion with God in a part of His environment untouched by human selfishness and pride. For in such places man can regain his ability to reflect upon his relation to God and to weigh carefully the alternatives in the difficult decisions life thrusts upon him. It is a strange paradox that man in order to prevent himself acting like only an animal must seek contemplative access to sheltered areas where animals live in relationship primarily to one another. The world still needs to pay heed to St. Francis's insight that God truly loves men but animals also; after all, He created them all.

4. I am in basic accord with those organizations that, recognizing the dangers of uncontrolled growth, attempt to motivate mankind to alter its child-producing patterns. Such motivation attempts should clearly point out the dangers of population crowding to the individual (in cultural context) as a whole person, not just to his or her material well-being. It should treat individuals in all cultures as capable of responsible choice and thereby attempt an educational approach that will meaningfully communicate to diverse populations the dangers of excess population. Man is both "brute and angel;" when he is respected as an individual he might just make the right choice in sufficient numbers to stem the population tide. God still works in human history. All volunteer methods of controlling population growth should be exhausted before any legal sanction against giving birth is put into force. And it is my view that any such legal sanctions should limit themselves to additional taxes, etc. Compulsory sterilization sounds far too much like Nazi Germany and ignores that only God is a true prophet of the future. Such sterilization on a world-wide scale might even lead to eventual dangers of under population.

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Books Received and Available for Review

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

Gish, Duane T., *Evolution: The Fossils Say No!'* ICR Publishing, 1973.

Hayward, Alan, *God's Truth* (A Scientist Shows Why it Makes Sense to Believe the Bible), Marshall, Morgan and Scott, 1973.

Martin Charles, *How Human Can You Get?* IVP, 1973.

Packer, J. I., *Knowing God*, IVP, 1973.

Patten, D. W., *et. al., The Long Day of Joshua and Six Other Catastrophies,* Pacific Meridian Publishing, 1973.

D. Bridge and D. Phypers, *Spiritual Gifts and the Church*, IVP, 1973.

R. E. Fowler, *UFO's: Interplanetary Visitors,* Exposition-Banner, 1974.

D. Hull, *Philosophy of Biological Science,* Prentice-Hall, 1974.

U. Middlemann, *Pro Existence,* IVP, 1974.

W. E. Mills, *Speaking in Tongues: Let's Talk About It,* Word, 1973.

W. E. Oates, *The Psychology of Religion,* Word, 1973.

North America Cannot Feed the World

I am writing to comment on a statement in *Journal ASA* 26 (1), 12 (1974) to the effect that "the Americans would produce 60% of the food." This is a quote from a company newsletter. I expect it is always dangerous to use information from such sources without checking original documents or statistics. Although it is difficult to get up to date statistics on food production on a global basis, it is not difficult to demonstrate that the accuracy of this statement is questionable.

The U.S. has some 450 million of the world's total of 3.4 billion acres of crop land. Through the application of modern technology high yields are obtained in the U.S. on much of this crop acreage, particularly in the more humid eastern portion of the country and on the relatively small acreage of irrigated land. High yields are also obtained in other parts of the world, as, for example, in Western Europe. Therefore, on the basis of crop acreage alone the statement that the U.S. produces 60 per cent of the world's food is suspect.

Turning to statistics on food production one is led to a similar conclusion. Wheat and rice are the major food grains used for human consumption. U.S. production of wheat is about 10 to 15 per cent of the world total and of rice less than 5 per cent.

In closing may I say that there are two reasons for my writing this letter. First, to point out an error which I would not want your excellent magazine to perpetuate. Second, that although we on the North American continent have been richly blessed, it does not include having the wherewithal to produce food sufficient to provide the rest of the world.

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Where Will Tomorrow's Energy Come From?

Goals of Future Technology

Energy Source	*Process*	*Positive Outlook*	*Negative Outlook*
A. *Fossil Fuels*			
1. Petroleum.	Drilling.	Convenient. Low pollution.	Limited supply. Production peaked in 1971. 75% of world's oil reserves are in Middle East.
2. Natural gas.	Drilling.	Convenient. Low pollution.	Extremely limited supply: USA may use last molecule within 20 years.
3. Anthracite coal.	Deep mining.	Easy to handle. Burns cleanly.	Expensive. Supply limited: one-half of reserve already mined; remainder is only 2% of total USA coal reserve.
4. Bituminous coal.	Deep or strip mining.	Easy to handle. Moderate smoke upon burning.	High sulfur content contributes to intense air pollution.
5. Subbituminous or lignite coal.	Strip mining.	56% of USA coal reserves are in this form. Relatively free of sulfur. Can be burned on the site to produce electricity, which can be transmitted to where needed.	Burning produces much fly ash. No local industry to use. Too expensive to ship. Detrimental environmental impact of strip mining.
6. Oil shale.	Obtain petroleum products by processing oil shale, a laminated rock containing an organic substance like tar.	Reserves are eight times those of petroleum.	33% more expensive than domestic crude oil. Environmental problems of mining and disposal of processed rock. 80% of deposits are located on federal land.
7. Solvent refining of coal.	Organic solvent under H_2 pressure produces a heavy, low-melting solvent-refined coal; or a liquid if H_2 pressure high enough.	Process automatically purifies coal.	Process technology not yet developed.
8. Pyrolysis of coal.	Heat coal in the absence of O_2 to produce char, oil and a low-energy gas.	Source of oil.	High costs.
9. Gasification of coal to produce synthetic natural gas.	Coal or naptha combined with water at high temperatures to produce methane.	Source of gas.	Naptha process simpler but almost all naptha must be imported. Modern improvements over older methods needed.
10. Gasification of coal or residual fuel oil to produce "power gas."	Simpler version of gasification to produce synthetic natural gas. "Power gas" has only 15% heating value of natural gas.	Use at site for generation of electricity in systems combining gas and steam turbines. Automatic purification from sulfur.	Low heating value. Cannot be economically transported.
11. Magnetohydrodynamic use of coal. (MHD)	Expanding hot ionized gas in a magnetic field produces an electric current.	Requires less fuel. Produces less pollution.	Operates at very high temperatures. Large magnets are needed. Materials research for long term endurance needed. Must be tried on a large scale.

B. *Nuclear Energy*

12. Fission: light water reactors. (LWR)	Split atoms of heavy elements like U-235, using normal water as coolant.	Compact. Fuel requires less mining than coal. Atmospheric pollutants essentially eliminated.	Converts only 1% of naturally occurring Uranium—fuel supply is more limited than that of coal. Thermal pollution of waterways. Operating hazards in case of accident. Danger in transport, safeguarding, and storing radioactive materials. Vulnerable to sabotage.
13. Fission: liquid metal-cooled fast breeder reactors. (LMFBR)	Higher power density system cooled by liquid Na, in which more fissionable material is produced than is consumed.	Lower thermal pollution and more efficient use of Uranium reserves than LWR.	Severe materials problems for tolerating high neutron fluxes. Safety problems greater than for LWR. Radioactive waste disposal requires surveillance for thousands of years. Precautions needed for dealing with highly reactive liquid Na.
14. Fusion: magnetic containment.	Contain hot, ionized gas necessary for fusion reaction by a magnetic field large enough to keep gas from touching reactor walls.	Essentially unlimited fuel supply. No danger of explosive accident. Ultimate energy resource surpassed only by the sun itself.	Extremely difficult engineering and materials problems to handle high temperature and neutron flux gradients. Danger of accidents to magnet system. Constant leakage of radioactive tritium, even without accident.
15. Fusion: laser initiated.	Deliver a very rapid highly focused pulse of laser light to pellet of deuterium or tritium so as to heat it to induce fusion before the pellet has time to expand physically.	Elimination of containment problems.	Extensive materials research needed on much more powerful lasers.

C. *Other Energy Sources*

16. Solar energy for direct heating and cooling.	Direct absorption and utilization of the solar heat for heating and cooling low-rise buildings.	Essentially ready for use. Pollution-free use of unlimited energy source.	High initial costs in building due to major changes in architectural design and insulation, as well as solar systems themselves.
17. Solar energy to produce electricity through heat.	Use of solar heat to operate a steam turbine generator.	Pollution-free use of unlimited energy source.	Collection, focusing, and storage of solar energy all require special attention. Materials required with high absorption for sunlight, but a low emission for heat.
18. Solar energy to produce electricity directly.	Photovoltaic effect in semiconductor junction devices.	Pollution-free use of unlimited energy source.	High cost of devices. Problems of lifetime, energy storage, and DC to AC conversion.
19. Hydro-electric power.	Fall of water under gravity used to generate electricty.	Renewable. Cheapest source in USA. Can be used for energy storage. i.e., storage by pumping water to greater altitudes. Large potential in Africa, South America and Southeast Asia.	A large fraction of the likely sites in the USA have already been developed.
20. Tidal energy.	Motion of water under gravitational pull of the moon, used to generate electricity.	Renewable.	Limited number of exploitable sites. More expensive than hydroelectric power. Diffused over all the coastlines of the world.

21. Wind power.	Force of the wind, used to generate electricity.	Potentially useful source.	Costs and hazards not yet determined. Effect on weather of large-scale use unknown. Storage essential. Aesthetic damage to environment if widely used.
22. Temperature differences in tropical oceans.	An indirect result of absorption of solar energy at the surface; can be used to turn a turbine and generate electricity.	Renewable.	Special materials needed to resist corrosion of sea water. Problems of anchoring in place. Costly transmission. Unforeseen environmental effects of large-scale usage.
23. Geothermal energy.	Decay of radioactive materials within the earth produce heat in the form of steam, hot water, and hot rock.	Potentially useful source.	Limited knowledge of sites. Corrosion problems due to mineral-rich hot water. Needs low-temperature turbine generators. Possible environmental and seismic effects of large-scale usage.
24. Fuel from wastes.	Conversion of solid organic wastes into synthetic fuel by hydrogenation, pyrolysis or bioconversion.	Ready supply. Aids waste disposal problems. Can be augmented by deliberate growth of plants for fuel.	Although a large supply, still small if considered as basis for energy. Cost. Disposal of organic sludge remaining, which may be as much as 40% of original.

Note: The utilization of new sources of energy, and a growing dependence on electrical energy, puts special emphasis on the need for appropriate methods of energy transmission and storage. Solutions lie in developing more efficient electrical transmission (cooled cables and superconducting cables), in concentrating on decentralized power production, and in developing other forms in which energy can be stored and more conveniently transported, e.g., batteries, compressed air, inertial flywheels, or using the electricity to electrolyze water, and then transporting hydrogen in gaseous or liquid form to be burned at the site of energy utilization, directly or in a fuel cell for the generation of electricity, by what is essentially the reverse process of electrolysis.

This summary of energy sources for the future is an editorial service for the readers of the Journal ASA. *The facts and figures are derived from* Energy and the Future *by A. L. Hammond, W. D. Metz, and T. H. Maugh, II, American Asociation for the Advancement of Science, Washington, D.C.* (1973). *An article by R. H. Bube elaborating on this table was published in* The Reformed Journal, *July/August* 1974.

Reprints of this table are available from the ASA; write Executive Secretary, 5 Douglas Ave., Elgin, Illinois 60120. Quantities under 100—10¢ each. 100 and over—5¢ each.

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PUBLICATIONS include the *ASA News* (sent to all members four to six times each year); three symposia: *Modern Science and Christian Faith,* F. Alton Everest, Editor, Van Kampen, Wheaton, Illinois (1950) (out of print), *Evolution and Christian Thought Today,* Russell L. Mixter, Editor, Eerdmans, Grand Rapids, Michigan (1960), and *Our Society in Turmoil,* G. Collins, Editor, Creation House, Carol Stream, Illinois (1970). Individual authors are also encouraged to publish independently.

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