PERSPECTIVES on Science and Christian Faith

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In this issue

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

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Putting Things in Perspective

The theme of the ASA Annual Meeting at Houghton College in 1986 was "The Nature of Humanity," for which David Myers of Hope College was the keynote speaker. For our lead article of this issue we have the written text of one of his lectures. Professor Myers compares the image of human nature as derived from contemporary social psychology with that derived from Christian theology. He notes that from both perspectives truth is best approximated by complementary propositions. Thus in psychology: attitudes influence behavior, but attitudes also follow behavior; in Christian theology: faith is a source of action, and faith is a consequence of action.

David Lindberg and Ronald Numbers analyze the popular notion of the perpetual warfare between science and Christianity and emphasize that such a notion is not historically accurate. While the two camps have certainly not always been allies, their interaction has been complex, and therefore unpopular with those who want to simplify the relationship to a friend/foe or villain/victim scenario. Some of the recent attacks on ASA's "Teaching Science in a Climate of Controversy" make it obvious that some of our fellow scientists need to do a bit more homework in the history of science, and especially in the creation/evolution controversy. I personally found much of the denunciation of the ASA—e.g. "A Slick New Packaging of Creationism" (*The Science Teacher*, May 1987)—to be distorted history, bad science, and misleading attempts to read between the lines on the basis of the author's own preconceived and prejudiced philosophical biases. Both scientists and Christians are supposed to be seekers of truth!

Stanley Rice, who is obviously no slick anti-evolutionist, grapples with a major theological/philosophical difficulty—the problem of evil in a world created by a just and loving God. To be sure, much of this is speculative, but in our present state of inadequate knowledge we join with Job and his friends, Habbakuk, and others of the Old Testament when we ask: how can this thing be? As a biologist, Mr. Rice grapples with the unpleasant aspects of the natural world and evaluates some common Christian responses.

After psychology, history, and theodicy one would hopefully assume that there would be no problems in a nice exact science such as statistics. However, Jan Geertsema discusses some of the philosophical underpinnings of statistics, and demonstrates that even in the so-called "exact" sciences our personal biases can manifest themselves. Thus a Christian philosophy of statistics is important.

For shorter papers (Communications) we have two contributions. Ted Cable reports on original research into the status of environmental studies in Christian college curricula. He concludes that there is a significant effort to teach environmental science, and to a lesser degree, environmental ethics. William Venable discusses current "information theory" and suggests that such theory supports (although does not prove) the idea of biblical inerrancy as plausible and even probable.

WLB

Responding in Love to Naive Heretics

Guest Editorial

People involved in both science and Christian theology often find themselves in a situation where they are called upon to respond to the scientific or theological views of others, these views being characterized by errors caused by the naive understanding of those advancing them. Such views are generally typical of a class of phenomena known as pseudo-science when the naive views are directed toward scientific descriptions, or as pseudo-theology when the naive views are directed toward theological descriptions.[1,2] Those advancing them are sure that they have discovered a new key to understanding and to integrating science and religion, and they represent in a real sense "heretics," advocates of heterodox positions in science, theology, or both.

Encounters of this type can usually be separated into three different categories. There is the mature Christian who has only a popular understanding of science, who is committed to defending the faith through pseudo-scientific arguments. There is the experienced scientist who has only a fourth-grade understanding of Christianity, who is committed to defending science through pseudo-theological arguments. Perhaps the most delicate case of all is encountered with people who have made a Christian commitment and show genuine devotion to the faith, but are attempting to put together, perhaps for the first time, their newly-accepted faith and some cursory knowledge of scientific concepts, words and ideas. They could be non-pejoratively called "naive" both in understanding authentic science and in understanding authentic theology. In their zeal to achieve subjection of their entire lives to Christ, they oftentimes propose perspectives that they view as creative scientific solutions to the problem of how to relate science and theology in their lives. I have in mind such propositions as: "If evolution by chance processes occurred, then this would mean that there was no God," or "The very existence of our world with properties that support human life proves that there must be a God who created it."

What does a person responding to them do, when it is realized that the proposed solution violates the very integrity of authentic science as well as many of the historically developed patterns of integrating science and theology while maintaining the authenticity of both? It is often argued that no overt criticism of their position should be directed toward them, since such criticism might be interpreted as a non-Christian, unloving reaction that could drive them away from the faith—a problem of particular significance if they happen to be recent converts. On the other hand, to make no critical comments often reinforces them in their conviction that they have a valid method of integrating their scientific and theological understanding, which they then attempt to pass on to others, often with evangelical fervor.

In order to obtain another perspective on this situation, consider the similar case of people with naive notions of what Christianity is all about, who have a strong, if not totally well informed, commitment to a naive scientific worldview. Such people will often propose religious perspectives that they consider to be consistent with their scientific understanding, in an effort to integrate their scientific and theological viewpoints. I have in mind such statements as: "If the Universe is all there is, then the Universe must be the same as God," or "If evolution has developed mankind with its present abilities, it will surely develop a fully spiritual and purely loving individual in the future."

How does one deal with these people, since a direct criticism of their religious perspective may be considered to be an unloving thing to do, and might drive them away from any further consideration of authentic Christian faith? If no such direct criticism is made known, however, they will also most likely continue to pursue the naive integration of science and religion that they have invented, and will be active in spreading this word to others with evangelical zeal.

I suspect that the Christian readers of these words are in general much more in favor of correcting the science-oriented person who is misinformed about Christianity, than they are in favor of correcting the Christian person who is misinformed about science. If people have faulty ideas about theology (and its connection with science), it is only for their own good that they be corrected. Otherwise they are likely to spread these ideas and mislead many others. I suggest that the correction of the Christian person with faulty ideas about science is no less urgent. If people have faulty ideas about science (and its connection with theology), it is only for their own good and the good of others that they be corrected. The commonly heard plea, "Do not criticize these Christian brothers, but rather affirm our commitment to Christ and their right to interpret science the way they think best—at least for the present," is no more defensible than the symmetric plea, "Do not criticize these scientific colleagues, but rather affirm our commitment to authentic science and their right to interpret theology the way they think best—at least for the present."

We must always be ready to respond to errors and misleading perspectives based on naiveté whether that naiveté is focussed primarily on science or on Christian theology. But we must respond in love. We must recognize that not to respond is not to really love; for love requires us to express the need for correction. Certainly it is preferable if this response can be made in private and in person. Unfortunately this option is not always available, as for example when the persons proposing naive heresies have already taken the public platform and through public addresses and published books are seeking to influence the Christian community. Under these conditions, our response must be set forth in such a form that our questioning of the naive heresies does not indicate a lack of love or concern for the individual advancing them.

Unity in Christ among Christians does not require us to tacitly accept fallacious perspectives in science or philosophy, any more than it requires us to tacitly accept fallacious perspectives in theology. Rather, we are called upon to exhort and help one another grow toward a more perfect understanding of God, His Word, and what He has made.

REFERENCES

1. R.H. Bube, "Pseudo-Science and Pseudo-Theology" in *Science and the Whole Person*, pp. 18-40, ASA (1985).
2. R.H. Bube, "Science and Pseudoscience," *The Reformed Journal* 32(11), 10 (1982).

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Yin and Yang in Psychological Research and Christian Belief

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Reality often seems best approximated by complementary principles, each of which is by itself a half truth. Massive bodies of reseach indicate that 1) mind emerges from brain, and mind controls brain; 2) attitudes influence behavior, and attitudes follow behavior; 3) self-serving bias is powerful and perilous, and self-esteem and positive thinking pay dividends; 4) we are the creatures of our social worlds, and we are the creators of our social worlds; and 5) our cognitive capacities are awesome, and to err is human. Likewise, Christians believe that 1) we are, now and in eternity, bodies alive, yet also created for spiritual relationships; 2) faith is a source of action and a consequence of action; 3) pride is the fundamental sin, but grace is a key to self-acceptance; 4) God is in control, and we are responsible; and 5) we are made in the image of God, and we are finite creatures.

When Christian psychologists link their profession with their faith they typically do one of three things: they analyze religious phenomena, such as conversion or prayer, through a psychological microscope; they correlate the speculations of personality theorists with the presumptions of theologians; or they propose a distinctly Christian approach to counseling or to psychological inquiry. My own interests in linking psychology and faith are rather different and for the most part arise from my involvement in the mainstream of psychological research and my vocation as a teacher of psychology. Thus my occupation—indeed my preoccupation—is to ponder two questions: What are the major insights and ideas regarding human nature that college and university students should encounter in their courses in introductory and social psychology? And, how does the human image emerging from contemporary psychology connect with Christian assumptions about human nature?

In any academic field the results of tens of thousands of studies, the conclusions of thousands of investigators, the insights of hundreds of theorists, can usually be boiled down to a few overriding ideas. Biology offers us

This paper was delivered as an invited lecture at the 1986 meeting of the Victoria Institute, London, and as an annual lecture at the 1986 ASA convention. Further information on the psychological reseach summarized here may be found in Myers' texts, Psychology *(Worth Publishers, 1986) and* Social Psychology, *2nd ed. (McGraw-Hill, 1987), or in his new book,* Psychology Through the Eyes of Faith, *with Malcolm Jeeves (Harper and Row, 1987). This address is being published simultaneously in the U.K. by* Faith and Thought, *the journal of the Victoria Institute.*

principles such as natural selection and adaptation. Sociology builds upon concepts such as social structure and social process. Music develops our ideas of rhythm, melody, and harmony.

It occurred to me when contemplating this address that many of the major insights and ideas of psychology —especially of social and cognitive psychology—could be distilled down to five pairs of complementary principles. Remarkably, these five pairs of complementary principles are paralleled in Christian thought by five pairs of theological principles.

Each psychological and theological principle represents a partial truth—an important aspect of a total system. As Pascal reminded us, no single truth is ever sufficient, because the world is not simple. Any truth separated from its complementary truth is a half-truth. It is in the union of complementary opposites—of what the Chinese called yin and yang—that one glimpses the whole reality.

Consider, first, five great principles of contemporary psychology that unite with five complementary principles, like the five fingers of the left hand clasping the five fingers of the right, to form a more complete picture of the human system. As we move along through these five pairs of psychological principles you will, perhaps, be able to anticipate some of the Christian ideas that parallel this yin and yang of psychological research.

The Yin and Yang of Psychological Research

Brain and Mind

The explosion of recent research on genetic influences on behavior, on the influence of neurotransmitters on thought and emotion, and on the intricate links between brain structures and language, perception, and memory, confirms more surely than ever that *mind emerges from brain.* My colleague Malcolm Jeeves, a cognitive neuroscientist, is unhesitating: "Every new advance in the flourishing field of neuropsychology tightens the apparent links between brain and mind."[1]

Although much mystery remains, we now understand better than ever the specific brain malfunctions that cause disorders of speaking, reading, writing, or understanding language. We have glimpsed how precise surgical or chemical manipulations of the brain can manipulate thoughts, moods, and motives. We are beginning to understand the awesome process by which our sensory systems and brains decompose sensory experiences into formless neural impulses and then reassemble them into their component features and, finally, into conscious perceptions. And we are being offered new clues to the extent and the mechanisms of genetic influences upon countless traits, from emotionality to intelligence, from criminal tendencies to altruism, from gender differences to schizophrenia.

Neuroscientist David Hubel has said that "fundamental changes in our view of the human brain cannot but have profound effects on our view of ourselves and the world."[2] The dualistic view that mind and body are distinct entities—that we are, as Descartes believed, lodged in our bodies as pilots in their vessels—seems more and more implausible. Thus psychologist Donald Hebb concludes that however implausible it may be to say that consciousness consists of brain activity, "it nevertheless begins to look very much as though the proposition is true."[3] Mind emerges from brain.

This apparent truth is, however, complemented by another truth: *mind controls brain.* In many ways our brains function mindlessly—by automatically, effortlessly, and usually infallibly managing a myriad of routine functions. This frees our consciousness to focus, rather as the chief executive of a great country or corporation does, on the most important problems at hand. In doing so, our conscious experience directs the brain to control bodily functions in ways once thought

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impossible. In the burgeoning field of health psychology, for example, we are discovering the bodily consequences of stresses, be they cataclysmic events or routine daily hassles. We are learning more about the effects of emotions such as anger on a person's vulnerability to heart disease and to disorders of the immune system. We are exploring psychological techniques of pain control and stress management, and gaining clues to the control of ailments such as tension headaches and hypertension. We are glimpsing how social support or even a sense of humor helps buffer the effects of stress. These examples of "mind over body" are extensions of phenomena we frequently experience. Embarrassed, we blush. Frightened, we feel our heart pounding, our skin perspiring. Thus, our first pair of complementary principles: mind emerges from brain, and mind controls brain.

Attitudes and Behavior

Among social psychology's best known principles are those that describe the reciprocal relations between attitudes and behavior. During the 1960's, dozens of research studies challenged the assumption that people's attitudes guide their actions. But studies since 1970 have revealed conditions under which our attitudes *do* influence our actions. This is especially true when we are keenly aware of our attitudes and when other influences on our behavior, such as social pressures, are minimized. If our attitudes toward cheating, or church-going, or racial minorities are brought to mind in a pertinent situation—if something causes us to stop and remember who we are before we act—then we may indeed stand up for what we believe. In such situations, *attitudes influence behavior.*

But if social psychology has taught us anything during the last three decades, it is that the reverse is also true: we are as likely to act ourselves into a way of thinking as to think ourselves into action; we are as likely to believe in what we have stood up for as to stand up for what we believe. Simply put, *attitudes follow behavior.* Consider a few examples of the wide-ranging evidence:

1. In the laboratory, and in everyday situations, evil acts shape the self. People induced to harm an innocent victim typically come to disparage the victim. Those induced to speak or write statements about which they have misgivings will often come to accept their little lies. Saying becomes believing.

2. Positive actions—resisting temptation, giving help to someone, behaving amicably in desegregated situations—also shape the self. As social psychologists predicted would happen, changes in racial behavior resulting from desegregation rulings and civil rights legislation have been followed by positive changes in racial attitudes. Evil actions corrupt, but repentant actions renew.

3. Many of today's therapy techniques make a constructive use of the self-persuasive effects of behavior. Behavior therapy, assertiveness training, and rational-emotive therapy all coax their clients to rehearse and then practice more productive ways of talking and acting, trusting that by so doing the person's inner disposition will gradually follow along.

This principle, like that of its complement, is especially valid under certain conditions—notably when people feel some choice and responsibility for their behavior rather than attributing it entirely to coercion. But most behaviors, even the enforced Nazi greeting, "Heil Hitler," do involve some element of choice. Thus, there often occur feelings of discomfort when one's behavior is out of alignment with one's attitudes. For example, historian Richard Grunberger reports that when "prevented from saying what they believed," many Germans "tried to establish their psychic equilibrium by consciously making themselves believe what they said."[4]

Any truth separated from its complementary truth is a half-truth. It is in the union of complementary opposites—of what the Chinese called yin and yang—that one glimpses the whole reality.

To repeat, two fundamental principles of social psychology are that attitudes influence behavior, and attitudes follow behavior. Behavior and attitude, like chicken and egg, generate one another in an endless spiral.

Self-Serving Bias and Self-Esteem

It is widely believed that most of us suffer the "I'm not OK—you're OK" problem of low self-esteem; the problem that comedian Groucho Marx had in mind when he declared that "I wouldn't want to belong to any club that would accept me as a member." As we will see, there is evidence supporting today's conventional wisdom about the benefits of high self-esteem and positive thinking. But we moderns seem less aware of the powerful phenomenon called "self-serving bias" that has been revealed by a dozen lines of research. Consider:

1. People readily accept responsibility for their successes and good deeds, but are prone to attribute failure or bad deeds to factors beyond their control. Self-serving attributions have been observed not only in countless laboratory situations, but also with athletes (after victory or defeat), with students (after high or low exam grades), with drivers (after accidents), and with married people as they explain their conflicts. Researcher Anthony Greenwald sums up countless findings: "People experience life through a self-centered filter."[5]

2. In virtually any area that is both subjective and socially desirable, most people see themselves as relatively superior. Most business people see themselves as more ethical than the average business person. Most community residents see themselves as less prejudiced than their neighbors. Most people see themselves as more intelligent and as healthier than most other people. In "ability to get along with others," virtually all American high school seniors rate themselves above average and 60 percent put themselves among the top 10 percent. As Elizabeth Barrett Browning might have summarized, "How do I love me? Let me count the ways."

These observations of self-serving attributions of responsibility and self-serving perceptions of superiority are joined by other findings. Many studies indicate that: we tend to justify our past actions; we have an inflated confidence in the accuracy of our beliefs and judgments; we tend to overestimate how desirably we would act in situations in which most people are known to behave less than admirably; we are quicker to believe flattering descriptions of ourselves than unflattering ones; we misremember our own past in self-enhancing ways; we exhibit a Pollyanna-ish optimism about our personal futures; we guess that physically attractive people have personalities more like our own than do unattractive people.

The list goes on, but the point is made. At times we may disparage ourselves, especially when comparing ourselves with those who are even more successful than we are or when our expressions of self-disparagement can trigger reassuring praise from others. Nevertheless, the evidence is overwhelming: the most common error in people's self-images is not unrealistically low self-esteem, but a self-serving bias; not an inferiority complex, but a superiority complex.

The phenomenon is not only pervasive but also at times socially disruptive. For example, people who work on a group task will typically claim greater-than-average credit when their group does well and less-than-average blame when it does not. When most people in a group believe they are underpaid and underappreciated, given their better-than-average contributions, disharmony and envy surely lurk. Several studies indicate that 90 percent or more of college faculty think themselves superior to their average colleague. Is it therefore surprising that when merit salary raises are announced and half receive an average raise or less, many feel an injustice has been done them?

The dualistic view that mind and body are distinct entities—that we are, as Descartes believed, lodged in our bodies as pilots in their vessels—seems more and more implausible.

More dangerous yet is self-serving bias in its collective forms. Racism, sexism, nationalism, and all such chauvinisms lead one group of people to see themselves as more moral, deserving, or able than another. The flip side of taking credit for one's self-perceived achievements is to blame the poor for their poverty and the oppressed for their oppression. Samuel Johnson recognized this two hundred years ago: "He that overvalues himself will undervalue others, and he that undervalues others will oppress them."

In recognizing this principle, that *self-serving bias is powerful and perilous*, we must, however, not forget its complement: that *high self-esteem and positive thinking pay dividends.*

People who express high self-esteem—feelings of self-worth—tend to be less depressed, freer of ulcers and insomnia, less prone to drug addiction, more independent of conformity pressures, and more persistent at difficult tasks. In experiments, those whose self-esteem is given a temporary blow (say, by being told they did poorly on a test or were judged harshly by others) tend then to express heightened racial prejudice. Many clinicians believe that underneath much of the despair and psychological disorder with which they deal is an impoverished self-acceptance. For children and adults a high self-esteem can indeed be healthy.

The power of positive thoughts about oneself is also evident in the hundreds of studies that testify to the benefits of a strong "internal locus of control"—a

belief in one's ability to control one's destiny. These are reinforced by hundreds more studies on the benefits of "self-efficacy," "intrinsic motivation," and "achievement motivation," and of the costs of "learned helplessness" and self-defeating thinking patterns. The moral of all these research literatures is that people profit from viewing themselves as free creatures and their futures as hopeful. Believe that things are beyond your control, and they probably will be. Believe that you can do it, and maybe you will.

Most people see themselves as more intelligent and as healthier than most other people.

Of course, there are limits to the power of positive thinking. Limitless expectations may bring endless frustrations and the guilt and shame that accompany the failure to achieve what we believed was achievable—"A" grades, record sales, marital bliss.

So where do these complementary self-image principles leave us? For the individual, self-affirming thinking is often adaptive, maintaining self-confidence and minimizing depression. But it is also important to remember the reality of self-serving bias and the harm that self-righteousness can wreak upon social relationships. The question is, therefore, how can we encourage a positive self-acceptance, while not encouraging self-serving pretensions?

Situational and Personal Control

Yet another overarching principle comes to us as the greatest lesson of social psychology, that social influences are enormous. Indeed, it is difficult to overestimate the extent to which our decisions, beliefs, attitudes, and actions are influenced by our social environments. *We are the creatures of our social worlds.* Consider some everyday examples of but four phenomema of social influences:

Suggestibility: Suicides, bomb threats, hijackings, and UFO sightings have a curious tendency to come in waves. One well-publicized incident—the suicide of a famous movie star—can inspire imitation. And as we will see, copycat perceptions and actions are not restricted to crazy people. Laughter, even canned laughter, is contagious. Bartenders and beggars know to "seed" their tip or money cups with money supposedly left by others.

Role playing: A group of decent young men volunteered to spend time in a simulated prison devised by psychologist Philip Zimbardo. Some were randomly designated as guards. They were given uniforms, billy clubs, and whistles, and were instructed to enforce certain rules. The remainder became prisoners, locked in barren cells and forced to wear humiliating outfits. After a day or two of "playing" their roles, the young men became caught up in the situation. The guards devised cruel and degrading routines, and one by one the prisoners either broke down, rebelled, or became passively resigned. Meanwhile, outside the laboratory, another group of men was being trained by the military junta then in power in Greece to become torturers. The men's indoctrination into cruelty occurred in small steps. First, the trainee would stand guard outside the interrogation and torture cells. Then he would stand guard inside. Only then was he ready to become actively involved in the questioning and cruelty.

Persuasion: In late October of 1980, U.S. presidential candidate Ronald Reagan trailed incumbent Jimmy Carter by 8 percentage points in the Gallup Poll. On November 4, after a 2-week media blitz and a presidential debate, Reagan, "the great persuader," emerged victorious by a stunning 10 percentage points. The Reagan landslide made many people wonder: what qualities made Ronald Reagan so persuasive, and his audience so persuadable?

Several surveys indicate that 90 percent or more of college faculty think themselves superior to their average colleague.

Group influence: One of the first major decisions President John F. Kennedy and his bright and loyal advisors had to make was whether to approve a Central Intelligence Agency plan to invade Cuba. The group's high morale seemed to foster a sense that the plan couldn't help but succeed. No one spoke sharply against the idea, so everyone assumed there was consensus support for the plan, which was then implemented. When the small band of U.S. trained and supplied Cuban refugee invaders was easily captured and soon linked to the American government, Kennedy wondered aloud, "How could we have been so stupid?"

Each of these phenomena of social influence has been "bottled up" in countless laboratory experiments that isolate their important features and compress them into a brief time period, enabling us to see just how they affect people. A few of the best known of these experiments have put well-intentioned people in an evil situation to see whether good or evil prevails. To a dismaying extent, evil pressures overwhelm good intentions, inducing people to conform to falsehoods or capitulate to cruelty. Faced with a powerful situation, nice people often don't behave so nicely.

In affirming the power of social influence, we must not overlook a complementary truth about our power as individuals: *We are the creators of our social worlds.* Social control (the power of the situation) and personal control (the power of the person) co-exist, for at any moment we are both the creatures and the creators of our environment. We may well be the products of past biological and social influences. But it is also true that the future is coming, and it is our job to decide where it is going. Our choices today determine our environment tomorrow, and as we noted earlier, those who most believe in their power to influence their destinies tend most successfully to do so.

The reciprocal influences between situations and persons occurs partly because individuals often choose their situations. When choosing which college to attend or which campus groups to join, a student is also choosing a particular set of social influences. Ardent political liberals are unlikely to settle in Orange County, California, join the Chamber of Commerce, or read *U.S. News and World Report.* They are more likely to live in San Francisco, join Common Cause, and read the *New Republic.*

Also, our expectations and behavior will modify our situations. As many recent experiments demonstrate, if we expect someone to be extroverted, hostile, feminine, or sexy, our actions toward the person may induce the very behavior we expect. The social environment is not like the weather—something that just happens to us. It is more like our homes—something we have made for ourselves and in which we now live.

Again, the reciprocal influences between situations and persons allow us to see people as either reacting to or acting upon their social environment. Each perspective is correct, for we are both the products and the architects of our social worlds.

Rationality and Irrationality

The debate over the extent of human wisdom versus the magnitude of human foolishness is longstanding. Are we, as Shakespeare's Hamlet rhapsodized, "noble in reason! . . . infinite in faculties! . . . in apprehension, how like a god!"? Or are we, as T.S. Eliot suggested, "hollow men . . . Headpiece filled with straw"?

Research psychologists of late have produced considerable ammunition for both sides of the debate. Some of their findings lead us to marvel at our capabilities, others to be startled by our capacity for illusion and self-deception. Let's consider some of this new thinking about thinking, looking first at findings which suggest that *our cognitive capacities are awesome.*

To a dismaying extent, evil pressures overwhelm good intentions, inducing people to conform to falsehoods or capitulate to cruelty. Faced with a powerful situation, nice people often don't behave so nicely.

We have been amazed by capabilities that are enabled by the human brain—a mere three pounds of tissue that contains circuitry more complex than all the telephone networks on the planet. We have been surprised at the competence even of newborn infants—at their skill in interacting with their caregivers, their ability to discriminate the sound and smell of their mothers, their abilities to imitate simple gestures. We have marvelled at the seemingly limitless capacity of human memory and the ease with which we simultaneously process varied information, both consciously and unconsciously, effortfully and automatically, with each hemisphere of the brain carrying out special functions. We have wondered at our abilities to form concepts, solve problems, and to make quick, efficient judgments using rule-of-thumb strategies called heuristics. Little wonder that our species has had the genius to invent the camera, the car, and the computer; to unlock the atom and crack the genetic code; to travel into space and probe the depths of the oceans.

We have also been awestruck by the ease with which children acquire language. Before children can add 2 plus 2, they are creating their own grammatically intelligible sentences and comprehending the even more complex sentences spoken to them. Before being able to tie their shoes, preschoolers are soaking up several new words a day and grasping complex grammatical rules with a facility that humbles computer

scientists as they struggle to simulate natural language. Or consider your own dimly understood capacity for language—how, in your most recent conversation, you managed *all at once* to monitor your muscles, order your syntax, watch out for semantic catastrophes that would result from a slight change in word order, continuously adjust your tone of voice and expressive gestures, and say something meaningful when it would have been so easy to speak gibberish. Indeed, it is this human capacity to do so many complex things all at once—to sense the environment, to encode information about the place, timing and frequency of experienced events, to interpret word meanings, to use common sense, to experience emotion, and even to consciously wonder how we do it —that causes us to echo Hamlet: "how infinite in faculties! . . . how like a god!" We are indeed *Homo sapiens*, the wise species.

But the complementary truth is that our capacity for illusory thinking is equally astonishing. *To err is human*. I know from experience that one can fill a book describing our human tendencies to self-deception and false belief. Thanks to countless experiments since 1970 in the burgeoning subdiscipline of "cognitive social psychology," we have gained insight into many of the intuitive thinking patterns that, as the price we pay for their efficiency, can lead us astray. Among these reasons for unreason are the following:

First, we often do not know why we do what we do. In experiments, people whose attitudes have been changed will often deny that they have been influenced; they will insist that how they feel now is how they have always felt. When powerful influences upon our behavior are not so conspicuous that any observer could spot them, we too can be oblivious to what has affected us.

Second, our preconceptions help govern our interpretations and memories. In experiments, people's prejudgments have striking effects upon how they perceive and interpret information. Other experiments have planted judgments or false ideas in people's minds after they have been given information. These experiments reveal that just as before-the-fact judgments bias our perceptions and interpretations, so do after-the-fact judgments bias our recall.

Third, we tend to overestimate the accuracy of our judgments. This "overconfidence phenomenon" seems partly due to the much greater ease with which we can imagine why we might be right than why we might be wrong. Moreover, people are more likely to search for information that can confirm their beliefs than information that can disconfirm them.

Fourth, vivid anecdotes and testimonies can be powerfully persuasive, often more so than factual data drawn from a much broader sample of people. This is apparently due to the attention-getting power of vivid information, and to the ease with which we later recall it.

These experiments reveal that just as before-the-fact judgments bias our perceptions and interpretations, so do after-the-fact judgments bias our recall.

Fifth, we are often swayed by illusions of correlation, causation, and personal control. It is tempting to perceive correlations where none exist ("illusory correlation"), to perceive causal connections among events which are merely correlated (the "correlation causation" fallacy), and to think we can control events which are really beyond our control (the "illusion of control").

Finally, erroneous beliefs may generate their own reality. Studies of experimenter bias and teacher expectations indicate that at least sometimes an erroneous belief that certain people are unusually capable (or incapable) can lead one to give special treatment to those people. This may elicit superior (or inferior) performance, and therefore seems to confirm an assumption that is actually false. Similarly, in everyday social affairs we often get what we expect.

It is important to remember that these illusory thinking processes are by-products of thinking strategies that usually serve us well, much as visual illusions are by-products of perceptual mechanisms that help us organize sensory information. But they are errors nonetheless, errors that can warp our perceptions of reality and prejudice our judgments of persons, leading us at times to act like headpieces filled with straw. By becoming aware of such tendencies we may, perhaps, also become a bit more humble about our intuitive judgments, more aware of our need for disciplined training of the mind, and more open to careful analysis and critique of our judgments. It is true that our cognitive capacities are awesome, but it also is true that to err is the most human of tendencies.

* * * * *

"There are trivial truths and great truths," declared the physicist Niels Bohr. "The opposite of a trivial truth is plainly false. The opposite of a great truth is also true."[6] Psychological inquiry illustrates Bohr's contention. Massive bodies of research indicate that mind emerges from brain, and that mind controls brain; that attitudes influence behavior, and that attitudes follow behavior; that self-serving bias is powerful and perilous, and that self-esteem and positive thinking pay dividends; that we are the creatures of our social worlds, and that we are the creators of our social worlds; that our cognitive capacities are awesome, and that to err is human. To propound any one of these truths while ignoring its complement is to proclaim a half truth. It is in the union of complementary opposites, of yin and yang, that we glimpse the human reality.

Yin and Yang in Christian Belief

Although I have so far avoided any mention of Christian views of human nature, some of what I have said may have a vaguely familiar ring. And well it should, for these five complementary pairs of psychological principles parallel five pairs of Christian assumptions, do they not? Consider the following.

Body and Spirit

The emerging scientific view that we are a unified mind-brain system may pose a threat to those who, in the tradition of Plato and Socrates, believe we are a dualism of two distinct realities—a mortal body and an undying soul. But it is supportive, in its fundamentals if not its details, of the implicit psychology of the Old Testament people who were said to think with their hearts, feel with their bowels, and whose flesh longed for God. In this Hebrew view, one's *nephesh* (soul) therefore terminates at death; we do not *have nephesh* (Plato's immortal soul), we *are nephesh* (living beings).

The New Testament similarly offers us whole persons, "souls" who can eat, drink and be merry. And it offers the hope that after death we, like Christ, will be resurrected as a perfected mind-body unit. For the Christian, death is a real enemy, not merely a "passing away" of the immortal soul as it was for Socrates drinking the hemlock. But we are promised that God will take the initiative by giving us in a new world what we do not inherently possess—eternal life.

Our minds are nothing apart from our bodies, suggests the scientific image. *We are, now and in eternity, bodies alive*, suggests the Bible. Fundamentally, both views assume—in contradiction to occult and spiritualist claims of reincarnation, astral projection, and seances with the living dead—that without our bodies we are nobodies.

Having said this, we must also add the complementary truth that in both the scientific and Christian views, something special and mysterious emerges from the unimaginably complex activity of the body. So far as neuroscientists can tell, mind is not an extra entity that occupies the brain. Yet there it is: our memories, our wishes, our creative ideas, our moment-to-moment awareness somehow arising from the coordinated activity of billions of nerve cells, each of which communicates with hundreds or thousands of other nerve cells. From the material brain there emerges the mystery of consciousness.

A scientific analogy may help us see how the properties of a whole system, such as the brain-mind system, may emerge from, yet not be reducible to, its physical parts. Physically, an ant colony is but a collection of solitary ants, each of which has a relatively few neurons strung together—a witless, thoughtless creature if ever there was one. Yet the interactions of a dense mass of thousands of ants produces a wondrous phenomenon; a collective intelligence, a social organism that "knows" how to grow, how to move, how to build. There is nothing extra plugged into the ants to create this intelligence. Yet to look no further than the individual ants would be to miss the miracle of the living colony. Likewise, to stop with the story of the brain cells would be to miss the miracle of consciousness.

To Paul and other biblical writers, our spirituality has not to do with an invisible essence that is plugged into a bodily compartment, like a pilot in a small plane, but with the whole person in relationship with God and other persons.

Similarly, while the Bible teaches that we are bodily creatures, made from dust, it also teaches that we have the potential for something special and mysterious: *we are created for spiritual relationships.* To Paul and other biblical writers, our spirituality has not to do with an invisible essence that is plugged into a bodily compartment, like a pilot in a small plane, but with the whole person in relationship with God and other persons. Theologian Bruce Reichenbach suggests that to

recapture this sense of spirituality we ought to drop the term "soul" from our religious vocabulary: "Such an approach, far from destroying faith in the spiritual aspect of man, will aid in clarifying precisely wherein the spiritual lies, i.e., that it lies not in the possession of an entity, but in the style of life one leads insofar as it manifests a relation to God and to one's fellow man."[7]

Faith and Action

The social psychologist's contention that attitudes and behavior grow from each other parallels and reinforces the biblical understanding of action and faith. Depending on where we break into the spiraling faith-action chain, we will see faith as a source of action or as a consequence. Faith and action, like attitude and action, feed one another.

Much as conventional wisdom has insisted that our attitudes determine our behavior, so has Christian thinking traditionally emphasized that *faith is a source of action*. Faith, we believe, is the beginning rather than the end of religious development. For example, the experience of being "called" demonstrates how faith can precede action in the lives of the faithful. Elijah is overwhelmed by the Holy as he huddles in a cave. Paul is touched by the Almighty on the Damascus Road. Ezekial, Isaiah, Jeremiah and Amos are likewise invaded by the Word, which then explodes in their active response to the call. In each case, an encounter with God provoked a new state of consciousness which was then acted upon.

Faith grows as we act on what little faith we have.

The dynamic potential of faith is, however, complemented by the not-so-widely appreciated principle that *faith is a consequence of action*. Throughout the Old and New Testaments we are told that full knowledge of God comes through actively doing the Word. Faith is nurtured by obedient action. For example, in the Old Testament the Hebrew word for *know* is generally used as a verb, as something one does. To know love, we must not only know about love but we must act lovingly. And to *hear* the word of God means not only to listen, but also to obey.

Likewise, we read in the New Testament that by loving action a person knows God, for "he who does what is true comes to the light." Jesus declared that whoever would do the will of God would know God, that he would come and dwell within those who heed what he said, and that we would find ourselves by actively losing ourselves as we take up the cross. The wise man, the one who built his house on a rock, differed from the foolish man in that he acted on God's Word. Over and again, the Bible teaches that the gospel's power can only be known by living it.

Our theological understanding of faith is informed by this biblical view of knowledge. Faith grows as we act on what little faith we have. Just as experimental subjects become more deeply committed to something for which they have suffered and witnessed, so also do we grow in faith as we act it out. Faith "is born of obedience," said John Calvin.[8] "The proof of Christianity really consists in 'following,'" declared Sören Kierkegaard.[9] Karl Barth agreed: "Only the doer of the Word is its real hearer."[10] Pascal is even more plain-spoken: to attain faith, "follow the way by which [the committed] began; by acting as if they believed, taking the holy water, having masses said, etc. Even this will naturally make you believe. . . ."[11] C.S. Lewis echoed Pascal's sentiments:

> Believe in God and you will have to face hours when it seems *obvious* that this material world is the only reality: disbelieve in Him and you must face hours when this material world seems to shout at you that it is *not* all. No conviction, religious or irreligious, will, of itself, end once and for all [these doubts] in the soul. Only the practice of Faith resulting in the habit of Faith will gradually do that.[12]

The practical implication of this faith-follows-action principle is that in church management, in worship, and in Christian nurture we need to create opportunities for people to enact their convictions, thereby confirming and strengthening their Christian identity. Biblical and psychological perspectives link arms in reminding us that faith is like love. If we hoard it, it will shrivel. If we use it, exercise it, and express it, we will have it more abundantly. In his *Cost of Discipleship*, Dietrich Bonhoeffer summarized this faith-action spiral: *"Only he who believes is obedient, and only he who is obedient believes."*

Human Pride and Divine Grace

The new research on self-serving bias is aptly summarized in a W.C. Fields quip: "Hubris is back in town." The abundant evidence that human reason is adaptable to self-interest and that our self-perceptions tend to be self-justifying, echoes a very old Christian idea: that *pride is the fundamental sin*, the original sin, the deadliest of the seven deadly sins.

Unpacking this doctrine of pride, we find that it has two components. First is the assumption that self-love and self-righteous pretension are pervasive. Thus the

Psalmist could declare that "no one can see his own errors" and the Pharisee could thank God "that I am not like other men" (and you and I can thank God that we are not like the Pharisee). Paul assumed that our natural tendency is to see ourselves as superior when he admonished the Philippians to reverse this tendency—to "in humility count others better than yourselves." Likewise, he assumed self-love when he argued that husbands should love their wives as their own bodies, just as Jesus assumed self-love when commanding us to love our neighbors as we love ourselves. The Bible neither teaches nor opposes self-love; it takes it for granted.

In Christian nurture we need to create opportunities for people to enact their convictions, thereby confirming and strengthening their Christian identity.

The Christian doctrine of pride assumes, secondly, that prideful self-love can go before a fall. The Bible warns us against self-righteousness—the pride that alienates us from God and leads us to disdain one another. Pride is the fundamental sin because it corrodes human community and erodes our sense of dependence on one another and on God. The Nazi atrocities, for example, were rooted not in self-conscious feelings of German inferiority, but in Aryan pride. The arms race is fed by a national pride that enables each nation to perceive its own motives as righteously defensive, the other's as hostile. Even that apostle of positive thinking, Dale Carnegie, foresaw the danger: "Each nation feels superior to other nations. That breeds patriotism—and wars."

The sin that grows from human pride is an essential part of the biblical story, but it is not the whole story. In the *Interpreter's Dictionary of the Bible*, S.J. DeVries reduces the whole of Scripture to a pair of propositions: We find ourselves "in sin and suffer its painful effects; God graciously offers salvation from it. This, in essence is what the Bible is about." The salvation half of the story proclaims an unshakable basis for self-esteem: Our worth is said to be more than we appreciate, certainly more than that of "the birds of the air" and God's other creatures. It is worth enough to motivate Jesus' kindness and respect even toward those with little honor; toward women and children, Samaritans and Gentiles, leprosy victims and prostitutes, the poor and the tax collectors. Recognizing that our worth is what we are worth to God—an agonizing but redemptive execution on a cross—therefore draws us to a self-affirmation that is rooted in divine love.

Thus the Christian answer to self-righteous pride is the good news that *to experience grace is to feel accepted*, and therefore to be liberated from the need to define our self-worth in terms of achievements, or prestige, or material and physical well-being. It is simultaneously to be liberated both from our self-protective pride and our self-rejection. Recall Pinocchio. Floundering in confusion about his self-worth, Pinocchio turns to his maker Geppetto and says, "Papa, I am not sure who I am. But if I'm all right with you, then I guess I'm all right with me." In the life, death, and resurrection of Jesus, our Maker signals to us that we belong to him and that we are set right. St. Paul, surrendering his pretensions, could therefore exult that "I no longer have a righteousness of my own, the kind that is gained by obeying the Law. I now have the righteousness that is given through faith in Christ . . . "[13]

"To give up one's pretentions is as blessed a relief as to get them gratified," noted William James, "and where disappointment is incessant and the struggle unending, this is what men will always do. The history of evangelical theology, with its conviction of sin, its self-despair, and its abandonment of salvation by works, is the deepest of possible examples."[14] There is indeed tremendous relief in confessing our limits and our pride, in being known as we are, and in then experiencing "unconditional positive regard." Having been forgiven and accepted, we gain release, a feeling of being given what formerly we were struggling to get: security, peace, love. Having cut the pretensions and encountered divine grace, we feel *more*, not less value as persons, for our self-acceptance no longer depends exclusively upon our own virtue and achievement nor upon others' approval.

Having been forgiven and accepted, we gain release, a feeling of being given what formerly we were struggling to get: security, peace, love.

The feelings one can have in this encounter with God are like those we enjoy in a relationship with someone

Table 1

Yin and Yang in Psychological Research and Christian Belief

In Psychological Research	*In Christian Belief*
1. Brain and Mind	1. Body and Spirit
a. Mind emerges from brain.	a. We are, now and in eternity, bodies alive.
b. Mind controls brain.	b. We are created for spiritual relationships.
2. Attitudes and Behavior	2. Faith and Action
a. Attitudes influence behavior.	a. Faith is a source of action.
b. Attitudes follow behavior.	b. Faith is a consequence of action.
3. Self-Serving Bias and Self-Esteem	3. Human Pride and Divine Grace
a. Self-serving bias is powerful and perilous.	a. Pride is the fundamental sin.
b. High self-esteem and positive thinking pay dividends.	b. To experience grace is to feel accepted.
4. Situational and Personal Control	4. Divine Sovereignty and Human Responsibility
a. We are the creatures of our social worlds.	a. God is ultimately in control.
b. We are the creators of our social worlds.	b. We are responsible.
5. Rationality and Irrationality	5. Divine Image and Finite Creature
a. Our cognitive capacities are awesome.	a. We are made in the image of God.
b. To err is human.	b. We are finite creatures.

who, even after knowing our inmost thoughts, accepts us unconditionally. This is the delicious experience we enjoy in a good marriage or an intimate friendship, in which we no longer feel the need to justify and explain ourselves or to be on guard, in which we are free to be spontaneous without fear of losing the other's esteem. Such was the Psalmist's experience: "Lord, I have given up my pride and turned away from my arrogance . . . I am content and at peace."[15]

Divine Sovereignty and Human Responsibility

The dialectic of situational and personal control finds its Christian counterpart in the paradox of God's sovereignty and our responsibility. Attacks on the idea that we are self-made people—that thanks to our free will we are independently capable of righteousness—have come not only from social researchers but also from theologians such as Augustine, Luther, Calvin, and Jonathan Edwards. *God is ultimately in control*, they insist.

Edwards would not give so much as an inch to human free will, because to the extent that human will is spontaneous and free, God's plans become dependent on our decisions. This, said Edwards, would necessitate God's "constantly changing his mind and intentions" in order to achieve his purposes. "They who thus plead for man's liberty, advance principles which destroy the freedom of God himself," the sovereign God of whom Jesus said not even a sparrow falls to the ground apart from his will.[16] Nor is human will added to God's will such that the two together equal one hundred percent. Rather, agreed St. Augustine, "our wills themselves are included in that order of causes which is certain to God."[17] God is working in and through our lives, our choices. He is due all credit even for our faith, insisted Luther. His grace operates within the processes of nature, suggested Thomas Aquinas; God sustains and orders the natural processes that shape us.

But there can also be no doubt that the Bible assumes that *we are responsible*. We are accountable for our choices and our actions. The streams of causation run through our present choices, which will in turn determine the future. So what we decide makes all the difference. Even our decision to believe, to choose whom we will serve, is in our hands.

Everything depends on us and everything depends on God. "I . . . yet not I, but the grace of God,"[18] said St. Paul. C.S. Lewis notes that the New Testament puts these two ideas together

> into the amazing sentence. The first half is, "Work out your own salvation with fear and trembling"—which looks as if everything depended on us and good actions: but the second half goes on, "For it is God who worketh in you"—which looks as if God did everything and we nothing. I am afraid that is the sort of thing we come up against in Christianity. I am puzzled, but I am not surprised. You see, we are now trying to understand, and to separate into watertight compartments, what exactly God does and what man does when God and man are working together. And, of course, we begin by thinking it is like two men working together, so that you could say, "He did this bit and I did that." But this way of thinking breaks down. God is not like that. He is inside you as well as outside. . . .[19]

Faced with this paradox of divine repsonsibility and human responsibility, or with the twin truths of social and personal control, we might think of ourselves as like someone stranded in a deep well with two ropes dangling down. If we grab either one alone we will sink deeper into the well. Only when we hold both ropes at once can we climb out, because at the top, beyond where we can see, they come together around a pulley. Grabbing only the rope of God's sovereignty or of our responsibility plunges us to the bottom of a well. So instead we grab both ropes, without yet understanding how they come together. In doing so, we may be comforted that in science as in religion, a confused acceptance of seemingly irreconciliable principles is sometimes more honest than a tidy, over-simplified theory that ignores half the evidence.

Divine Image and Finite Creature

The tension between the grandeur of our cognitive capacities and our vulnerability to error was anticipated by the Psalmist. Thus he could exult that human beings are "little less than God" in the very next breath after wondering "What is man that Thou art mindful of him?" Pascal's *Thoughts* reflect a similar ambivalence. One moment we read that "Man's greatness lies in his power of thought," and the next moment that the human mind is "a cesspool of uncertainty and error."

And so it is throughout the Scriptures. *We are made in the image of God*, crowned with honor and glory and given dominion over God's created world. Humanity is special. We are the summit of God's creative work. We are God's own children.

Yet we are also a part of the creation. *We are finite creatures* of the one who declares "I am God, and there is none like me."[20] Loved by God, we have dignity, but not deity. Thus Karl Barth warns us never to make an idol out of our religion, by presuming our own thoughts to be God's absolute truth. Always we see reality in a mirror, dimly. "For as the heavens are higher than the earth, so are my ways higher than your ways and my thoughts than your thoughts."[21]

* * * * *

So we see that in Christian belief, much as in contemporary psychology (see Table 1), the whole truth seems best approximated by complementary propositions: we are, now and in eternity, bodies alive, yet we are also created for spiritual relationships; faith is a source of action and a consequence of action; pride is the fundamental sin, but grace is a key to self-acceptance; God is in control, and we are responsible; we are made in the image of God, and we are finite creatures. These Christian propositions find their counterparts in recent psychological inquiry. Both sets of propositions are the creations of human minds, mere approximations of reality that are subject to revision. Still, the parallels of content and of dialectical form are noteworthy. Because faith always seeks understanding in the language of the day, psychology can perhaps enliven ancient Christian wisdom. Perhaps it can also help us feel more comfortable with the yin and yang of truth. To ask whether it is more true that we are body or spirit, whether faith or action comes first, whether God or we are responsible, whether pride or self-rejection is the problem, or whether we are wise or foolish, is like asking which blade of a pair of scissors is more necessary. Always it is tempting when emphasizing one truth to forget the other. Martin Luther once likened us to the drunkard, who, having fallen off his horse on the right, would then proceed to fall off it on the left. In our time, at least, the cutting edge of truth seems to lie between the yin and the yang.

REFERENCES

[1]In Myers, D.G. and M.A. Jeeves *Psychology Through the Eyes of Faith*. San Francisco: Harper and Row, 1987.

[2]Hubel, David H. "The Brain." *Scientific American* (September, 1979), pp. 45–53.

[3]Hebb, D.O. *Essay on Mind*. Hillsdale, N.J.: Erlbaum, 1980.

[4]Grunberger, R. *The 12-Year Reich: A Social History of Nazi Germany 1933-1945*. New York: Holt, Reinhart and Winston, 1971, p. 27.

[5]Quoted by D. Goleman, "A Bias Puts Self at Center of Everything." *The New York Times* (June 12, 1984), pp. C1, C4.

[6]Quoted by W. McGuire, "The Yin and Yang of Progress in Social Psychology: Seven Koan." *Journal of Personality and Social Psychology, 26*, 1973, pp. 446-456.

[7]Reichenbach, B. "Life After Death: Possible or Impossible?" *Christian Scholar's Review*, 3, 1974, pp. 232–244.

[8]Calvin, J. *Institutes of the Christian Religion*, I, VI, 2 (J.T. McNeil, ed., F.L. Battles, trans.). Philadelphia: Westminster Press, 1975, p. 72.

[9]Kierkegaard, S. *For Self-Examination and Judge for Yourselves* (W. Lowrie, trans.). Princeton: Princeton University Press, 1944, p. 88.

[10]Quoted by J.H. Westerhoff, III, *Values for Tomorrow's Children*. Philadelphia: Pilgrim Press, 1971, p. 44.

[11]Pascal, B. *Thoughts*, 233 (W.F. Trotter, trans.), in M. Mack (ed.), *World Masterpieces*, vol. 2. New York: Norton, 1965, p. 38.

[12]Lewis, C.S. *Christian Reflections*. Glasgow: Collins (Fount Paperbacks), 1981, p. 61.

[13]Philippians 3:9, *Good News*.

[14]James, W. *The Principles of Psychology*, vol. 2. New York: Holt, 1890.

[15]Psalm 131, *Good News*.

[16]Edwards, J. *Freedom of the Will* (P. Ramsey, ed.). New Haven: Yale University Press, 1957, pp. 27, 253.

[17]Augustine, *The City of God*, Book 5, Chapter 9.

[18]I Corinthians 15:10, *King James*.

[19]Lewis, C.S. *Mere Christianity*, Book III, Chapter 12.

[20]Isaiah 46:9, *King James*.

[21]Isaiah 55:9, *King James*.

Beyond War and Peace: A Reappraisal of the Encounter between Christianity and Science

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During the last third of the nineteenth century Andrew Dickson White and others used military metaphors to describe the historical relationship between science and Christianity. Recent scholarship, however, has shown the "warfare" thesis to be a gross distortion—as this paper attempts to reveal, employing illustrations from the patristic and medieval periods and from the Copernican and Darwinian debates. The authors argue that the interaction between science and Christianity was far too rich and varied to be covered by any simple formula.

On a December evening in 1869, with memories of civil war still fresh in their minds, a large audience gathered in the great hall of Cooper Union in New York City to hear about another conflict, still taking its toll—"with battles fiercer, with sieges more persistent, with strategy more vigorous than in any of the comparatively petty warfares of Alexander, or Caesar, or Napoleon." Although waged with pens rather than swords, and for minds rather than empires, this war, too, had destroyed lives and reputations. The combatants? Science and Religion.[1]

The bearer of this unwelcome news was Andrew Dickson White, a 37-year-old Episcopal-bred historian who had taught at the University of Michigan and served in the New York State Senate before becoming the first president of Cornell University at the age of thirty-three. His refusal as president to impose any religious tests on students and faculty and his declared intention of creating in Ithaca "an asylum for *Science*—where truth shall be sought for truth's sake, not stretched or cut exactly to fit Revealed Religion" had aroused the enmity of pious New Yorkers, who accused the young president and his school of religious indifference and infidelity. When "sweet reasonableness" failed to placate his critics, White fired his Cooper Union broadside, accusing them of possessing the same kind of narrow minds and mean spirits that had led to the persecution of Vesalius, Kepler, and Galileo.[2]

History showed, White declared, that "interference with Science in the supposed interest of religion—no matter how conscientious such interference may have been—has resulted in the direst evils both to Religion and Science, and *invariably*." To document this thesis, he surveyed "some of the hardest-fought battle-fields of this great war," illustrating how rigid biblical literalists and dogmatic theologians had stunted the growth of science and prostituted religion—only to lose in the end.[3]

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Some of the bloodiest battles, White believed, had been fought during the sixteenth and seventeenth centuries, the period of the so-called Scientific Revolution, when powerful church leaders repeatedly tried to silence the pioneers of modern science. Nicolaus Copernicus, who dared to locate the sun at the center of the planetary system, risked his very life to publish his heretical views and escaped "persecution only by death." Many of his disciples met a less happy fate: Bruno was "burned alive as a monster of impiety; Galileo tortured and humiliated as the worst of unbelievers; Kepler hunted alike by Protestants and Catholics." Andreas Vesalius, the sixteenth-century physician who laid the foundations of modern anatomy by insisting on careful first-hand dissection of the human body, paid for his temerity by being "hunted to death." The latest victim in the protracted war on science, said White in an obvious reference to his own experience, was a certain American university, denounced from pulpit and press as "godless" merely because it defended scientific freedom and resisted sectarian control. White no doubt felt that its president, too, deserved to be ranked among the martyrs of science for the persecution that he had endured.[4]

White's Cooper Union lecture appeared the next day as "The Battle-Fields of Science" in the *New-York Daily Tribune*. In the years following, White fleshed out his history of the conflict between science and religion with new illustrations, some drawn from contemporary hostilities between creationists and evolutionists. Along the way he also narrowed the focus of his attack: from "religion" in 1869, to "ecclesiasticism" in 1876, when he published a little book entitled *The Warfare of Science*, and finally to "dogmatic theology" in 1896, when he brought out his fully documented, two-volume *History of the Warfare of Science with Theology in Christendom*. In this last version of his thesis he distinguished sharply between theology, which made unprovable statements about the world and took the Bible as a scientific text, and religion, which consisted of recognizing "a Power in the universe" and living by the Golden Rule. Religion, so defined, fostered science; theology smothered it.[5]

No work—not even John William Draper's best-selling *History of the Conflict between Religion and Science* (1874)—has done more than White's to instill in the public mind a sense of the adversarial relationship between science and religion. His *Warfare* remains in print to the present day, having appeared also in German, French, Italian, Swedish, and Japanese translations. His military rhetoric has captured the imagination of generations of readers, and his copious references, still impressive, have given his work the appearance of sound scholarship, bedazzling even twentieth-century historians who should know better. In recent decades, for example, the intellectual historian Bruce Mazlish certified White's thesis to have been established "beyond reasonable doubt," and the late George Sarton, a distinguished historian of science at Harvard, found White's argument so compelling that he urged its extension to non-Christian cultures.[6]

Such judgments, however appealing they may be to foes of "scientific creationism" and other contemporary threats to established science, fly in the face of mounting evidence that White read the past through battle-scarred glasses, and that he and his imitators have distorted history to serve ideological ends of their own. Although it is not difficult to find instances of conflict and controversy in the annals of Christianity and science, recent scholarship has shown the warfare metaphor to be neither useful nor tenable in describing the relationship between science and religion.[7] In the remainder of this paper, we wish to support this conclusion with a series of examples drawn from recent scholarly studies—thereby giving White's thesis a more systematic critique than it has heretofore received.

1.

White viewed the early centuries of the Christian era as an unmitigated disaster for science. By his account, the church fathers regarded all scientific effort as futile and required any crumbs of scientific knowledge acquired through patient observation and reasoning to yield to puerile opinions extracted by dogmatic church leaders from sacred writings. Such "theological views of science," he wrote, have "without exception . . . forced mankind away from the truth, and have caused Christendom to stumble for centuries into abysses of error and sorrow."[8] The coming of Christianity thus "arrested the normal development of the physical sciences for over fifteen hundred years," imposing a tyranny of ignorance and superstition that perverted and crushed true science.[9]

It is true, of course, that few church fathers placed high value on science and that some spurned it altogether. Augustine expressed reservations about the value of natural science: "When it is asked what we ought to believe in matters of religion, the answer is not to be sought in the exploration of the nature of things, after the manner of those whom the Greeks called 'physicists.' . . . For the Christian, it is enough to believe that the cause of all things, whether in heaven or on earth, whether visible or invisible, is nothing other than the goodness of the Creator."[10]

One must not conclude from such remarks, however, that the church fathers totally repudiated scientific knowledge or demanded that it always conform to dictates of scripture. The opening clause of the passage

just quoted is often overlooked. Augustine is arguing only that *in matters of religion* there is little or nothing to be learned from the Greek physicists. In another context he argues that insofar as scientific knowledge is required, it must be taken from the pagan authors who possess it:

> It frequently happens that there is some question about the earth, or the sky, or the other elements of this world, the movement, revolutions, or even the size and distance of the stars, the regular eclipses of the sun and the moon, the course of the years and seasons; the nature of the animals, vegetables and minerals, and other things of the same kind, respecting which one who is not a Christian has knowledge derived from the most certain reasoning or observation. And it is highly deplorable and mischievous and a thing especially to be guarded against that he should hear a Christian speaking of such matters in accordance with Christian writings and uttering such nonsense that, knowing him to be as wide of the mark as . . . east is from west, the unbeliever can scarcely restrain himself from laughing.[11]

White and other writers on science and religion have suggested that science would have progressed more rapidly in the early centuries of the Christian era if Christianity had not inhibited its growth. Counterfactual speculations about what might have occurred had circumstances been otherwise are of questionable value. But it is worth pointing out that the study of nature held a very precarious position in ancient society; with the exception of medicine and a little astronomy, it served no practical function and generally failed to win recognition as a socially useful activity. As a result, it received little patronage from either pagans or Christians, but depended for its existence on independent means and individual initiative. When the economic and political fortunes of the Roman Empire declined in late antiquity, people of wealth decreased in number, and the elites directed their initiative elsewhere. Moreover, changing educational and philosophical values were diverting attention from the world of nature. Inevitably the pursuit of science suffered.

Christianity did little or nothing to alter the situation. It contained more or less the same spectrum of attitudes toward natural science as did paganism. If there were differences, Christianity was perhaps a little less otherworldly than the major competing ideologies (Gnosticism, Neoplatonism, and the mystery religions) and afforded slightly greater incentive for the study of nature. The church fathers used Greek scientific knowledge in their defense of the faith against heresy and in the elucidation of scripture, thereby preserving and transmitting it during the social and political turmoil of the first millennium of the Christian era. Science was thus the handmaiden of theology—a far cry from its modern status, characterized by autonomy and intellectual hegemony, but also far from the victim of Christian intolerance that White portrayed. Science was not the enemy, but a valued (if not entirely reliable) servant.[12]

In addition to serving theology, Greek scientific knowledge occupied a prominent place in Christian world views, from the time of Basil of Caesarea and Augustine through the end of the Middle Ages and beyond. The notion that any serious Christian thinker would even have attempted to formulate a world view from the Bible alone is ludicrous. For example, contrary to popular belief (which White's *Warfare* has helped to shape), the church did not insist on a flat earth; there was scarcely a Christian scholar of the Middle Ages who did not acknowledge its sphericity and even know its approximate circumference. By the beginning of the thirteenth century, virtually all of the works of Aristotle had become available in Europe, and from this point onward we see a persistent effort to integrate Aristotelian natural philosophy, or science, with Christian theology. In the end, Christianity took its basic categories of thought, its physical principles, and much of its metaphysics and cosmology from Aristotle. By means of its power to organize and interpret human experience, Aristotelianism conquered Christendom.

But Christian theology impinged on science in return and altered its character. Certain aspects of Aristotelian natural philosophy, such as its determinism (everything

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that will occur must occur) and its denial of a creation, were diametrically opposed to central Christian doctrines. The ensuing struggles (which were not between Christianity and science, but rather, one must note, among Christians holding different views of the proper relationship between Christianity and science) led ultimately to a theological condemnation of these and other philosophical propositions in 1270 and 1277. The complexity of the encounter between Christianity and science is illustrated nicely by the aftermath of these condemnations.[13] The condemnations did place a lid on certain lines of scientific speculation; henceforth, philosophers or scientists were forbidden to uphold certain Aristotelian positions and forced to tread lightly whenever they approached theological territory. But while losing certain freedoms, they gained others. Theological condemnation of a considerable body of Aristotelian propositions weakened the heavy hand of Aristotelian authority and freed scientists to speculate in non-Aristotelian and anti-Aristotelian directions. Thus we see in the fourteenth century a steady stream of attacks on various Aristotelian doctrines and a veritable orgy of speculation about non-Aristotelian possibilities, including such notions as the rotation of the earth on its axis.

The condemnations affected the scientific enterprise in another way. One of the central themes of the condemnations was the proclamation of God's absolute sovereignty and omnipotence. From this doctrine follows the absolute contingency of nature—that the course of nature can be anything God chooses it to be and, therefore, that humankind's acquired knowledge of natural causes can be overturned simply by God's decision to do things otherwise. The condemnations thus generated a certain skepticism about the ability of the human mind to penetrate with certainty to the underlying causes of observed events; this attitude encouraged the view that science should restrict its attention to empirical fact and ignore the search for underlying causes, thus influencing the development of scientific methodology. Four hundred years later, the idea of God's absolute sovereignty and its corollary, the total passivity of matter, became central features of Isaac Newton's mechanistic world view.[14]

2.

In 1543 Nicolaus Copernicus (1473–1543), a Catholic church administrator from northern Poland, announced a heliocentric astronomy that removed the earth from the center of the universe and led, ultimately, to the overturning of the medieval world view. White's interpretation of these events is almost as wide of the mark as his understanding of the Middle Ages. White reports that Copernicus feared to publish his discoveries in Rome or Wittenberg—the centers, respectively, of Catholicism and Protestantism. Instead, the astronomer turned to Nuremberg, where his work was published with a "grovelling preface," written by the Lutheran clergyman Andreas Osiander (1498–1552), which contained the "apologetic lie that Copernicus had propounded the doctrine of the earth's movement not as a fact, but as a hypothesis." "The greatest and most ennobling, perhaps, of scientific truths" was "forced, in coming before the world, to sneak and crawl."[15] Copernicus died within a few hours of receiving his first copy of the book and thus, in White's words, placed himself "beyond the reach of the conscientious men who would have blotted his reputation and perhaps destroyed his life."[16]

White's picture of unremitting religious hostility to heliocentrism is no longer defensible—if, indeed, it ever was. If Copernicus had any genuine fear of publication, it was the reaction of scientists, not clerics, that worried him. Other churchmen before him—Nicole Oresme (a bishop) in the fourteenth century and Nicholas of Cusa (a cardinal) in the fifteenth—had freely discussed the possible motion of the earth, and there was no reason to suppose that the reappearance of this idea in the sixteenth century would cause a religious stir.[17] Indeed, various churchmen, including a bishop and a cardinal, urged Copernicus to publish his book, which appeared with a dedication to Pope Paul

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III. Had Copernicus lived beyond its publication in 1543, it is highly improbable that he would have felt any hostility or suffered any persecution. The church simply had more important things to worry about than a new astronomical or cosmological system. Although a few critics noticed and opposed the Copernican system, organized Catholic opposition did not appear until the seventeenth century.[18]

Concerning the Protestant response to the ideas of Copernicus, White claims that "all branches of the Protestant Church . . . vied with each other in denouncing the Copernican doctrine as contrary to Scripture."[19] He also maintains (and his account has been repeated endlessly) that the theologians Martin Luther, Philipp Melanchthon, and John Calvin all bitterly attacked the new theory. In fact, from Luther we have only a single off-the-cuff remark, made during a "table talk" in 1539 (four years *before* publication of Copernicus's book), in which he refers to "that fool who wants to overturn the whole art of astronomy." Melanchthon expressed early disapproval of heliocentrism as a description of reality but later softened his position. Calvin spoke out against the mobility of the earth in a sermon on 1 Corinthians 10 and 11 (dating from 1556), denouncing the propagators of such vain novelties for their contentious spirit, which undermines the quest for truth; however, it is likely that Calvin had in mind only the rotational motion of the earth as described in Cicero's *Academica*, and there is no convincing evidence that he was even acquainted with the heliocentrism of Copernicus. In any case, Calvin's dismissal of the earth's mobility is a passing remark, and it is clear that cosmological issues never entered systematically into his thought.[20]

Significantly, the first sustained response to Copernicus came from a group of young Lutheran mathematical astronomers who worked under Melanchthon's general patronage.[21] One of them, Georg Joachim Rheticus (1514–1574), spent two years with Copernicus shortly before the latter's death and persuaded the elderly astronomer to publish his book. Rheticus saw it through the press, with Osiander's help. Osiander's prefatory letter, maintaining that astronomy makes mathematical predictions but does not necessarily describe physical reality, was no "grovelling" apology, but an expression of deeply held convictions, shared by many astronomers—a sincere attempt to save Copernicus from unnecessary criticism. Rheticus himself accepted the physical reality of heliocentrism and, contrary to White's claim, proclaimed his position openly. However, many of Rheticus's colleagues adopted Copernicanism simply as a mathematical reform, which offered a better way of predicting planetary positions, while overlooking or rejecting the radical thesis that the earth really moves. Their reasons for opposing the motion of the earth were both scientific and theological: heliocentrism violated the principles of Aristotelian physics and conflicted with the literal interpretation of certain biblical passages that seemed to teach the fixity of the earth. To the latter objection, heliocentrists replied that such passages were written in the language of everyday speech and should not be taken as statements of scientific truth. By the end of the century, then, Protestants held a variety of cosmological views, the merits of which they freely debated.

The seventeenth century, according to White, produced a "new champion" of heliocentrism: the young Galileo, equipped with a new scientific instrument, the telescope. "Against him," White writes, "the war was long and bitter. . . . Semi-scientific professors, endeavoring to curry favour with the Church, attacked him with sham science; earnest preachers attacked him with perverted Scripture; theologians, inquisitors, congregations of cardinals, and at last popes dealt with him, and, as was supposed, silenced his impious doctrine forever."[22] This dramatic tale has come, for many, to symbolize the theological assault on science.

White experienced little difficulty identifying good and evil, truth and error, heroes and villains. Modern scholarship, however, offers a picture more subtle in its shadings. In order to grasp the events and understand why Galileo's fate differed from that of Copernicus, we must keep in mind the Counter-Reformation of the second half of the sixteenth century. Responding to the challenge of the Protestant Reformation, Catholicism grew more conservative and authoritarian; power became centralized, and ideological vigilance increased. One of the most sensitive issues was biblical interpretation, for Protestant rejection of the Catholic position that the church alone has the authority to interpret the Bible set the two sides in direct opposition. The Catholic church assumed a firm stance on this issue at the Council of Trent (1545–1563), forbidding the interpretation of scripture on any matter of faith or practice "contrary to the sense determined by the Holy Mother Church."[23] The hermeneutic flexibility of the Middle Ages had become a thing of the past.

When Galileo burst on the scene in 1610, he came equipped not only with telescopic observations that could be used to support the heliocentric theory, but also with liberal arguments about how to interpret biblical passages that seemed to teach the fixity of the earth. Galileo argued that God spoke through both scripture and the "book of nature," that the two could not truly conflict, and that in physical matters authority

should rest with reason and sense. Faced with demonstrative scientific proof, any scriptural passage to the contrary would have to be reinterpreted. Galileo was flirting with danger, not only by entering the domain of the theologians, but also by defending hermeneutic principles clearly at odds with the spirit of the Council of Trent. Moreover, Galileo lacked the convincing physical proof of the mobility of the earth that his own position demanded. Every one of his telescopic observations was compatible with the modified geocentric system of Tycho Brahe, and Galileo's argument from the tides (that they represent a sloshing about of the oceans on a moving earth) convinced few. The trouble in which Galileo eventually found himself, and which led ultimately to his condemnation, then, resulted not from clear scientific evidence running afoul of biblical claims to the contrary (as White tells the story), but from ambiguous scientific evidence provoking an intramural dispute within Catholicism over the proper principles of scriptural interpretation—a dispute won by the conservatives at Galileo's expense.[24] Galileo never questioned the authority of scripture, merely the principles by which it was to be interpreted.

The details of Galileo's condemnation need not detain us long.[25] Galileo's campaign on behalf of Copernicanism was halted abruptly in 1616, when the Holy Office declared the heliocentric doctrine heretical—though at the time Galileo faced no physical threat. Eight years later Galileo received permission from the new pope, the scholarly Urban VIII, to write about the Copernican system as long as he treated it as merely hypothesis. After many delays, Galileo's *Dialogue Concerning the Two Chief World Systems* appeared in 1632. In it, Galileo not only unambiguously defended the heliocentric system as physically true, but also made the tactical mistake of placing the pope's admonition about its hypothetical character in the mouth of the slow-witted Aristotelian, Simplicio. Although the official *imprimatur* of the church had been secured, Galileo's enemies, including the now angry Urban VIII, determined to bring him to trial. The inquisition ultimately condemned Galileo and forced him to recant. Although sentenced to house arrest for the rest of his life, he lived comfortably in a villa outside Florence. He was neither tortured nor imprisoned—simply silenced.

The Galileo affair was a multi-faceted event. Certainly it raised serious questions about the relationship between reason and revelation and the proper means of reconciling the teachings of nature with those of scripture. Nonetheless, it was not a matter of Christianity waging war on science. All of the participants called themselves Christians, and all acknowledged biblical authority. This was a struggle between opposing theories of biblical interpretation: a conservative theory issuing from the Council of Trent versus Galileo's more liberal alternative, both well precedented in the history of the church. Personal and political factors also played a role, as Galileo demonstrated his flair for cultivating enemies in high places.[26]

3.

Throughout the nineteenth century, but especially after the publication in 1859 of Charles Darwin's *Origin of Species*, the hottest battles in White's warfare were fought over the biblical account of creation. These conflicts allegedly pitted the "great body of theologians" against a coalition of scientists drawn from the fields of astronomy, geology, biology, and anthropology who sought to substitute a dynamic, natural history of the world for the static, supernatural account found in Genesis. Each encounter, says White, followed a predictable pattern: theologians first marshaled biblical texts against the offending scientific doctrine, then sued for peace, after the development of a scientific consensus, by offering "far-fetched reconciliations of textual statements with ascertained fact."[27]

As an example of this process, White cites the reception given to the nebular hypothesis of Pierre Simon Laplace, who in 1796 proposed that the solar system had developed naturally from a contracting, rotating nebula. "Throughout the theological world," White writes, "there was an outcry at once against 'atheism,' and war raged fiercely." Later, after various discoveries had made the hypothesis scientifically respectable, the faithful decided that Laplace's conjecture was not atheistic at all, but corresponded marvelously with the biblical declaration that "in the beginning . . . the earth was without form, and void" (Gen. 1:1–2).[28]

In his zeal to describe the battle, White neglects to inform his readers that clergy were among the first to embrace and popularize the hypothesis—and that the most successful and influential of the "far-fetched" efforts to harmonize the Mosaic and Laplacian cosmogonies came not from over-imaginative biblical scholars but from two of America's most distinguished scientists, Arnold Guyot of Princeton and James Dwight Dana of Yale. Instead of illustrating the eagerness of theologians to wage war on science, the history of the nebular hypothesis shows the extent to which orthodox Christians went to avoid conflict with science.[29]

The religious response to developments in historical geology provides another example of the fallacy of the science-versus-theology formula. As Charles C. Gillispie pointed out years ago, the problem in geology

during the early nineteenth century was "one of religion (in a crude sense) *in* science rather than one of religion versus science." To illustrate the absurdity of pitting men of science against men of the cloth, we need only point out that the leading English geologists of the early nineteenth century—William Buckland, William Daniel Conybeare, and Adam Sedgwick—were all clergymen, as was the American geologist Edward Hitchcock. And for every theologian who labored to produce "more or less absurd" schemes for reconciling geology and Genesis, there were scientists—for example, the geologists Benjamin Silliman and John William Dawson—who did the same thing.[30]

Had Copernicus lived beyond its publication in 1543, it is highly improbable that he would have felt any hostility or suffered any persecution. The church simply had more important things to worry about than a new astronomical or cosmological system.

Geologists who argued for the antiquity of the earth, the existence of pre-Adamic life, and a limited Noachian flood inevitably generated heated debate. But when conflict erupted, it did not find geologists facing theologians. Rather, as James R. Moore recently has argued, professional geologists, who subscribed to Charles Lyell's admonition to study geology "as if the Scriptures were not in existence," joined with professional biblical scholars, who adopted Benjamin Jowett's advice to "interpret the Scriptures like any other book," in alliance against amateur geologists and exegetes who refused to accept these maxims.[31]

The appearance of Darwin's controversial theory of organic evolution, which made humans animals and left God virtually unemployed, understandably stirred passionate debate. But White's polemical analysis confuses rather than clarifies the issues. According to White, Samuel Wilberforce, the Bishop of Oxford, launched the theological offensive against Darwin—and set the tone of the debate—by writing an essay for *The Quarterly Review* in which he condemned Darwinism for contradicting the Bible. Later, on 30 June 1860, in an address at Oxford before the British Association for the Advancement of Science, Wilberforce repeated his objections, this time congratulating himself "that he was not descended from a monkey." Upon hearing this remark, Darwin's friend the zoologist Thomas Huxley shot back: "If I had to choose, I would prefer to be a descendant of a humble monkey rather than of a man who employs his knowledge and eloquence in misrepresenting those who are wearing out their lives in the search for the truth"—a shot, says White, that "reverberated through England" and indeed the world.[32]

To White's credit, he refrained from passing on an even more sensational (and apocryphal) version of the story, according to which the bishop impertinently asked Huxley whether it was "on your grandfather's or grandmother's side that you claim descent from the apes." Replied the irreverent zoologist: "I would rather be descended from an ape than a bishop." This is a dramatic and memorable story, but one, as J.R. Lucas and others have shown, that perpetuates many errors and places Wilberforce in a grossly unfair light.[33]

In his essay for *The Quarterly Review*, which provided the basis for his comments at Oxford, Wilberforce expressed concern about the theological implications of Darwinism, but he dwelt on the scientific, not the religious, objections to Darwin's theory. In fact, he professed a willingness to embrace the theory if it should be demonstrated to be correct:

> If Mr. Darwin can with the same correctness of reasoning [as Newton] demonstrate to us our fungular descent, we shall dismiss our pride, and avow, with the characteristic humility of philosophy, our unsuspected cousinship with the mushrooms . . . only we shall ask leave to scrutinise carefully every step of the argument which has such an ending, and demur if at any point of it we are invited to substitute unlimited hypothesis for patient observation. . . . We have no sympathy with those who object to any fact or alleged facts in nature, or to any inference logically deduced from them, because they believe them to contradict what it appears is taught by Revelation.

These are hardly the ravings of an intransigent fundamentalist, as even Darwin recognized. Writing to a friend, Darwin called the bishop's review "uncommonly clever" and noted that his clerical critic "picks out with skill all the most conjectural parts [of the *Origin*], and brings forward well all the difficulties."[34]

The Huxley-Wilberforce exchange, far from setting the tone of the Darwinian debate, went virtually unnoticed at the time. The botanist Joseph Hooker, who later endorsed the legend, reported to Darwin shortly after the meeting that he, not Huxley, had responded most effectively to the bishop. And a writer covering the meetings for *The Athenaeum* neglected even to mention Huxley's alleged riposte. Wilberforce and Huxley did, without doubt, exchange words, but the words became memorable only with the passage of time, as victorious Darwinians began reconstructing the history of their struggle for recognition. In their memories

Huxley won the day at Oxford, but contemporary records indicate otherwise: Wilberforce's supporters included not only the majority of clerics and laypeople in attendance, but "the most eminent naturalists" as well.[35]

In recent decades, the encounter between William Jennings Bryan and Clarence Darrow at the Scopes trial in 1925 has achieved similar legendary status as a major turning point in the war between science and religion. According to common opinion, the evolutionists, though defeated on legal grounds, scored a stunning public-relations victory, halted the anti-evolution crusade, and exposed the bumbling Bryan as an ignoramus. A more careful look suggests that they did nothing of the sort. Even liberal contemporaries, Paul M. Waggoner has shown, tended at first to view the trial as a disturbing fundamentalist victory, and the anti-evolution campaign continued to prosper for several years after the trial. By present standards, Bryan displayed remarkable openmindedness for a creationist. Publicly, he not only accepted the testimony of geologists regarding the antiquity of the earth, but conceded that the "days" of Genesis represented long periods of time. Privately, he allowed to friends that he had no quarrel with "evolution before man."[36]

White's seeming compulsion to reduce every episode in the history of science and Christianity to a simple warlike confrontation blinded him to the possibility that Darwin's critics might have been motivated by honest scientific objections or that his supporters might have been attracted for theological reasons. Thus he tells us that Harvard's venerable Louis Agassiz rejected evolution because he could not escape "the atmosphere of the little Swiss parsonage in which he was born" and that the Canadian geologist Sir William Dawson opposed Darwinism for theological reasons—ignoring in both cases their scientific complaints. Likewise, White overlooked the affinity between Darwinism and Calvinism that apparently encouraged such orthodox Christians as the botanist Asa Gray and the geologist-clergyman George Frederick Wright to accept natural selection.[37]

We are not suggesting that all was harmony—that serious conflict did not exist—only that it was not the simple bipolar warfare described by White. Recent scholarship suggests that Darwinism produced conflict in at least three different ways. According to James R. Moore, the Darwinian debates created conflict, not between scientists and theologians, but within individual minds experiencing a "crisis of faith" as they struggled to come to terms with new historical and scientific discoveries. It was, he writes, a "conflict of minds steeped in Christian tradition with the ideas and implications of Darwinism."[38]

Neal C. Gillespie has argued that the conflict involved competing systems of science or "epistemes," the older of which rested on theological assumptions while the newer one, associated with Darwin, rejected religion as a means of knowing the world and insisted on an interpretation of nature that involved only natural, secondary causes. "Because the new episteme for science differed from the old in having within it no place for theology," he explains, "serious questions were thereby raised that made the conflict, sometimes dismissed as an illusion or a mistake, very real indeed." Such conflict, arising from transformations *within* science, had little to do with warring scientists and clerics.[39]

By the end of the [sixteenth] century, Protestants held a variety of cosmological views, the merits of which they freely debated.

Frank M. Turner has offered still a third way of viewing the Darwinian controversies. The "Victorian conflict between religious and scientific spokesmen," he claims, resulted not from hostility between progressive science and retrogressive theology, as White would claim, but from a "shift of authority and prestige . . . from one part of the intellectual nation to another," as professionalizing scientists sought to banish the clergy from the scientific enterprise and end their control of education. According to Turner, the positivist episteme described by Gillespie

> constituted both a cause and a weapon. The "young guard" agreed among themselves that science should be pursued without regard for religious dogma, natural theology, or the opinions of religious authorities. . . . The drive to organize a more professionally oriented scientific community and to define science in a more critical fashion brought the crusading scientists into conflict with two groups of people. The first were supporters of organized religion who wished to maintain a large measure of control over education and to retain religion as the source of moral and social values. The second group was the religiously minded sector of the preprofessional scientific community, which included both clergymen and laymen.

In Turner's view, then, the conflict had a social as well as an intellectual dimension.[40]

4.

This brief excursion to some of White's old battlefields has demonstrated that the historical relationship between science and Christianity—or, more properly, scientists and theologians—cannot be reduced simply

to conflict or warfare. Additional examples would only strengthen this conclusion.[41] However, discrediting the warfare thesis represents only the beginning of the historical task confronting us. We also must construct a satisfactory alternative, for until we do, it is likely that the military metaphor will continue to dominate historical analysis. We require a fresh history of science and religion, free (or as free as we can make it) of the distortion of malice and self-interest. Reinterpreting something as complex as the encounter between Christianity and science is a delicate and arduous task that can hardly be accomplished within the scope of one paper. Nevertheless, we wish to offer a few caveats and suggestions that may help to define a suitable program.

First, to insure that we will not be misunderstood, we wish to assert plainly that our displeasure with White's warfare thesis is matched by our aversion to its converse. That is, in denying that unremitting hostility and conflict have characterized the relationship between Christianity and science, we do not in any way mean to suggest that Christianity and science have been perennial allies. Such an interpretation, though widely held in some circles, particularly among Christian apologists, fails to pass historical muster.[42]

Second, one of the great attractions of White's view is its simplicity; few qualifications and nuances detract from the clarity of his picture. The memorable imagery found in his writings helps to explain their remarkable longevity. Unfortunately, we will never find a satisfactory alternative of equal simplicity. Any interpretation that begins to do justice to the complexity of the interaction between Christianity and science must be heavily qualified and subtly nuanced—clearly a disadvantage in the quest for public recognition, but a necessity nonetheless.

Third, we are convinced that traditional categories—enemies versus allies, conflict versus consensus—are misleading, even pernicious, because they direct us toward the wrong questions. For more than a century historians of Christianity and science like White have wasted their time and dissipated their energies attempting to identify villains and victims, often with polemical or apologetic intent and always within a framework heavily laden with values. They have tacitly assumed that science has been, and continues to be, one of Western civilization's most valuable cultural artifacts—so valuable, indeed, that nothing should be allowed to interfere with it. Then they have proceeded to inquire why the most perfect expression of scientific activity (namely, modern science) was so long in coming into existence, as if its creation were a simple and inevitable matter; they have leapt quickly to the conclusion that science has suffered various indignities at the hand of assorted enemies, of which Christianity was chief. Such scientism must not pass unchallenged.

In offering these criticisms, we do not mean to question the significance or value of the scientific enterprise. We mean only to suggest that to start with scientistic assumptions is no way to understand the nature and genesis of science. If we are going to celebrate the rise of science, we are not apt to understand it. Besides, partisan historians of religion can play a similar game: by supposing religion to be the premier cultural property, to which everything else (including science) must be subordinate, they may discover that science has frequently interfered with the progress of religion. Both games, though seductive for their apologetic function, are of little merit to the historian, because the outcome is, in very large measure, predetermined by the value-laden rules of the game being played. Sound scholarship requires a more neutral starting point.[43]

It was not a matter of Christianity waging war on science. All of the participants called themselves Christians, and all acknowledged biblical authority.

Historical investigation to date has revealed a rich and varied interaction between science and Christianity. People of assorted scientific and theological persuasions and varieties of knowledge and commitment have, with varying degrees of skill and integrity, gone about the business of understanding themselves and their world, building institutions, creating careers, and pursuing sundry satisfactions. In the process, Christianity and science—as intellectual systems, as institutions, and as objects of personal commitment—have rubbed against each other, sometimes comfortably, sometimes with destructive force.[44] In the future, we must not simply ask "Who was the aggressor?" but "How were Christianity and science affected by their encounter?" We are confident that research will show that the encounter has been multiform, the range of effects enormous. We will discover shifting alignments and dual memberships. We will uncover as much struggle and competition within the Christian and scientific communities as between them. Most important, we will see that influence has flowed in both directions, that Christianity and science alike have been profoundly shaped by their relations with each other. If, however,

we fail to escape the trap of assigning credit and blame, we will never properly appreciate the roles of science and Christianity in the shaping of Western culture; and that will deeply impoverish our understanding.

NOTES

[1]"First of the Course of Scientific Lectures—Prof. White on 'The Battlefields of Science,'" *New York Daily Tribune*, 18 Dec. 1869, p. 4.

[2]Bruce Mazlish, Preface to *A History of the Warfare of Science with Theology in Christendom*, by Andrew Dickson White (abridged ed., New York, 1965), p. 13; Andrew Dickson White, *A History of the Warfare of Science with Theology in Christendom*, 2 vols. (New York, 1896), 1:viii. On White, see Glenn C. Altschuler, *Andrew D. White—Educator, Historian, Diplomat* (Ithaca, 1979).

[3]"First of the Course of Scientific Lectures," p. 4.

[4]*Ibid.*

[5]*Ibid.*; Andrew Dickson White, *The Warfare of Science* (New York, 1876), p. 145; White, *A History of the Warfare*, 1:ix,xii. Although hints of White's distinction between religion and theology appear in his earlier works, the focus on dogmatic theology in his 1896 volumes seems to have been more of an afterthought—a misleading effort to distance himself from John William Draper—than an essential premise. See Draper, *History of the Conflict between Religion and Science* (New York, 1874). Henry Guerlac corroborates this judgment in an unpublished memoir, "Sartoniana and Forward," where he notes that White had intended to entitle the 1896 book *A History of the Warfare of Science and Religion*, but was talked out of it by his collaborator, George Lincoln Burr.

[6]Mazlish, Preface, p. 18; George Sarton, "Introductory Essay," in *Science, Religion and Reality*, ed. Joseph Needham (New York, 1955), p. 14.

[7]For a brilliant critique of the warfare metaphor, see James R. Moore, *The Post-Darwinian Controversies: A Study of the Protestant Struggle to Come to Terms with Darwin in Great Britain and America, 1870–1900* (Cambridge, 1979), pp. 19–122. See also David C. Lindberg and Ronald L. Numbers, eds. *God and Nature: Historical Essays on the Encounter between Christianity and Science* (Berkeley, 1986), passim; and Ronald L. Numbers, "Science and Religion," in *Historical Writing on American Science*, ed. Sally Gregory Kohlstedt and Margaret W. Rossiter, *Osiris* 1, 2nd ser. (1985): 59–80.

[8]White, *A History of the Warfare*, 1:325. For a fuller account of science and the early church, see David C. Lindberg, "Science and the Early Church," in *God and Nature*, pp. 19–48.

[9]White, *A History of the Warfare*, 1:375.

[10]Augustine, *Enchiridion* 3.9, trans. Albert C. Outler, Library of Christian Classics 7 (Philadelphia, 1955), pp. 341–342.

[11]Augustine, *De genesi ad litteram* 1.19, trans. Meyrick H. Carre, *Realists and Nominalists* (London, 1946), p. 19. For another translation, see Augustine, *The Literal Meaning of Genesis*, trans. John Hammond Taylor, S.J., 2 vols., Ancient Christian Writers 41–42 (New York, 1982), 1:42–43.

[12]The themes of this and the preceding paragraph are more fully developed in Lindberg, "Science and the Early Church," pp. 29–33.

[13]For a good account of the effects of the condemnations, see Edward Grant, "The Condemnation of 1277, God's Absolute Power, and Physical Thought in the Late Middle Ages," *Viator* 10 (1979): 211–244; reprinted in Edward Grant's *Studies in Medieval Science and Natural Philosophy* (London, 1981), article 13.

[14]See Gary Deason, "Reformation Theology and the Mechanistic Conception of Nature," in *God and Nature*, pp. 181–185.

[15]White, *A History of the Warfare*, 1:123.

[16]*Ibid.*, 1:123–124.

[17]Oresme's discussion is translated and analyzed in Marshall Clagett, *The Science of Mechanics in the Middle Ages* (Madison, 1959), pp. 600–609.

[18]On the sixteenth century Catholic response to Copernicanism, see Robert S. Westman, "Copernicanism and the Churches," in *God and Nature*, pp. 86–95.

[19]White, *A History of the Warfare*, 1:126. On the Protestant response to Copernicanism, see Westman, "Copernicanism and the Churches," pp. 81–85, 89–98.

[20]On Luther and Melanchthon, see B.A. Gerrish, "The Reformation and the Rise of Modern Science," in *The Impact of the Church Upon Its Culture: Reappraisals of the History of Christianity*, ed. Jerald C. Brauer (Chicago, 1986), pp. 231–265. For recent discussion of Calvin's position, see R. Stauffer, "Calvin et Copernic," *Revue de l'histoire des religions* 179 (1971): 31–40; Robert White, "Calvin and Copernicus: The Problem Reconsidered," *Calvin Theological Journal* 15 (1980): 233–243; and Christopher B. Kaiser, "Calvin, Copernicus, and Castellio," *Calvin Theological Journal*, 21 (1985): 5–31.

[21]Robert S. Westman, "The Melanchthon Circle, Rheticus, and the Wittenberg Interpretation of the Copernican Theory," *Isis* 66 (1976): 164–193.

[22]White, *A History of the Warfare*, 1:130–131.

[23]The text of the decree is given in Olaf Pedersen, "Galileo and the Council of Trent: The Galileo Affair Revisited," *Journal for the History of Astronomy* 14 (1983):28–29, n. 46.

[24]On the issues between Galileo and his critics within the church, see *ibid.*; also William R. Shea,"Galileo and the Church," in *God and Nature*, pp. 118–133.

[25]On the course of events, see (in addition to the works by Pedersen and Shea) Jerome J. Langford, *Galileo, Science, and the Church* (New York, 1966).

[26]The struggle over heliocentrism was not the only battle during the period of the scientific revolution identified by White. For his discussion of the biomedical sciences, see *A History of the Warfare*, 1:49–63. For contrasting views, see Ronald L. Numbers and Ronald C. Sawyer, "Medicine and Christianity in the Modern World," in *Health/Medicine and the Faith Traditions*, ed. Martin E. Marty and Kenneth L. Vaux (Philadelphia, 1982), pp. 134–136; and James J. Walsh, *The Popes and Science* (New York, 1908).

[27]White, *A History of the Warfare*, 1:22, 218.

[28]*Ibid.*, 1:17–18.

[29]Ronald L. Numbers, *Creation by Natural Law: Laplace's Nebular Hypothesis in American Thought* (Seattle, 1977).

[30]Charles Coulston Gillispie, *Genesis and Geology: A Study in the Relations of Scientific Thought, Natural Theology, and Social Opinion in Great Britain, 1790–1850* (Cambridge, Mass., 1951); White, *A History of the Warfare*, 1:234. See also Nicolaas A. Rupke, *The Great Chain of History: William Buckland and the English School of Geology, 1814–1849* (Oxford, 1983).

[31]James R. Moore, "Geologists and Interpreters of Genesis in the Nineteenth Century," in *God and Nature*, pp. 322–350. See also Martin J.S. Rudwick, "The Shape and Meaning of Earth History," *ibid.*, pp. 296–321.

[32]White, *A History of the Warfare*, 1:70–71.

[33]J.R. Lucas, "Wilberforce and Huxley: A Legendary Encounter," *The Historical Journal* 22 (1979): 313–330. See also Sheridan Gilley, "The Huxley-Wilberforce Debate: A Reconsideration," in *Religion and Humanism*, ed. Keith Robbins, Studies in Church History 17 (Oxford, 1981), pp. 325–340.

[34]Quoted in Lucas, "Wilberforce and Huxley," pp. 317–320.

[35]*Ibid.*, pp. 313–330.

[36]Paul M. Waggoner, "The Historiography of the Scopes Trial: A Critical Re-evaluation," *Trinity Journal*, n.s. 5 (1984): 155–174; Ronald L. Numbers, "Creationism in 20th-Century America," *Science* 218 (1982): 538–544. See also Edward J. Larson, *Trial and Error: The American Controversy over Creation and Evolution* (New York, 1985).

[37]White, *A History of the Warfare*, 1:68, 82. On the relationship between Darwinism and Calvinism, see Moore, *Post-Darwinian Controversies*, pp. 280–298, 334–340. White's interpretation of the Darwinian debates is rejected also by A. Hunter Dupree, "Christianity and the Scientific Community in the Age of Darwin," in *God and Nature*, pp. 351–368.

[38]Moore, *Post-Darwinian Controversies*, pp. 102–103.

[39]Neal C. Gillespie, *Charles Darwin and the Problem of Creation* (Chicago, 1979), pp. 12–13, 18, 53. See also Alvar Ellegård, *Darwin and the General Reader: The Reception of Darwin's Theory of Evolution in the British Periodical Press, 1859–1872* (Göteborg, Sweden, 1958), p. 337.

[40]Frank M. Turner, "The Victorian Conflict between Science and Religion: A Professional Dimension," *Isis* 69 (1978): 356–376. Owen Chadwick has argued that the conflict between science and religion "was hypostatized, necessarily, out of a number of conflicts"; *The Secularization of the European Mind in the Nineteenth Century* (Cambridge, 1975), pp. 163–164.

[41]See, for example, Edward E. Daub, "Demythologizing White's Warfare of Science with Theology," *American Biology Teacher* 40 (1978): 553–556.

[42]See, for example, R[eijer] Hooykaas, *Religion and the Rise of Modern Science* (Grand Rapids, Mich., 1972); and Stanley L. Jaki, *The Road of Science and the Ways to God* (Chicago, 1978).

[43]On the need for a neutral stance, see Martin Rudwick, "Senses of the Natural World and Senses of God: Another Look at the Historical Relation of Science and Religion," in *The Sciences and Theology in the Twentieth Century*, ed. A.R. Peacocke (Notre Dame, 1981), pp. 241–261.

[44]Although we are aware of the danger that some readers might interpret our use of the terms "science" and "Christianity" as an unwarranted reification of these entities, we have retained this terminology as a convenient way of designating the various manifestations of Christianity and science.

On the Problem of Apparent Evil in the Natural World

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Why would a God of love create a natural world that contains the appearance of evil and suffering? For several biblical and biological reasons, I conclude that the apparent evil in the natural world cannot be attributed to the Fall of Man. Furthermore, the apparent evil can be considered necessary for the functioning of the ecosystem as a whole only if individuals within species and species within ecosystems work for the common good. However, natural selection, whether viewed as a creative mechanism by evolutionists or a conservative mechanism by creationists, is a thoroughly selfish process. The problem of apparent evil is therefore worsened rather than solved: the unselfish God of love is contradicted by a selfish world of nature

I propose a metaphorical view of nature as a solution to these difficulties.

Most people may profess a belief in a deity of some sort, and may be willing to listen to arguments about intelligent Design. But when confronted by news or personal experience of evil and suffering in the human world, and when they see apparently similar situations in the natural world, they cannot convince themselves that the deity controlling the universe is the Christian God of Love. David Hume[1], John Stuart Mill[2], Charles Darwin[3], and Mark Twain[4] are four influential examples. It is one thing to admit that the "Heavens proclaim God's glory" (Psalm 19:1) and "His eternal power and deity" (Romans 1:20), to admit that the constancy of natural law reflects His providential reliability, and that the complexity of the natural world proves His intelligence; it is quite another to demonstrate that the natural world reflects the existence of a loving God.

Many of the evils befalling humankind can be attributed to human sin. Animals and plants cannot sin, however. Therefore I want to clearly state that throughout this article I am referring to the *appearance* of evil, rather than actual evil, in the natural world. To insist that God did not create actual evil does not help us very much, however, since it is the *appearance* of evil that bothers us. Presumably the Creator wanted to express His personality in the creation in part so that we, the rational of His creatures, could learn about Him. Why, then, would a God of love create a natural world that contains the appearance of evil and suffering, contradicting His own character?

Two major categories of Christian response have been made to this problem. I am not convinced that either of them is adequate. The major purpose of the

present article is to carefully and respectfully demonstrate the inadequacies.

The Human Fall

The first category of responses maintains that the natural world was originally created good, then became bad—truly bad, not just possessing the appearance of evil.[5] In particular, most proponents of this view claim that not only violence, but death of any kind, even of animals, was not part of the world as originally created.[6] God therefore expressed His lovingkindness in a world of nature that no longer exists. In order to posit such a theory, the Christian is obligated to find some biblical reference to God making changes in the natural world, and some plausible motivation for God to do such a thing.[7] The latter is provided by the Human Fall, and the former by the "curse" of Genesis 3 pursuant to that Fall. The inadequacy of explaining all apparent evil in the natural world by attributing it to the Curse is twofold: first, this approach has an inadequate biblical basis; second, it has severe biological difficulties.

1. *The Biblical Basis.*

First, the Genesis 3 passage is very specific with regard to what is included in the Curse: the snake and its enmity with humans; pain in childbirth; agricultural toil, with weeds as part of the outcome. As we read these verses, it is difficult to see how they could be interpreted to refer to all apparent evil in the natural world. Some interpreters say "the ground," and therefore the whole earth, was cursed at that time. This interpretation is out of context; "the ground" described in this passage is that which is tilled, agricultural soil. To attribute all the apparent evil of nature (or as some young-earth creationists claim[8], the very alteration of physical laws) to this passage is highly figurative and should be admitted as such.

Second, there is no clear biblical basis for asserting that the death of animals is necessarily evil and therefore could not have occurred prior to the Fall of Man. There are biblical passages that will permit this interpretation, but they do not require it. The Bible teaches that "death" entered "the world" through Adam's Fall. "Therefore as sin came into the world through one man and death through sin . . . many died through one man's trespass . . . because of one man's trespass, death reigned . . . " (Romans 5:12, 15, 17). " . . . by a man came death. . . . As in Adam all die, so in Christ shall all be made alive" (I Corinthians 15:21–22). It is clear that our spiritual death results from our sin, and it is possible that human physical death is also "the wages of sin"(Romans 6:23). The context of these passages is *human* sin and death. Sin presupposes the knowledge of right and wrong (James 4:17), therefore animals cannot sin. Humans sin, and die; animals do not sin, yet die.

The Bible uses the words we translate as "death" and "die" in more than one way. Adam lived 900 years after the Fall, even though God said, "In the day you eat of [this fruit] you will surely die." "Death" here refers either to spiritual death or the beginning of a gradual physical decline, or both. "I die daily," said Paul in I Corinthians 15:31, and "For you have died," in Colossians 3:3. These verses use the same *apothenesko* as does I Corinthians 15:22. "We have passed from death into life" (I John 3:14) uses the same *thanatos* as does I Corinthians 15:21. The use of these words in more than one way demonstrates that the writers did not intend for them to be received literally.

The word we translate as "world" can also be used in more than one way. Daniel told Nebuchadnezzar that his dominion "reaches to the ends of the earth" (Daniel 4:22). Both of them knew that this was not literally true. "World" can refer to something more limited than the planet Earth. Thus "death" entering the "world" can refer to spiritual death entering into just the human realm.

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Romans 8:19–23 indicates that "the whole creation" is under a "bondage to decay" and is "groaning in travail." Paul's choice of wording ("groan" and "travail") was deliberately metaphorical. Moreover, if God has really placed the natural world under a bondage, it is one that was placed upon it "in hope" (v. 20). Therefore, it is not necessarily a product of the Curse.

Finally, proponents of "the curse" explanation of apparent evil in nature often cite eschatological passages as descriptions of the pre-Fall world. Two famous biblical passages refer to the wolf lying down with the lamb. One of these (Isaiah 11) is associated with "a shoot coming forth from the stump of Jesse" (v. 1). In the other (Isaiah 65), conditions on "God's Holy Mountain" (v. 25) are explicitly associated with "*new* heavens and a *new* earth" (v. 17). No scripture plainly teaches that the pre-Fall world had to resemble the post-Resurrection world.

Conditions, we are told, were idyllic for Adam and Eve inside the Garden. Are we therefore to assume that conditions *outside* the Garden were likewise idyllic?

The inadequacy of explaining all apparent evil in the natural world by attributing it to the Curse is twofold: first, this approach has an inadequate biblical basis; second, it has severe biological difficulties.

The Bible says that God planted the Garden; it would not have been there had He not planted it; therefore the world surrounding the Garden was not idyllic in the way the Garden was. And Adam and Eve were banished from this Garden after the Fall.

2. *Biological Difficulties.*

First, the plants and animals in Genesis 1 were commanded to multiply. They were not commanded to stop reproducing. In a world with limited resources (the "finished creation" of Genesis 2:1) reproduction can only be balanced by death. Further, all animals and plants have the capacity to reproduce more than is necessary to just replace themselves. There are many examples of reproductive potential. Overpopulation of deer resulted from hunting of predatory pumas on the Kaibab Plateau of Arizona, and overpopulation of moose occurred on Isle Royale in Lake Superior prior to the migration of wolves. Overpopulation of a species can result in a severe depletion of food resources for that species, and disturbance which can harm many other species.[9]

Second, many animals are thoroughly designed for predation or parasitism. Some Christian writers imagine that before the Fall mammalian predators could have gotten along fine on a vegetarian diet, and that only a slight change of anatomy and physiology would have been necessary to make them into predators. But there are many other kinds of animals that could not have been gentle herbivores before the Fall without having to be completely redesigned at the moment of the Curse. Vultures have bald heads and gastrointestinal tracts specially designed for the eating and digesting of rotting flesh. Spiders, ticks, fleas, and mosquitoes have sucking mouthparts unsuited to herbivory. There are scores of thousands of parasitic wasps whose larvae slowly eat living caterpillars.

Whole classes of animals are morphologically and physiologically committed to parasitism. One such is the *Cestoda* (tapeworm) class of the phylum Platyhelminthes. The adaptation of *Dibothriocephalus latus*, the broad fish tapeworm, to its series of hosts is breathtaking. When it enters the stomach of its carnivore host, it is exposed to very acidic conditions and powerful digestive enzymes. In the intestine of many carnivores it is bathed in nutrition, but is exposed to very low oxygen levels and very alkaline conditions. Nevertheless it thrives, and can be thirty feet long, with 4000 body segments. With shameless reproductive efficiency, each mature segment contains male and female organs and produces eggs. The eggs, voided with the feces into water, hatch into "coracidia" that swim freely. They are ingested by tiny aquatic copepods, and inside their body cavities develop into larvae known as "procercoids." When a fish eats a copepod, the procercoid develops into another kind of larva, a "plerocercoid," which lives not in the fish body cavity, but in the muscles—which are in turn consumed by carnivores, thus completing the cycle. The parasite has gone through five very different developmental stages and lived in as many contrasting environments![10]

Some writers, such as Wenham[11], claim that such examples of apparent evil in nature are rare, and are mostly associated with human disturbance. However, the information presented above indicates that predation and parasitism, astounding in both their diversity and complexity, are at least as intricately designed as anything else in the natural world. If an intelligent Designer created the world, He had to have put the parasites into it. If He put all predators and parasites into the world at the time of the Fall, the biological

world had to be almost completely redesigned. Where is the biblical account of such extensive alteration?

Finally, the approach in which death and decay in nature are attributed to the Fall is inextricably wedded to the young-earth creationist position. The fossil record contains evidence of predation and death throughout. Only a universal Deluge or set of catastrophes on a relatively young earth could produce a post-Curse fossil record. Anyone who makes the origin of death coincident with the Fall must be prepared to accept the young-earth position and deal with the evidence against it, which is extensively documented by both Christians and non-Christians.[12]

In a world with limited resources (the "finished creation" of Genesis 2:1) reproduction can only be balanced by death.

For the biblical and biological reasons above, we cannot attribute all apparent evil in the biological world to the Fall of Man.

For the Good of the Ecosystem

The second category of responses maintains that those occurrences that appear evil to us are necessary for the functioning of the world ecosystem as a whole.

Egerton[13] and Birch and Cobb[14] have reviewed this category of responses, calling it the "balance of nature" approach, and they associated it with the pre-Darwinian special creation viewpoint. Perhaps the most ancient proponent was Herodotus, who explained that animal populations remained in balance because big animals and predators reproduced less than small animals and prey. Their patterns of reproduction, and their deaths, were therefore part of a benevolently designed world. Empedocles, Democritus, Lucretius, and Cicero presented similar explanations.[15] The explanation used by Plotinus inspired Augustine's defense of the goodness of God despite the appearance of evil in Nature.[16] Much later, in the 17th through early 19th centuries, Sir Thomas Browne, John Graunt, Sir Matthew Hale, John Ray, William Derham, Alexander Pope, Carolus Linnaeus, and William Paley explained that species were perfectly designed for their environments, and that this perfect design included their interactions such as predation.[17] It is well known that the emergence of the theory of evolution by means of natural selection provided a challenge to traditional creationism. But if the "balance of nature" concept was essential to the creationist view, then the discovery of extinctions, and Malthus' study of populations, also constituted serious challenges. The realization that the "natural economy" was *not* in balance, with all parts working for the common good, played a major role in turning both Wallace and Darwin away from creationism.

However, some evolutionists have held a similar view, only they think that it is evolution rather than God that produces individuals "for the good of the species" and species "for the good of the ecosystem." Organisms reproduce in order to insure the continuation of the species, and natural selection gets rid of those individuals that do not contribute to the progress of the species. The ecosystem needs predators to control prey populations, and needs decomposers to recycle nutrients, so evolution produces them. The most successful species are those that contribute best to the ecosystem.

This view is implicit in evolutionary philosophies that make the assumption that evolution is always a progression upward. Such philosophies, set forth by Herbert Spencer, Chauncey Wright, Charles Pierce, Henri Bergson, Josiah Royce, and Errol Harris, have been summarized by Collins.[18] Several evolutionists have made specific reference to evolution as a process leading to "higher and richer modes of fellowship," and other similar ideas.[19] As recently as 1960, an ecologist wrote about natural selection occurring on the ecosystem level.[20] This idea underlies the popular writings of Lewis Thomas[21] and John Lovelock.[22]

Ecologists have now gathered enough information to dismiss the concepts of "individuals working for the good of the species" and "species working for the good of the ecosystem" (whether from a creationist or an evolutionist perspective) as general descriptions of ecological interactions. The shortcomings of this approach can be described in ecological terms without reference to evolution. An ecosystem whose components worked "for the common good" would be inherently unstable; ecological interactions are "selfish." Such value terms do not imply that organisms have selfish motivations, but rather that organisms behave unwittingly to defend their own interests and thus will prevail in ecological interactions.

The "selfish," individualistic understanding of ecological interactions has to a certain extent poisoned our ability to see an unselfish, even self-sacrificing, God expressing His personality within nature. Because evolution requires competition among organisms, Van

Dyke[23] concludes that theistic evolution "cannot continue to be viewed by religious intellectuals as a Christian panacea to the origins debate." He is correct. But some creationist positions have a similar shortcoming.

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Some Examples of Ecological Interaction

1. One of the first examples that comes to mind of species appearing to work for one another's benefit is of flowers and pollinators. In many plant species, cross-pollination is necessary for reproduction. Pollinators, such as bees, carry pollen from one plant to another, and the flowers reward them with nectar. In an ecosystem designed by a Creator or produced by evolution for maximum efficiency, the most successful bees would be those most effectively carrying pollen, and the most successful flowers would be those most effectively rewarding the bees. However, both the carrying of pollen and the production of nectar are processes that divert time and energy away from the important task of reproduction. If a bee can obtain nectar without carrying pollen, it will be able to devote more resources to reproduction. If a flower can attract bees without producing nectar, it can devote more resources to reproduction. The selfish bees will out-reproduce the unselfish ones, and the selfish flowers will out-reproduce the unselfish ones. This is the process of natural selection, which evolutionists consider to be the mechanism of evolution and which creationists consider to be a process that conserves and maintains the designs of the Creator. It is a process that consistently rewards the *most efficiently selfish individuals* within species, those that most efficiently contribute to the survival of their own offspring and the offspring of those other individuals most closely related to them.

2. Ecological interactions involving beautiful flowers, singing birds, graceful trees, and the care of animal parents for their offspring superficially declare the unselfishness and love of the Creator, but on closer examination they prove to be illustrations of selfishness, in absolute contrast to the Christian understanding of God. I will examine each of these examples.

a. Beautiful flowers. I described above the manner in which natural selection would lead to animals obtaining nectar without carrying pollen, and to flowers attracting pollinators without rewarding them with nectar. There are many such interactions.

There are "nectar thieves" and "nectar robbers."[24] In some cases, insects and birds are able to hover in front of a flower and take nectar from it without touching the pollen-laden stamens.[25] In other cases, robbers will chew holes and enter the flower from behind, avoiding the stamens[26], or will drink nectar from holes left by other robbers.[27] Such "floral larceny," as ecologists refer to it, can be even more common than true pollination. In one habitat, robbers accounted for more than half of the nectar usage, and the experimental exclusion of robbers (allowing only the true pollinators to have access to the flowers) caused a four- to twelve-fold increase in seed production.[28]

There are also flowers that attract pollinators but do not reward them. Several species of orchids, themselves nectarless, resemble other species of flowers that grow in the same vicinity and possess nectar. The pollinators cannot distinguish between the flowers that have nectar and those that do not, and the nectarless orchids therefore benefit from the nectar expenditure made by other species.[29] There are other orchids that produce fake stamens. Pollinators that habitually consume pollen are attracted, only to discover too late, that there is little or no pollen.[30] Both of these kinds of "mimicry" are also found in the same species, in which some individuals take advantage of others. In one species, it is the male, not the female flowers that produce nectar[31], and in another species the female flowers produce fake stamens.[32]

Some plants go much further in the extent to which they take advantage of their pollinators. Tropical orchids of the genus *Ophrys* attract male wasps of a certain species by looking and smelling like female wasps[33]; another species of orchid elicits attack from male bees[34]; and one species of pitcher-plant attracts pollinators, then eats them.[35]

In each case above, some individual plants benefit while other plants (of the same or different species) experience a net loss. Such arrangements clearly do not promote the maximum efficiency of operation of the ecosystem. Their evolutionary origin, and their persistence (even if they were specially created), require an individualistic, "selfish" explanation.

b. Singing birds. Birdsong delights us, but its primary function appears to be in settling territorial disputes among birds rather than in expressing avian joy. At first, this territorialism might appear to be

unselfish, because the *whole population* of birds can more efficiently gather food for their young if the habitat is divided into territories. The parents do not have to travel as far to find food, and therefore not only waste less energy, but have more time at home to protect the nest from predators. Paley would have been delighted, and would certainly have cited this as evidence of divine benevolence. It very much resembles the orderliness of decent human societies. Bird territorialism, however, arises from "selfish" competition. A male bird that can claim for itself the best and largest territory can attract not just one but two or more females. A male bird that practices polygamy will leave more offspring than one that constrains its appetites. In most bird populations, a few males have many mates and most have none.[36]

c. Graceful trees. Trees fill whole landscapes with delight. But from the functional viewpoint of photosynthesis in the ecosystem, trees are unnecessary. In order for plants to fulfill what Paley might have called their offices in nature, plants need to store sunlight energy in the chemical form of sugar. The plants themselves, and the animals that eat them, use this sugar as a source of energy and raw material. Since the sun is 93 million miles away, tree leaves are not significantly closer to the sun, and are no more efficient at using the sunlight than are little plants close to the ground. Indeed, they are less efficient. The moisture and nutrients required by the leaves must be transported from the ground to the leaves of lofty tree branches in an intricate plumbing system, and another system is required for transporting sugars down to the roots. Mosses grow very near the ground, and do not have or need such plumbing systems, nor do they have or need extensive root systems. The trunk and branches of trees must not only have plumbing, but plumbing with thick walls to support the enormous weight of twigs and leaves. All this enormous expense is unnecessary for the photosynthetic process. Why aren't all plants like mosses?

A plant with its leaves held aloft can obtain more sunlight not by being closer to the sun but by being *above* its neighbors with whom it would otherwise have to share the light. For this reason, plants that are capable of growing tallest under a given set of resource limitations can intercept the most sunlight energy. In dense herbaceous populations, it is very common to find a large number of small plants suppressed by a few large ones, the few large ones accounting for almost all of the reproduction within the population.[37] Garret Hardin[38] therefore considers every plant larger than green scum to be a monument to waste. I prefer to phrase it differently: they are examples of efficient selfishness. Their tall growth is wasteful from the ecosystem viewpoint, but strongly beneficial on the individual level.

Monsi et al.[39] calculated that the total amount of photosynthesis in a whole field of plants would be maximized if the leaves of the plants were vertical. In most fields of plants in nature, and in most tree canopies, most of the leaves are horizontal, not vertical. Why do leaves tend to be arranged in a fashion that is less efficient for the species, or the whole community of species? Because an *individual* plant can maximize its own photosynthesis by having horizontal leaves, if it is fortunate enough to be the tallest plant. Its horizontal leaves will shade its neighbors, but *its own* reproduction is not harmed by the bad luck of the other plants. Once again, individuals maximize their own growth, *at the expense* of the ecosystem as a whole.

An ecological or evolutionary system of ethics would identify selfishness, whether it leads to cruelty or to cooperation, as the fundamental good. Christians reject this approach, because we believe that God is like Jesus, an unselfish, humble servant.

d. The care of parents for their offspring. The care that animals lavish upon their offspring is sometimes interpreted as reflecting the desire to "keep the species going." Yet it is just another aspect of animals working to increase their own reproductive output at the expense of the community as a whole. If parental care is motivated by selfishness, we would expect parental violence rather than parental love whenever the parents' own reproduction might be jeopardized by offspring of other individuals within the species. Such violence is in fact observed. In polygamous animal species, the few dominant males inseminate many females. If the female is already pregnant with another male's offspring, the dominant male would gain nothing in allowing this female to reside in his defended territory or benefit from his resources. In order to make females immediately available for insemination, male baboons have been observed to induce abortion in females.[40] If female lions have a living cub, the newly-arrived male frequently kills the cub.[41] Offspring, therefore, do not have value of their own apart from passing on the parents' genes to future generations, despite the fact that these offspring may be perfectly suitable for carrying on the species and fulfilling their role in the ecosystem! In some species, such as spiders and mantids, the males, if they do not contribute to defense or resource acquisition for the offspring, are useless once they have fertilized a female—useless

except as food to the female. The male's contribution to reproduction is not any the less for his death—indeed, he may thereby help as his offspring's nourishment!

As mentioned above, almost all organisms possess the ability to reproduce more than is necessary to replace themselves. This can have two explanations. William Paley attributed this "superfecundity" to the necessity of species to "fill the void" which disaster or human activity has created, so that it will not remain empty. This is a "good-of-the-ecosystem" explanation. The more widely-accepted explanation is an individualistic one: an *individual's* reproductive success is not dependent upon the extent to which it helps regulate the population level of the species, but on the success with which its own offspring are represented in the next generation. An individual can thus be more successful by producing more offspring (even if this contributes to overpopulation) than its less fecund neighbor. This explanation has been invoked to explain the tragic paradox of large human families in famine situations.

A Basic Biological Process

The "selfishness" that characterizes ecological interactions is not, of course, the product of evil intentions on the part of the organisms. It arises automatically from the ability of DNA to replicate itself. The origin of viruses provides an excellent illustration of this point.

Viruses consist of protein-coated strands of DNA or RNA, but cannot replicate themselves.[42] DNA is the nucleic acid which stores genetic information inside of cells. RNA is a related nucleic acid. The host cell in which the virus resides does not recognize the virus as foreign, and replicates the viruses as it would its own DNA. In several cases, portions of viral DNA or RNA, including the "oncogenes" that allow some viruses to cause cancer[43], are found to have structures very similar to portions of the DNA of higher plants and animals. Such evidence indicates that viruses most likely arose as escaped bits of DNA from the cells of the organisms that they now infect.[44] They are, therefore, diseases from *within* the higher animals and plants. Escaped bits of DNA, whose job it was to replicate, continued replicating even after the cells of the host lost control over them.

Therefore a truly unselfish world could not evolve into existence, and even if created unselfish it could not persist as such.

A Metaphorical Approach

We conclude, therefore, that if God created the natural world, and in particular if He allowed evolution to play a role in its production, partly in order to exhibit to us a literal reflection of His character, we would have to conclude that God places highest priority on efficient selfishness. This is what the theology textbook of nature teaches us about God. An ecological or evolutionary system of ethics would identify selfishness, whether it leads to cruelty or to cooperation, as the fundamental good. Christians reject this approach, because we believe that God is like Jesus, an unselfish, humble servant.

Since nature, when read as a theology textbook, gives us an impression of God's character that openly contradicts the character of Jesus, then we must not use nature as such a textbook. It is Jesus, not nature, that teaches us about God (Hebrews 1:2, John 14:7). Jesus must be our primary, and nature our secondary, source of information about the character of God. Yet, if we cannot trust what nature teaches us about God, we are left with the feeling that nature's whole *raison d'etre* has been blighted. We have encountered a contradiction which we must resolve; yet the two major Christian responses to this contradiction have failed to resolve it.

The Bible presents no literal theology of nature. Aside from the passages quoted above that indicate that nature gives clear evidence of God's existence, the Bible has no coherent theory of "how to see God in nature." This is the reason that the two approaches I discussed above have had to rely heavily on just a few passages of scripture.

Instead of presenting a theology of nature, the Bible treats nature as a storybook. The prophetic imagery of the Old Testament is replete with allusions to nature. Both Old and New Testaments contain nature parables. In each case, a predetermined story is *read into* the natural phenomena. The phenomena themselves do not literally teach the principles they are made to illustrate. The biblical approach to nature is therefore overwhelmingly metaphorical.

We can obtain factual information about nature through the scientific method. But human observers feel irresistably drawn to impose metaphorical interpretations upon nature. The very use of the word "selfish" is metaphorical. If we Christians try to obtain theological information from nature, we should learn about God from Jesus then *impose* the resulting ideas on the natural world. This is admittedly an unscientific procedure. This procedure is metaphorical because it causes us to seek illustrations of Christian themes which are not literally connected with either the origin or the operation of the natural systems so studied. If we employ this procedure, it does not matter whether we can demonstrate that nature has a Designer or whether evolutionary theory is correct or not. In the storybook

of nature, the conflict between design and evolution is irrelevant.

The apparent contradiction between a good God and "evil" in nature also vanishes. For if nature is His great work of fiction, He need not approve of all the activities of the participants in the story any more than a novelist need approve of all the actions of his characters.

In using parables, Jesus was inviting His listeners to apply their own knowledge from everyday life—knowledge of mustard seeds and salt and fig trees—to understanding the kingdom of God. I believe His invitation was open-ended: to learn *more* about seeds and sowers was to allow an *extension* of our knowledge of the Kingdom. Thus as there seems no end to scientific discovery, there may also be no end to the raw material from which Christians can elaborate on Jesus' parables, or invent new ones after His example. I speculate that providing such raw material for metaphors was a major reason that God made the nonhuman universe so big and complex.

REFERENCES

[1]See Hick, J. 1978, *Evil and the God of Love* (revised edition). New York: Harper and Row, p. 329.

[2]Hick, *Ibid.*, p. 310.

[3]See Gould, S.J. 1983, "Nonmoral nature," chapter 2 of *Hen's Teeth and Horse's Toes*. New York: Norton.

[4]"Was the World Made for Man?" from *The Damned Human Race*.

[5]See Hick, *op. cit.*, p. 331 for references.

[6]Most of these are the young-earth creationists, who have published many articles with this viewpoint in the *Creation Research Society Quarterly*. Francis Schaeffer (*No Final Conflict*, Downers Grove: InterVarsity, 1975) distinguished between the violent and the quiet death of animals.

[7]Hick, *op. cit.*, p. 331ff.

[8]Morris, H.M. 1973, *Creation Research Society Quarterly* 10:157.

[9]Rasmussen, D.I. 1941, *Ecological Monographs* 11:230–275.

[10]Cheng, T.C. 1970, *Symbiosis*. New York: Pegasus, p. 105.

[11]Wenham, J.W. 1985, *The Enigma of Evil*. Grand Rapids: Academie, pp. 197, 198, 204.

[12]See Newell, N.D. 1982, *Creation and Evolution: Myth or Reality?* New York: Columbia University Press; Frye, R.M. 1983, *Is God a Creationist? The Religious Case Against Creation-Science*. New York: Scribners.

[13]Egerton, F.N. 1972, "Changing concepts of the balance of nature." *Quarterly Review of Biology* 48:322–350.

[14]Birch, C. and J.B. Cobb 1981, *The Liberation of Life*. Cambridge University Press, p. 36ff.

[15]Egerton, *op. cit.*

[16]Hick, *op. cit.*, p. 38ff.

[17]Birch and Cobb, *op. cit.*; Paley, William 1802, *Natural Theology*.

[18]Ong, Walter J. (ed.) 1960, *Darwin's Vision and Christian Perspectives*. New York: Macmillan.

[19]Morgan, C. Lloyd 1928, "Mind in Evolution," pp. 340–354 in *Creation by Evolution*, ed. by Frances Mason. New York: Macmillan. See also Macfarlane, J.M. 1918, "The Law of Proenvironment," pp. 205–242 in *The Causes and Course of Organic Evolution*. New York: Macmillan.

[20]Dunbar, M.J. 1960, "The evolution of stability in marine environments: natural selection at the level of the ecosystem." *American Naturalist* 94:129–136.

[21]Thomas, Lewis 1975, *Lives of a Cell*. New York: Bantam.

[22]Lovelock, John 1979, *Gaia*. Oxford University Press.

[23]Van Dyke, F. 1986, "Theological problems of theistic evolution." *Journal of the American Scientific Affiliation* 38:11–18.

[24]Inouye, D.W. 1980, "The terminology of floral larceny." *Ecology* 61:1251–1252.

[25]Hopkins, H.C. 1984, "Floral biology and pollination ecology of the neotropical species of *Parkia*." *Journal of Ecology* 72:1–23.

[26]Roubik, D.W. 1982, "The ecological impact of nectar-robbing bees and pollinating hummingbirds on a tropical shrub." *Ecology* 63:354–360.

[27]Roubik, D.W. 1985, "Roles of nectar robbers in reproduction of the tropical treelet *Quassia amara* (Simaroubaceae)." *Oecologia* 66:161–167.

[28]*Ibid.* See also Heithaus, E.R. et al. 1982, "Cumulative effects of plant-animal interactions on seed production by *Bauhinia ungulata*, a neotropical legume." *Ecology* 63:1294–1302; Haber, W.A. and G.W. Frankie 1982, "Pollination of *Leuhea* (Tiliaceae) in Costa Rican deciduous forests." *Ecology* 63:1740–1750.

[29]Boyden, T.C. 1980, "Floral mimicry by *Epidendrum ibaguense* (Orchidaceae) in Panama." *Evolution* 34:135–136; Dafni, A. and Y. Ivri 1981, "Floral mimicry between *Orchis israelitica* Baumann and Dafni (Orchidaceae) and *Bellevalia flexuosa* Boiss (Liliceae)." *Oecologia* 49:229–232; Boyden, T.C. 1982, "The pollination biology of *Calypso bulbosa* var. *americana* (Orchidaceae): initial deception of bumblebee visitors." *Oecologia* 55:178–184; Dafni, A. 1983, "Pollination of *Orchis caspia*—a nectarless plant which deceives the pollinators of nectariferous species from other plant families." *Journal of Ecology* 71:467–474.

[30]Vogel, S. 1978, "Evolutionary shifts from reward to deception in pollen flowers," pp. 89–96 in *The Pollination of Flowers by Insects*, ed. by A. J. Richards. London: Academic Press.

[31]Bawa, K.S. 1980, "Mimicry of male by female flowers and intrasexual competition for pollinators in *Jacartia dolichaula* (D. Smith) Woodson (Caricaceae)." *Evolution* 34:467–474.

[32]Bawa, K.S. 1977, "The reproductive biology of *Cupania guatemalensis* Radlk (Sapindaceae)." *Evolution* 31:52–63.

[33]Wickler, W. 1968, *Mimicry in Plants and Animals*. New York: McGraw-Hill; Feinsinger, P. 1984, "Coevolution and Pollination," pp. 282–310 in D.J. Futuyma and M. Slatkin (eds.) *Coevolution*. Sunderland, MA: Sinauer.

[34]Dodson 1962, referenced in Wiens, D. 1968, "Mimicry in plants," *Evolutionary Biology* 11:365–403.

[35]Wiens, *op. cit.*

[36]Verner, J. 1964, "Evolution of polygamy in the long-billed marsh wren." *Evolution* 18:252–261; Holm, C.H. 1973, "Breeding sex ratios, territoriality, and reproductive success in the red-winged blackbird (*Agelaius phoeniceus*)." *Ecology* 54:356–365; Selander, R.K. 1965, "On mating systems and sexual selection." *American Naturalist* 99:129–144; Hohn, E.O. 1969, "The phalarope." *Scientific American* 220:105–111; Pitelka, F.A. et al. 1974, "Ecology and evolution of social organization in arctic sandpipers." *American Zoologist* 14:184–204.

[37]Harper, J.L. 1977, *Population Biology of Plants*. New York: Academic Press, pp. 151–194.

[38]Hardin, G. 1977, *The Limits to Altruism*. Bloomington: Indiana University Press.

[39]Monsi, M. et al. 1973, "Structure of foliage canopies and photosynthesis." *Annual Review of Ecology and Systematics* 4:301–327.

[40]Pereira, M.E. 1983, "Abortion following the immigration of an adult male baboon (*Papio cynocephalus*)." *American Journal of Primatology* 4:93–98.

[41]Bertram, B.C.R. 1975, "Social factors influencing reproduction in wild lions." *Journal of Zoology* 177:463–473; Hardy, S.B. 1979, "Infanticide among animals: a review, classification, and examination of the implications for the reproductive strategies of females." *Ethology and Sociobiology* 1:13–40.

[42]Nahmias, A.J. and D.C. Reanny 1977, "The evolution of viruses." *Annual Review of Ecology and Systematics* 8:29–50; Gillespie, D. and R.C. Gallo 1975, "RNA processing and RNA tumor virus origin and evolution." *Science* 188:802–811.

[43]Bishop, J.M. 1982, "Oncogenes." *Scientific American* 246: 80–92.

[44]Temin, H.M. 1976, "The DNA provirus hypothesis." *Science* 192:1075–1080; Hadidi, A. et. al. 1976, "Hybridization of potato spindle tuber viroid to cellular DNA of normal plants." *Proceedings of the National Academy of Sciences USA* 73:2435–2457; Varmus, H.E. 1977, "The function and origin of the transforming gene of avian sarcoma virus." *Cold Spring Harbor Conference on Cell Proliferation* (volume 4).

A Christian View of the Foundations of Statistics

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In order to develop a Christian approach to an "exact" science such as Statistics, it is useful to view such a science within the various broader contexts with which it is connected. Various contexts of Statistics are discussed and the relevant philosophical currents are indicated. These call for a Christian response, which is briefly touched on.

A Christian View Possible?

Since the beginning of this century, Statistics has grown to a full-fledged scientific discipline. Statistics may be defined as that science which has as purpose the construction and application of a theoretical-mathematical framework for the analysis of numerical data in order to obtain valid knowledge. Thus Statistics may be said to belong to the so-called mathematical sciences, together with sciences such as Mathematics, Applied Mathematics, Computer Science and Operations Research. These sciences play an increasingly important role in the broad scientific enterprise and in society. On the other hand, because of their so-called *exactness*, they are often thought to be neutral from a philosophical or religious point of view. This tendency is strengthened by a traditional view of science as a whole, known as the *standard view of science* (see Scheffler 1967:8–12). In this view, objectivity is emphasized as indispensible for science. The basis for this objectivity is sought in empirical facts and logical reasoning. All human factors should be eliminated, leading to a view of science as completely neutral. Thus it is often claimed that a Christian point of view has no role to play in a science such as Statistics.

However, in recent years, influential new directions of thought appeared in the Philosophy of Science. These stand in many ways in opposition to the traditional view. It is notable that one of the originators of these new directions, T.S. Kuhn, comes from Physics—one of the more exact sciences. Kuhn (1962) emphasizes science as activity in context ("within a *paradigm*," in his terminology). Using examples from the history of science, Kuhn attempts to show that in practice science does not function as prescribed by the traditional view. In fact, an important role is ascribed to the scientific community with its commitment to its own criteria and its own pattern of educating new scientists. The result is that the human aspect of science comes to the fore and that it becomes clear that science cannot be seen in isolation—it must be seen in context.

Given this new climate of thought, there is more room for the development of a Christian analysis of assumptions in scientific thought and practice and a Christian approach to the way science is used and taught. As far as Statistics is concerned, a further incentive exists, namely an intense current discussion of the foundations of Statistics on an international scale in various symposia (see Godambe and Sprott 1971, Harper and Hooker 1976) and many journal articles.

A Christian Contextual View of Science

For the viewpoint of science in context, I am indebted to the Christian philosopher Stoker (1976). He views science in connection with a coherently ranging series of evermore encompassing contexts. Examples

are the social context encompassed by the context of mankind, again encompassed by the context of the cosmos and finally encompassed by the context of God and His relation to the cosmos and human beings. Intersecting these are other contexts, of which the historical is of particular significance. In scientific work, scientists cannot evade the predispositional contextual views concerning the matter being explored. These contextual views are views to which scientists are committed, telling them what are valid problems, relevant criteria and appropriate methods. In this way their research, thoughts and observations are directed by the contextual views, but the views cannot be proved by logic and experiment. For Christians doing science, their contextual views are in part based on biblical teaching about man and nature, and conditioned by biblical instruction as to how they should see their tasks as scientists.

The contextual view of science developed by Stoker is in opposition to the standard view mentioned above. In the standard view, science is seen in isolation from its contexts. But this is not acceptable to Christians, since Christians see mankind as a unity that has connections with the narrow scientific material as well as the various contexts in which they are situated. Furthermore, they all belong to God's creation and cannot therefore be separated. The contextual view of science is a broad view which examines the narrow scientific material as well as the contextual views as part of science.

This view of science demands of Christian practitioners of science that they not only work analytically, but in a contextual way as well. We have a responsibility to examine the predispositions. This is especially important, since in most fields of science there are reigning paradigms and these could be in opposition to our Christian views without our even being aware of them.

In what follows, special attention is given to Statistics and various contexts which should be taken into account. This should make clear that, even in an exact science such as Statistics, a Christian view is meaningful.

The Historical Context

In a discussion of the historical context of Statistics, emphasis will be on the influence of philosophical currents of thought and their role in the development of the subject. This should lead to a better understanding of the factors influencing present day Statistics and of their historical roots. As Statistics is concerned with the formation of knowlege from numerical data, there is a close relationship with the philosophical problem of induction, which concerns itself with generalizing from incomplete information. Attempts to overcome this problem and to obtain practical statistical procedures for doing so, show two main and opposing lines of thought in history.

The dissension can be traced back to the publication in 1764 of a paper by the English clergyman, Thomas Bayes. The paper was published posthumously, being submitted for publication by his friend, Richard Price, who added his own notes to it. The paper contained a preliminary form of what is now known as Bayes' Theorem, a source of controversy through the centuries. The theorem contains a method of induction and shows how, given the results of an experiment, the probability of a hypothesis may be calculated. The problem here is the requirement that prior probabilities should be assigned to the various hypotheses even before the experiment is performed. The question is how this should be done. Some have argued that the assignment should be carried out on the basis of a principle of thought, but others have totally disagreed about the possibility of doing this in a scientifically acceptable way.

The circumstances under which Bayes' paper was published contribute toward the controversy. In a preface to the paper, Price remarks that Bayes had first

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derived his theorem under a certain assumption about the prior probabilities, but then did not believe that all readers would accept the assumption. Instead of the assumption, Bayes then described an auxiliary experiment concerning balls running on a table and coming to rest at random points. His mathematics could then be seen as a model for the experiment and the assignment of prior probabilities became more acceptable because of the correspondence with an experiment. If one adds to this the fact that Bayes apparently was reluctant to publish his paper, one seems to be able to conclude that he was doubtful about the possibility of assigning prior probabilities in an acceptable way, as required by his theorem (e.g., see Fisher 1956:10).

It is remarkable though, that the Frenchman Laplace formulated Bayes' Theorem more generally at a somewhat later stage and used it freely in his statistical work. Laplace apparently had no doubts about the assigning of prior probabilities, and his approach was very influential for several decades. He is considered to be the real originator of what nowadays is called Bayesian statistics.

Since Bayes' Theorem plays a central role in the present discussion, it might be fruitful to illustrate the theorem, its use and the difficulties surrounding it in a simple (and artificial) example. Suppose (as is often done in probability theory) that we have urns containing colored balls. We have two urns, labeled 1 and 2 respectively. Urn 1 contains one red and one green ball and urn 2 contains two red balls and one green ball. The composition of the urns is known to the investigator. An experiment consists of selecting an urn and afterwards a ball from the selected urn. It is not known which urn was selected. Suppose the ball that was drawn is found to be green and that the drawing of the ball was done in a random way (i.e., each ball in the selected urn had equal probability of being chosen). If we denote by H_1 and H_2 selection of urns 1 and 2 respectively, a question is how to decide between H_1 and H_2 on the basis of the observed evidence (the green ball). In other words, how do we decide whether urn 1 or urn 2 was selected, given the information that a randomly selected ball was green? If we denote by G the event to obtain a green ball, by P the probability and by $P(G \mid H_1)$ the conditional probability of G given that H_1 has occurred, *et cetera*, Bayes' Theorem can be stated by the following formula in the present case:

$$P(H_1|G) = \frac{P(G|H_1)\,P(H_1)}{P(G|H_1)\,P(H_1) + P(G|H_2)\,P(H_2)}$$

and similarly for $P(H_2 \mid G)$. Thus the formula gives a way of calculating the so-called posterior probability of H_1 given the evidence of a green ball. The calculation requires knowledge of two kinds of probability. First, probabilities like $P(G \mid H_1)$ which do not give rise to any particular difficulties because of the random choice of a ball. Thus $P(G \mid H_1) = \frac{1}{2}$, $P(G \mid H_2) = \frac{1}{3}$. The second kind of probability is the probabilities $P(H_1)$ and $P(H_2)$. These are called prior probabilities (before evidence is obtained) and are controversial. In the simple example which we consider, it could be arranged beforehand that the choice of an urn be random, so that $P(H_1) = P(H_2) = \frac{1}{2}$. However, if nothing is known about the way the urn was selected, the prior probabilities of the hypotheses H_1 and H_2 are unknown. Some have advocated the use of equal probabilities in such a situation as a principle of thought. Others have advocated the assignment of prior probabilities on the basis of introspection, and then making explicit one's beliefs concerning H_1 and H_2. Still others claim that it is impossible and unacceptable to assign prior probabilities if it is not known how the urn was selected. But if one is willing to assume equal probabilities for H_1 and H_2, the above formula gives:

$$P(H_1|G) = (\tfrac{1}{2} \times \tfrac{1}{2})/(\tfrac{1}{2} \times \tfrac{1}{2} + \tfrac{1}{3} \times \tfrac{1}{2}) = \tfrac{3}{5}$$

and similarly $P(H_2 \mid G) = \frac{2}{5}$.

Since H_1 has the higher posterior probability, Bayesian statistics prescribe that H_1 should be chosen on the basis of the evidence. Note that the decision might be wrong, but it has been reached in a systematic way.

Having illustrated Bayes' Theorem, we are now in a better position to discuss the two lines of thought mentioned above. Boldrini (1972:137–138) makes the following statement concerning the differing philosophical backgrounds of Bayes and Laplace:

> One can see here the different mental outlook of the two: the Englishman who derives his thinking from the tradition of Locke and Hume, and the Frenchman who aligned himself with the development of Cartesian rationalism.

It seems then that Bayes was part of the empiricist tradition of the England of his time and would rather use an auxiliary experiment than a principle of thought in connection with the question of prior probabilities, if indeed he was willing to make his views about this public. On the other hand, Laplace, in the more rationalist tradition of the European continent, seems not to have had any doubts about the validity of an approach with prior probabilities. Thus we observe the beginning of an empiricist versus a rationalist line of thought in Statistics which would continue to exert influence over the centuries and up to the present day.

On the continent, Laplace's standing ensured that his approach was well established for most of the past century, but in England it was much criticized by people such as Boole and Venn. By the beginning of this century, however, one of the great minds in modern

science got involved in Statistics. He was the Englishman R.A. Fisher, who also was one of the leaders in the field of Genetics. Fisher was vehemently opposed to Bayesian statistics and he proceeded to lay the foundations of an alternative statistical theory. This theory was taken further by people such as J. Neyman and E.S. Pearson, and became a comprehensive and established theory; so much so, that is is nowadays known as the *classical theory* (Barnett 1973).

The classical theory is empirical in nature. The probability concept used is an empirical concept: probability is to be thought of as an observed ratio of the number of occurrences of an event in an unlimited series of repetitions of an experiment. Thus, prior probabilities as used in Bayesian statistics make no sense. Also, only situations which are repeatable may be considered in a statistical analysis, and all statements concerning properties of procedures have to be interpreted in terms of "the long run."

But the Bayesian approach was never completely dead. Some years ago it experienced a remarkable revival under the leadership of figures such as H. Jeffreys, L.J. Savage, B. de Finetti and D.V. Lindley. This revival was accompanied by many new developments, recognized contemporary issues and claimed to be *the* approach to statistics. Bayesian statistics is more intellectualistic in character. It is often justified as the inevitable consequence of certain self-evident requirements for rational behavior. These requirements are called axioms and are mathematical formulations of concepts such as *consistency* and *coherence*. The Bayesian approach then follows by logical deduction from the axioms. In contrast with classical statistics, the probability concept here is subjective. It reflects the beliefs of the statistician in a unique given situation.

It may be mentioned that attempts have been made to compare the revival of Bayesianism with a scientific revolution, in the sense of Kuhn (Lindley 1980), with Bayesianism emerging as the victorious paradigm. Perhaps this conclusion is a bit premature, but one does have the impression that the foundations of Statistics are subject to areas of major disagreement. (A more comprehensive discussion of the foundational controversy in Statistics is contained in Geertsema 1983.)

Thus, if Statistics is viewed in a historical context, it becomes clear that the development of the subject is connected with broader philosophical issues. The old struggle between empiricism and rationalism in the rise of modern science becomes visible in Statistics also. In this arena, Christians should understand the issues in view of their faith. For instance, Hooykaas (1972) in an insightful analysis of the role of the Christian faith in the development of science from Greek antiquity up to the seventeenth century, points out that Greek science was strongly rationalist, mainly because of the Greek view of the world as a rational being, the product of a rational creation. The rationalist outlook retarded the progress of science, but as the influence of a biblical world view came to be felt more and more, an empirical approach gradually appeared in science. This was due to the biblical view of God, the Creator, who created according to His own will, not bound by human rationality or other prescriptions. Thus the biblical view of the world is that of a creation which can only be understood by man through observation. Thus an empirical approach is called for, but one should point out that the role of the mind is not hereby denied. In fact, observation as well as thought is needed in the formation of scientific knowledge. Although a full analysis cannot be given here, it appears that a Christian point of view concerning the two main approaches in Statistics would be a balanced one, appreciating both and steering away from one-sidedness.

A second example of the influence of philosophical currents of thought in the history of Statistics is to be found in the ideology of the Eugenics movement during the second half of the 19th century and the first part of this century in Britain. Mackenzie (1981) gives a penetrating analysis of these developments and argues that the social circumstances and patterns of thought not only influenced the *motivation* of the leading figures, but also the *content* of their statistical work. Notable amongst these leaders were Galton, Karl Pearson and R.A. Fisher, all of whom were dedicated to the ideal of improving the human race; an ideal that they pursued with almost religious fervor, motivated by a scientific naturalism that rejected the supernatural and saw scientists as best equipped to lead society. Their ideals led them into genetic research and this, in turn, required statistical tools which they strove to develop. Many of their tools, though cleaned and sharpened, still form the basis of modern statistical theory. Thus, the philosophical influences from the time of the formation of these tools still linger in the background, and need to be understood from a Christian perspective for a proper insight in their meaning. Such a discussion will not be attempted here.

The Scientific Context

Statistics is connected to all empirical sciences and acts as a mathematical auxiliary to them. This is because all sciences make use of data to some extent, and Statistics is just that ancillary science which has the task of handling empirical data. This unique characteristic of Statistics implies a closely assumed relationship between Statistics and Philosophy of Science. Kempthorne (1976) describes Statistics as applied Philosophy of Science. This is because Statistics is concerned with

questions such as: What is a random sample? Do the data support a given model? What are useful ways of analyzing data? How should a probability be judged? He notes, however, that in practice very little interplay between Statistics and the Philosophy of Science materializes—a deplorable situation. As Statistics may be viewed in the context of the empirical sciences as a whole, interpretations of these also have a bearing on Statistics. This is more so since there is the very special relationship between Statistics and Philosophy of Science. Many of these views are controversial, however, and call for a Christian reply.

The real reason why a Christian statistician avoids harmful effects on people taking part in experiments is to be found in the commandment to love one's fellowman.

As an interesting example, let us consider the attempt by Kempthorne (1976:286–288) to view the Philosophy of Knowledge, and consequently Statistics, from an existentialist perspective. In his view, the existentialist phrase "life is absurd" means that life is not perfectly predictable. He probably thinks that this is important for science and has a connection with Statistics where the study of random phenomena is central. A closely related existentialist phrase, "existence precedes essence," implies to him that a complete rational explanation in science is impossible. Of course these phrases belong to an atheistic philosophy and cannot be accepted by a Christian. Sartre (1948) explains that life is absurd because there is no God who gives man an essence by planning him before he comes into existence. Man makes his own essence by developing according to his own will. This is entirely opposed to the Christian faith in God who creates man and has a calling for him.

As another example of philosophical views of science which have implications for Statistics, one may mention the contribution of the pragmatist philosopher C.S. Peirce at the end of the nineteenth century. Kempthorne and Folks (1971:507–508) are of the opinion:

> The general philosophy of pragmatism as put forward by Peirce seems to lie at the root of statistical practice.

They also conclude that for Peirce knowledge was public and not personal, which is in opposition to the Bayesian view that the opinion of the individual is what is important. Also his ideas about the nature of scientific inference provide insight and should be studied with statistical application in mind. Apparently Peirce attempted the formation of a philosophy which would encompass both science and Christianity. He was deeply upset by the religious controversies which followed Darwin's views. (See Murphey 1968:531). Thus, Peirce's ideas warrant special attention from the Christian community.

The Social Context

Statistics also functions within society. This leads to various ethical problems to which biblical norms of love, justice, truth, honesty and authority should apply. Of course, the statistical profession is well aware of the ethical problems and has taken a firm stand for professional integrity. The most recent statement in this direction is the International Statistical Institute Declaration on Professional Ethics (1986). This declaration calls on the statistician to guard against misinterpretations or misuse of statistical material, to make an impartial assessment in a statistical study, not to accept contractual conditions that are contingent upon a particular outcome from a proposed statistical inquiry, to respect confidentiality requirements but allow colleagues to assess their methods, to avoid undue intrusion into the privacy of people, to protect experimental human subjects against potentially harmful effects, *et cetera*. It is clear, however, that a Christian statistician should view the ethical issues from a deeper dimension, namely from the biblical norms mentioned above. For instance, the real reason why a Christian statistician avoids harmful effects on people taking part in experiments is to be found in the commandment to love one's fellowman. One sees the immediate relevance of the Christian faith in statistical applications in society.

An interesting instance where ethical questions arise is in political (and other) opinion polls, which rest on statistical sampling theory and are often quite controversial. It is sometimes contended that the results of opinion polls exert influence on voters. People like to be on the winning side and are then persuaded to vote for the candidate who is shown to be the winner by the polls. Candidates with a poor showing in the polls have a hard time getting campaign funds, because nobody wants to support a loser. It is even claimed that the results of polls are manipulated by the pollsters, and that there are sometimes deviations from correct statistical sampling techniques in order to save money.

Concerning polls which are not aimed at election results, but other important public issues, there is even more criticism. It is contended that the "public opinion" does not consist of the opinion of a number of equally important people who independently cast their

votes. Also, experience has taught us that large segments of the public are very uninformed. There is also reason to suspect that individuals, rather than admit that they are uninformed, blindly choose one of the alternatives presented to them in a poll. In defense, the pollster, George Gallup, takes the point of view that opinion polls are almost indispensable in a democracy, and that the final stage in the development of a democracy will arrive when the will of the people is known at all times. He is quoted as saying: "The task of the leader is to decide how best to achieve the goals set by the people," and "This job almost makes you an evangelist for democracy."

The pollsters contend that there is no proof that polls exert an influence on the voters. They cite the British election of 1970 as an example to the contrary (the Conservatives won, even though the polls consistently predicted a victory for Labor). They also point out that the procedures that are used are not secret in any way—they have been carefully described in scientific journals. Much has been learned from the mistakes of the past and methods are continually refined to take into account, for instance, voters who do not show up to vote or the ignorance of members of the public. Also in defense of polls, it can be argued that a potential loser could gain by knowing the weakness of his support, so that he can work harder.

A Christian point of view is very relevant in this controversy. Opinion polls can be of great help to a government that is committed to the biblical norm that those who are in a position of authority have the duty to serve those over whom they have authority. In order to serve well it is important that they know the wishes and opinions of the nation and take these into account. The reason for this is not that government should be a government according to the will of the people—government should be according to the principles of the Word of God. Thus opinion polls can help a government to serve well. In this connection one is reminded of what Winston Churchill said during the Second World War:

> Nothing is more dangerous in wartime than to live in the temperamental atmosphere of a Gallup poll, always feeling one's pulse and taking one's temperature. . . . There is only one duty, only one safe course, and that is to try to be right and not to fear to do or say what you believe to be right.

Furthermore, truth and honesty require that opinion polls should be of a high standard. Methods with an accepted statistical basis should be used and no compromise should be allowed due to a shortage of money and time, even though requirements such as randomness in sampling may be expensive to achieve. Questions concerning the improper influence of political polls concern injustice which should be eliminated. This could be done, for instance, by the requirement that the polling be done by independent organizations and not by political parties. These independent organizations should do their work on a high statistical standard and should not compromise on the requirements set by statistical theory.

The Religious Context

There is a connection between the Statistics of a statistician and the god he worships. Christian statisticians should be aware of this and not be lured into uncritically accepting certain predispositions in the work of their colleagues. An example is to be found in the views of Karl Pearson, whose name has already been mentioned in connection with the Eugenics movement. He made many important contributions to Statistics, but was also very interested in philosophical matters. His son, E.S. Pearson, wrote two lengthy articles (1936 and 1937) shortly after the death of his father and gave many interesting details of his life and his views. From these articles we also get some glimpses of his religious views. For instance, towards the end of his life, Karl Pearson wrote (E.S. Pearson 1936:196):

> I can only say that till [sic.] this day I think Spinoza the sole philosopher who provides a conception of the Deity in the least compatible with scientific knowledge.

He also was the author of four lengthy articles on Spinoza. Without pursuing this much further, let us note that a characteristic of Spinoza's philosophy is the identification of God and nature. It is remarkable that Einstein, a contemporary of Pearson, is quoted to have said:

> I believe in Spinoza's God, who reveals himself in the orderly harmony of all that exists, not in the God who concerns himself with fates and actions of human beings. (Golden 1979:66)

Another interesting point is that Pearson's search for his own confession of faith is visible in his early writings. E.S. Pearson mentions that his father was driven by a "Moral force" in his scientific work and views. Such thinking was typical of the Victorian era, which was characterized by the penetration of scientific thought right through the traditions of orthodox Christianity. In spite of this, his father felt the compelling need for his own confession of faith; this can be found in his life ideals and in conjunction with his view of science. In K. Pearson's own words, this confession of faith leads to the phenomenon that men:

> serve science from love as men in great religious epochs have served the Church. (E.S. Pearson 1936:194)

He had as ideal the search for truth, and believed that scientific knowledge would bring salvation to man. Thus one can almost say that Pearson's god was science,

and one sees that his "religious" enthusiasm was intimately connected with his scientific and statistical work.

Another more recent example is a statement by Kish (1978), as president of the American Statistical Association, on the role of chance in human life. He sees chance as a phenomenon that occurs everywhere, and argues that statisticians have a special duty to prepare people for the effects of chance. One almost gets the feeling that he sees Chance as the god that must be served because it reigns supreme in the world. He states:

> The tragic biblical Job might have been happier and wiser if he knew that his plagues were due to chance. The triumphs or the problems of your children may be due to chance, not only to your behavior—despite what Freud may say; a statistical view may protect parents against false pride or against guilt and despair. But we are not mere helpless puppets of chance and we can improve our chances—for example, by quitting smoking, with regular exercises, and by losing weight. Recognition of the interplay of chance with discernable causes may yet lead us to a better way of life and to a better moral philosophy. Somebody may even start a new religion of Statisticology!

A last example shows that questions concerning truth and science have a profound religious significance. In his book, *Scientific Truth and Statistical Method*, Boldrini (1972) (member of the Pontifical Scientific Academy) discusses the role of Statistics in the search for scientific truth and is guided by the belief that truth is ultimately found only in Jesus Christ. In the preface of this book he states:

> What can one say by way of introduction to this book? The answer is to be found in a trial which took place 2,000 years ago, when some immortal words were spoken. 'Quid est veritas?' the perplexed Pontius Pilate asked himself after an interrogation which had left him full of anguish. Jesus, the accused, had already given an answer when he stated with authority, 'Ego sum Veritas'. In that tragic moment the answer reached but few hearts, but it set out on its way down the centuries.
>
> This book is entirely concerned with the development of Pilate's question and ends by accepting, on the very last page, the answer of Jesus. Indeed, the opinion was once firmly held that scientific truth was something essential and predetermined, a hidden principle of the physical world and a difficult objective for studious minds to achieve stage by stage, through conjecture and experiment. That opinion has now been shown to be mistaken. By scientific truth is still meant, of course, a certainty but a subjective one, transitory, a special relation between man and world, adapting itself to the progress of knowledge and to changes of interpretation and of human requirements.

Conclusion

We have given examples of various contexts within which Statistics may be viewed. Clearly, there is room for a Christian point of view. In some of the more encompassing contexts, such as the religious and social contexts, biblical perspectives could be used directly. However, in those which are less encompassing, such as the scientific context, philosophical questions have to be answered in a philosophical manner, and here the importance of a Christian Philosophy becomes clear.

It has been pointed out that study of these questions is the responsibility of a Christian statistician in order to form a single integrated world and life view. But the view of Statistics sketched here also has implications for the teaching of Statistics by the Christian. Students should not only be taught "the facts" which modern textbooks present. They should also know that there are different presumptions as to what constitutes a "fact," as well as different interpretations and uses of them. Students should therefore be helped to realize that belief, and thus their own belief, is connected to the subject which they are studying.

REFERENCES

Barnett, V. 1973. *Comparative Statistical Inference*. London: John Wiley and Sons.

Boldrini, M. 1972. *Scientific Truth and Statistical Method*. London: Griffin.

Fisher, R.A. 1956. *Statistical Methods and Scientific Inference*. New York: Hafner.

Geertsema, J.C. 1983. Recent views in the foundational controversy in statistics. *South African Statistical Journal* 17:121–146.

Godambe, V.P. and Sprott, D.A., eds. 1971. *Foundations of Statistical Inference*. Toronto: Holt, Rinehart and Winston.

Golden, F. 1979. The year of Dr. Einstein. *Time* 113, no. 8:60–67.

Harper, W.L. and Hooker, C.A., eds. 1976. *Foundations of Probability Theory, Statistical Inference, and Statistical Theories of Science, vol. II. Foundations and Philosophy of Statistical Inference*. Dordrecht-Holland: Reidel.

Hooykaas, R. 1972. *Religion and the Rise of Modern Science*. Edinburgh: Scottish Academic Press.

International Statistical Institute. 1986. International Statistical Institute Declaration on Professional Ethics. *International Statistical Review* 54:227–242.

Kempthorne, O. 1976. Statistics and the philosophers. (In Harper and Hooker 1976, pp. 273–314).

Kempthorne, O. and Folks, L. 1971. *Probability, Statistics and Data Analysis*. Ames: The Iowa State University Press.

Kish, L. 1978. Chance, statistics and statisticians. *Journal of the American Statistical Association* 73:1–6.

Kuhn, T.S. 1962. *The Structure of Scientific Revolutions*. Chicago: Chicago University Press.

Lindley, D.V. 1980. L.J. Savage—his work in probability and statistics. *The Annals of Statistics* 8:1–24.

Mackenzie, D.A. 1981. *Statistics in Britain 1865–1930*. Edinburgh: Edinburgh University Press.

Murphey, M.G. 1968. Peirce, C.S. (In *Collier's Encyclopedia*, 18:530–531).

Pearson, E.S. 1936. Karl Pearson: An appreciation of some aspects of his life and work. Part I, 1857–1906. *Biometrika* 28:193–257.

Pearson, E.S. 1937. Karl Pearson: An appreciation of some aspects of his life and work. Part II, 1906–1936. *Biometrika* 29:161–248.

Sartre, J.P. 1948. *Existentialism and Humanism*. London: Methuen.

Scheffler, I. 1967. *Science and Subjectivity*. Indianapolis: The Bobbs-Merrill Company.

Stoker, H.G. 1976. Our Christian calling of doing science. (In *Christian Higher Education: The Contemporary Challenge*. Scientific contributions of the Potchefstroom University for Christian Higher Education series F3 no. 6:134–158).

Communications

ENVIRONMENTAL EDUCATION AT CHRISTIAN COLLEGES

Environmental problems have long been identified as, fundamentally, a matter of ethics. Leopold (1949) identified the development of a "land ethic" as the key to natural resource conservation. Although his notion of a land ethic has been criticized by some (for example, Heffernan 1982, Moline 1986) it has had a profound effect on the conceptualization of current natural resource management principles. Partridge (1982) interpreted Leopold's land ethic as "ecological morality," and examined the human psychological capacity to accept and implement such a land ethic.

Because natural resource management is based on ethical and moral systems, theology becomes relevant in dealing with environmental issues. Baer (1985) called for state universities to solicit input from theologians when dealing with agricultural and environmental ethics. Van Dyke (1985), drawing upon this link between theology and ethics, critiqued Leopold's land ethic from a biblical perspective.

Ecology and theology have historically interfaced in several areas. Some historians and scientists have implicated Christianity as a contributor to our environmental problems (for example, McHarg 1969, Nash 1970, Santmire 1985, Shepard 1982, Toynbee 1972, White 1967). Even some Christian theologians have been critical of the role of Christianity in developing environmental ethics (Schaeffer 1970, McDaniel 1986). In the growing body of literature dealing with Christian ecotheology, numerous scientists and theologians have responded by stating that biblical teachings have been misinterpreted and that the practice of Christianity may be a potential solution to our environmental problems (for example, Bratton 1984, Carmody 1983, Derrick 1972, Elsdon 1981, Geisler 1971, Hart 1984, Hinkley 1981, Miller 1979). Quigley (1970) presents a detailed historical review of the role religion has played in the development of environmental attitudes.

This interface between theology and ecology manifested itself during James Watt's tenure as Secretary of the Interior. Repeated allegations by the media that Secretary Watt based his management policies on his religious beliefs led to a detailed study of Secretary Watt's ecotheology (Bratton 1983).

In light of these relationships between ecologically appropriate behavior, environmental ethics and theology this descriptive study explores the nature of environmental education at a sampling of 125 private Christian colleges, and compares their course offerings with opportunities for environmental study at 25 nondenominational and 25 state schools.

Methods

During the fall of 1985, catalogs from 125 private colleges with denominational affiliations were inventoried for course offerings directly related to environmental studies. The stratified random sample consisted of 25 schools from each of the five denominations supporting the most colleges. These denominations were Baptist, Roman Catholic, Methodist, Lutheran, and Presbyterian. To serve as a basis for comparison, 25 randomly selected nondenominational private colleges and 25 state schools with enrollments of less than 10,000 students were studied. Seminaries and Bible schools which only offered degrees in biblical or theological studies, and schools offering only two-year programs were not sampled. The rationale for excluding these schools was that it seemed inappropriate to expect them to have environmental study programs. However, Bible schools which offered degrees in liberal arts and sciences were included in the survey. The private institutions were randomly selected from a list of colleges and universities with religious affiliation (Ohles 1982). State schools were randomly selected from a similar listing (Torregrasa 1986).

The following data were collected: denomination, college enrollment, and titles of all environmental science and related courses. The titles were subsequently placed into one of four categories: environmental science, environmental ethics, outdoor recreation/skills, and environmental education methods. General science courses and courses in biology, chemistry, and the physical sciences were not included unless they focused specifically on the environment (for example, environmental chemistry, ecology, and most field courses). Likewise, educational methods classes were not tallied unless they dealt specifically with environmental education, and recreation classes were not included unless they dealt specifically with natural resource-based recreation (for example, wilderness camping). Sample course titles for each category are presented in Table 1.

Results

Institutions with Denominational Affiliation

Enrollments of the sampled colleges with denominational affiliation ranged from 100 to 3500 with a mean of 1239.85 (Table 2). Of the 125 colleges sampled, only seven (5.6%) had no environment-related courses. Two hundred and ninety-six environmental study courses were offered by the 125

Table 1

A listing of representative course titles by category

Environmental Science	Environmental Forum
Biology of the Environment	Environmental Issues
Conservation of Natural Resources	Ethics and the Life Science
Ecology	Issues in Ecology
Environmental Biology	People, Pollution, and Power
Environmental Conservation	Philosophy of Biology
Environmental Science	*Outdoor Recreation/ Outdoor Skills*
Environmental Studies	Adventure Expedition Workshop
Field Ecology	Backpacking & Wilderness Expedition
Field Study of the Environment	Camp Counseling
Marine Ecology	Camping
Nature Study	Outdoor Recreation
Public and Environmental Health	Outdoor Skills
Tropical Field Research	Recreation & Park Programming
Water Resources	Rock Climbing
Environmental Ethics	Survival
Bioethics	Wilderness Camping
Biological Problems: social and ethical implications	Wilderness Leadership
Biology and Human Concerns	*Environmental Education Methods*
Environmental Study and Religion	Environmental Education
Environmental Ethics	Outdoor Education

institutions (mean = 2.37). More than two-thirds (67.9%) of these courses were in the category of environmental science. Environmental ethics courses made up 17.7% of the courses, while outdoor recreation/skills and environmental education methods courses made up 11.2% and 3.4%, respectively. The most common course type for all denominations was environmental sciences.

There was a statistically significant relationship between denomination and number of course offerings ($x^2 = 21.44$, significance <.01, lambda = .58). Lutheran schools offered the most classes per institution (mean = 2.88 courses/school). This was followed by Methodists (2.64 courses/school), Baptist (2.40 courses/school), Catholic (2.08 courses/school) and Presbyterian (1.84 courses/school).

Lutheran schools not only offered the most courses in total, they also offered the most in every category except environmental ethics. Catholic schools offered the most ethics courses, but offered the fewest courses in environmental studies and outdoor recreation.

When the number of course offerings is compared to enrollments, the ranking of the denominations changes. Methodist schools with 2.53 classes/1000 students and Lutheran schools with 2.02 classes/1000 students again ranked high. Catholic schools offered the fewest classes/1000 students (1.48). The mean for the entire sample was 1.92 courses/1000 students.

State and Private Nondenominational Schools

All of the state schools, and all but one of the private nondenominational schools offered environmental study courses. The results for the state schools and the nondenominational private schools are very similar (Table 2). Like the denominational schools, the vast majority of environmental study courses offered by these schools were science courses, and the environmental education methods category had the fewest courses. The most notable differences between state schools and nondenominational private colleges were that: (1) state schools offered a total of 46 outdoor recreation classes (almost twice as many as the nondenominational colleges), and (2) nondenominational colleges offered a total of 57 environmental ethics classes, whereas state colleges only offered 16 of these courses.

These two types of institutions both offered three to four times the number of environmental study courses than the colleges with denominational affiliation. However, when courses/1000 enrollment are calculated, the results are similar to the colleges with denominational affiliation. Nondenominational schools offer more classes/1000 students than any other group (3.11). State colleges and universities offer 1.41 courses/1000 students—the least of any group of institutions considered.

Discussion and Implications

The fact that over 95% of the schools with Christian denominational affiliation offered some course(s) dealing with the environment seems to refute the criticism that depicts Christians as being negative, or at best apathetic, about environmental concerns. The distribution of classes by type was similar to that of nondenominational private schools and state schools. Although more classes were offered by nondenominational and state schools, one might expect larger institutions to have the human and physical resources to offer a more diverse array of classes. The mean enrollments of the nondenominational schools was almost three times the total mean enrollment of the denominational schools, and the mean enrollment of the state schools was over five times greater. There is no evidence that the relationship between course diversity and institution size is linear; however, when the enrollment of the institutions was considered, state schools had the fewest environmental study classes per 1000 students.

The greatest emphasis is in the area of environmental sciences (i.e., ecology) courses. The fact that this was a rather broad category encompassing several disciplines may have contributed to the large number of these classes.

Offering environmental science courses is appropriate. Theology teaches the responsibility and blessing of stewardship, but one must also know *how* to be a good steward. Effective stewardship of natural resources requires knowledge of ecological principles. The large number of course

Table 2

Number of environmental-related course offerings and enrollment data by institution affiliation

Denomination	*Total Enroll.*	*Mean Enroll.*	*Env. Sci.*	*Env. Ethics*	*Outdoor Rec.*	*Env. Ed. Methods*	*Total Courses*	*Courses/ School*	*Courses/ 1000 Enroll.*
Baptist	33,445	1337.80	40	11	9	0	60	2.40	1.79
Catholic	35,171	1406.84	29	18	2	3	52	2.08	1.48
Lutheran	35,718	1428.72	48	7	12	5	72	2.88	2.02
Methodist	26,047	1041.88	51	7	7	1	66	2.64	2.53
Presbyterian	24,600	984.00	33	9	3	1	46	1.84	1.87
Non-denominational	75,800	3032.00	150	57	25	4	236	9.44	3.11
State schools	158,492	6339.68	152	16	46	9	223	8.92	1.41
TOTAL	389,273	2224.42	503	125	104	23	755	4.31	1.94

offerings in environmental science relative to the other categories suggests that both state and Christian colleges may be focusing their efforts on this cognitive level rather than on ethical or affective components of environmental awareness.

Although these science classes are important, Partridge (1981) describes the important role formal philosophy should play in environmental studies. Nash (1976:10) warns against an over-emphasis in the sciences, stating that: "Another challenge . . . is to stem the gradual erosion of environmental *studies* into environmental *sciences*." He points out that the root of environmental problems comes from "man and his ideas," and therefore environmental education should be viewed as a general, multidisciplinary education.

Programs in both Christian colleges and secular universities may be imbalanced. There were relatively few offerings in environmental ethics. It is possible that some environmental ethics are being taught as part of environmental science classes; however, the importance of strong ethical foundations would seem to warrant separate courses.

Given the specialized nature of the subject matter, it was not surprising that relatively few courses were offered in outdoor recreation/outdoor skills and in environmental education. In fact, the list of outdoor skills classes was impressive considering the small size and apparent limited resources of the sampled schools.

Outdoor recreation/skills courses can contribute to greater environmental awareness. Social welfare can be enhanced by better recreation resource management which improves the quantity and quality of recreation experiences while protecting the environment. Likewise, skill courses can: (1) teach people how to maximize enjoyment from outdoor activities, and (2) introduce people to new ways of enjoying the environment.

Although there was a statistically significant relationship between the offerings of the denominations, the implications, if any, are difficult to determine. There does not seem to be any doctrinal or theological reason to explain why Lutheran and Methodist schools ranked high (both in total courses and in courses/1000 students) while Baptist, Presbyterian, and Catholic schools ranked relatively low in course offerings. The differences in course offerings may reflect differing degrees of sensitivity to environmental concerns and differences in the recognition of the theological implications of environmental ethics. However, it can not be necessarily assumed that a high degree of faith/subject integration automatically takes place in Christian college classrooms.

Christian theology is relevant to the maintenance of a stable global environment. By offering strong environmental studies programs, and by developing a concise, well-defined ecotheology, Christian colleges and universities have a unique opportunity and profound responsibility to contribute to a right relationship between humans and creation. A major contribution would be to encourage ecologically appropriate behavior from a Christian perspective. Theological arguments and practical environmental sensitivity may persuade a segment of the populace heretofore unreceptive to the pro-environment message. Intentions to behave in an environmentally sound manner result from: (1) sound attitudes concerning the outcomes of the behavior, (2) sound perceptions of normative behavior, and (3) motivations to comply with the perceived norms (Fishbein 1980). Environmental education in a Christian setting can effectively impact on all of these areas. To this end, Derrick (1972) called for Christians to "preach and practice . . . cosmic piety" and to cultivate "appreciative gratitude" of God's creation. Practicing this cosmic piety, according to Derrick, involves rejecting materialistic tendencies, bringing under control current "technomania," and distinguishing real human needs from fictitious ones.

In addition to encouraging ecologically sound behavior, there are other compelling reasons why Christian colleges should offer environmental studies. First, environmental education is a prerequisite for effective participation in society. Christians should be prepared to articulate and defend philosophical positions on environmental issues. Second, it will be impossible for the Christian community to have a consistent, comprehensive world view until environmental issues are addressed in an ecotheological framework.

Third, there are the normal vocational reasons (i.e., to prepare students for professions in environment-related fields). A fourth, basic reason for offering environmental education is that it constitutes a practical, purposeful part of any general education.

Van Dyke (1985) noted that Christians have been "lazy, ignorant, and apathetic about environmental concerns." However, he adds that "only Christians have the ethical system strong enough to bring conviction, courage, correction, and direction, to the environmental dilemma." Likewise, Derrick (1972), referring to a possible global environmental crisis, stated that " . . . our survival may actually depend upon religion . . . it may turn out that only Christianity can save the world." This survey indicated that there is currently a significant effort to teach environmental principles, and to a lesser degree environmental ethics, at Christian colleges and universities. However, the solemn conclusions of Van Dyke and Derrick should cause Christian educators to consider their commitment to environmental education and to strengthen it to meet the challenges and responsibilities of stewardship.

REFERENCES

Baer, R.A. 1985. Agricultural ethics at state universities: why no input from theologians? *Agriculture and Human Values* 2(4):41–46.

Bratton, S.P. 1983. The ecotheology of James Watt. *Environmental Ethics* 5:225–236.

Bratton, S.P. 1984. Christian ecotheology and the Old Testament. *Environmental Ethics* 6:195–209.

Carmody, J. 1983. *Ecology and Religion: Toward a New Christian Theology of Nature.* (New York: Paulist Press).

Derrick, C. 1972. *The Delicate Creation—Towards a Theology of the Environment.* (Old Greenwich, CT: Devon-Adair Co.).

Elsdon, R. 1981. *Bent World: A Christian Response to the Environmental Crisis.* (Downers Grove, IL: InterVarsity Press).

Fishbein, M. 1980. A theory of reasoned action: some applications and implications. In *1979 Nebraska Symposium on Motivation*, eds. H.E. Howe and M.M. Page, pp. 65–116.

Geisler, N.L. 1971. *Ethics: Alternatives and Issues.* (Grand Rapids, MI: Zondervan).

Hart, J. 1984. *The Spirit of the Earth.* (New York: Paulist Press).

Heffernan, J.D. 1982. The land ethic a critical appraisal. *Environmental Ethics* 4(3):235–247.

Hinkley, J.R. 1981. Theology and the land ethic. *American Land Forum* 2:7.

Leopold, A. 1949. *A Sand County Almanac.* (New York: Ballantine reprint, 1970).

McDaniel, J. 1986. Christian spirituality as openness to fellow creatures. *Environmental Ethics* 8(1):33–46.

McHarg, I.L. 1969. *Design with Nature.* (Garden City, NY).

Miller, G.T. 1979. *Living in the Environment*, 2nd ed. (Belmont, CA: Wadsworth).

Moline, J.N. 1986. Aldo Leopold and the moral community. *Environmental Ethics* 8(2):99–120.

Nash, R. 1970. *Wilderness and the American Mind.* (New Haven, CT: Yale University Press).

Nash, R. 1976. Logs, universities, and the environmental education compromise. *Journal of Environmental Education* 8(2):2–11.

Ohles, J.R. 1982. *Private Colleges and Universities.* (Westport, CT: Greenwood Press).

Partridge, E. 1981. Philosophers are joining the ranks. *Journal of Environmental Education* 12(3):1–3.

Partridge, E. 1982. Are we ready for an ecological morality? *Environmental Ethics* 4(2):175–190.

Quigley, C. 1970. Our ecological crisis. *Current History* 59:1–12.

Santmire, P. 1985. *The Travail of Nature.* (Philadelphia: Fortress Press).

Schaeffer, F.A. 1970. *Pollution and the Death of Man—The Christian View of Ecology.* (Wheaton, IL: Tyndale House).

Shepard, P. 1982. *Nature and Madness.* (San Francisco: Sierra Club Books).

Torregrasa, C.H. ed. 1986. *The HEP 1986 Higher Education Directory.* (Washington, DC: Higher Education Publications).

Toynbee, A. 1972. The religious background of the present environmental crisis. *International Journal of Environmental Studies* 3:141–146.

Van Dyke, F. 1985. Beyond Sand County: a biblical perspective on environmental ethics. *Journal of the American Scientific Affiliation* 37:40–48.

White, L. Jr. 1967. The historical roots of our ecologic crisis. *Science* 155:1203–1207.

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Information Theory and Biblical Inerrancy

"Biblical inerrancy?" an acquaintance of mine once scoffed. "For ancient documents of which numerous copies now exist with thousands of textual variations? From the scientific viewpoint, the very concept is absurd!"

But the speaker was not a scientist, and he was wrong. Even more interesting—perhaps even surprising to many Christians—the fact that he was wrong can be demonstrated on the basis of the modern, rigorous science of information theory. Join me for a few minutes on a logical journey that examines the concept of biblical inerrancy[1] from this point of view.

We begin by asking the question of whether information can *ever* be inerrantly transmitted from a sender to a recipient, and if so, under what conditions? An immediate and fairly obvious answer is: "Yes, in the absence of noise whose magnitude and character interfere with the transmission of the message." When such noise is present, however, errors result.

Consider an example. Frank and John are attending a football game with three other friends. During the game, Frank goes to the refreshment stand about a hundred feet away from their seats to get a hot dog. While he is there, John calls to him from his seat, asking him to bring some refreshments for himself and the other three men. He then proceeds to shout the items and quantities that each man wants. This is a classic case of the attempted transmission of information in the presence of disruptive noise. John is the Sender, Frank is the Recipient, and the hundred feet of space between them in the football stadium is the channel of transmission, filled with noise coming from the public address system and the thousands of other spectators in the stadium—noise whose magnitude is equal to, or greater than, the amplitude of John's shouts in Frank's ears. Small wonder if Frank comes back with the wrong items!

A similar situation exists in the attempted transmission of information by radio signals over great distances, especially between space vehicles and earth stations. The relatively

low-power signals travelling thousands or millions of miles between the transmitter and receiver are just as vulnerable to disruption by the incessant electromagnetic noise that pervades space and the earth's atmosphere as a human voice trying to shout to someone a hundred feet away over the din of a crowded football stadium. Inevitably, the recipient receives a distorted sequence of message elements from that which was emitted by the sender/transmitter.

Is inerrancy of transmission still possible under such difficult conditions? Surprisingly, the answer is: Yes! This remarkable fact was mathematically demonstrated in 1948 in what is known as "Shannon's theorem," enunciated by Dr. Claude E. Shannon of Bell Laboratories in New Jersey. It states essentially that *if the amount and character of the noise in a given channel are known, then a system of encoding can be devised which, when utilized, will make possible virtually error-free transmission of information between originator and recipient.*[2] Techniques based on this theorem are now commonplace in the encoding and transmission of information in a variety of applications, particularly between space vehicles and earth stations. They guarantee essentially inerrant transmission via relatively low-power signals over vast distances, in spite of the presence of noise whose magnitude and character would otherwise make such inerrant transmission impossible.

One interesting consequence of this theorem is that inerrancy does not demand that the sequence of signals received by the recipient be identical to the sequence emitted by the sender. In the simplest kind of example, suppose the sender emitted a sequence of 100 binary digits containing information about the magnetic field vector, at a certain time, at a certain point in space between the earth and the planet Jupiter. It is possible that the sequence of digits received by the earth station may differ from that emitted by the space vehicle at several points, and yet the information contained in that message would be inerrantly received, providing the information was properly encoded prior to transmission (and decoded following reception).[3] It is even possible that earth stations at widely-separated locations on the globe would receive sequences of digits differing from each other at several points, as well as from the distant transmitter, and yet each recipient would receive the information inerrantly. In other words, here we have inerrancy in spite of textual variations, within the rigorous mathematical framework of modern information theory.

The logic of Shannon's theorem is independent of the mode of communication in question. It applies in principle to all methods by which information can be transmitted from sender to recipient(s)[4]—whether by electromagnetic waves propagated through space or by successive copies of written documents propagated through human history—which brings us to the Bible.

The Bible, by its own witness, consists of an ensemble of messages emitted by its originator, God, into the noisy channel of human history. Clearly, its divine Originator knew the character and magnitude of the noise in the channel of transmission when He composed the messages in the ensemble. Equally clearly, He would have no difficulty encoding the information in this ensemble of messages in such a way that it could be inerrantly received by every intended recipient, in spite of the effects of the noise upon its individual message elements—that is, in spite of scribal errors, editorial or redactional emendations, or any other occurrences that would cause the text viewed by the recipient to differ in some ways from the text originally committed to the channel of transmission. Indeed, two or more recipients possessing texts differing from one another at various points could still inerrantly receive the same information, because these variations would not nullify the error-free character of the transmission.

An interesting consequence of this is that it demands verbal inspiration of the original documents, even though we need not possess verbally-inerrant copies of those documents today. In order to achieve error-free transmission of information, God must have encoded the original documents in the form that would accomplish His purpose, rather than leaving that form up to the unguided control of the human authors, before committing them to the channel of human history. This does not, however, imply that He must have obliterated the humanity of the human authors in the process, or reduced them to the status of mere dictating machines. Being omnipotent and omniscient, He surely had access to ways of guiding the human authors to produce documents encoded in conformity with His purposes, while still allowing them to retain and express their full humanity in the process.

The thesis of this paper, then, is simply this: the existence of a finite amount of textual corruption in the biblical documents as we possess them today does not, by itself, rule out the possibility of its originally encoded information being communicated inerrantly to its readers, in a way analogous to that in which information about magnetic fields (and other data) at different points in the solar system is routinely communicated inerrantly to scientists here on earth—in spite of the "textual corruption," due to electromagnetic noise, of the signals carrying that information between space vehicles and the earth. In other words, to return to the phrase used in the first paragraph of this article, the idea of biblical inerrancy is not, from the scientific viewpoint, absurd. On the contrary, it is quite reasonable.

One result of this thesis is to suggest a viable alternative to the doctrine of the Bible's inerrancy as consisting of *inerrancy in the autographs (original manuscripts) only*. George Mavrodes, in his article "Science and the Infallibility of the Bible" in the September 1967 issue of *JASA*, coins the term "A-Infallibility" to denote this formulation, and demonstrates by logical analysis that it leads to the conclusion that "the reliability of the science of textual criticism places a limit on the reliability of any information now derivable from the Bible."[5] If, however, the type of inerrancy that the Bible possesses is not "A-Infallibility," but rather the type which is described in the present paper, which we might abbreviate as "I-Inerrancy" or Informational Inerrancy, then the reliability of the information now derivable from the Bible is not limited by the science of textual criticism.[6]

This new view of biblical inerrancy (I, at least, have not seen it proposed anywhere else) will obviously not resolve all

difficulties connected with the interpretation of the Bible. It may serve as a starting point for further new and fruitful explorations into the way God speaks to us through it.

Most of all, I hope that it may contribute to a recognition among Christians that the concept of biblical inerrancy is not something about which we, in our modern, scientific age, are forced to equivocate or hedge, as if it were akin to some sort of medieval superstition or a product of ignorance and naiveté regarding the science of communication. This is not to claim that information theory can be used to "prove" biblical inerrancy. Because of the unique character of the data involved compared to usual scientific categories, the question of such proof lies far outside the bounds of scientific disciplines. It is only for us to recognize that the idea of such inerrancy is, in the light of modern communication theory, not only wholly plausible and achievable, but already a practical reality in a number of fields of human endeavor. Surely there is no absurdity in ascribing to God a feat which, far from being logically impossible, is now routinely accomplished by human beings (though on a more modest scale) over and over again.

NOTES

1. Beneath much of the debate over the "inerrancy" of the Bible, one senses a lack of agreement over what really is the definition of that term. I would advocate its definition simply as accuracy. Data that is accurate is *ipso facto* data that is not in error, i.e., "inerrant." I am aware that others may feel that this definition does not adequately express some aspects of the traditional concept of biblical inerrancy. I believe, however, that it adequately conveys the meaning of that concept as found in the Scriptures themselves.
2. C. Shannon, *The Mathematical Theory of Communication* (Chicago: University of Illinois Press, 1949), pp. 70–72. As is often the case when a highly technical subject is presented in general language, there is some over-simplification in this statement of Shannon's theorem, which does not, however, nullify the implications drawn from it in this article. The theorem is true with qualifications related to such things as the entropy of the source, the capacity of the channel, the amplitude of the noise, and the power of the signal carrying the information. Also, the frequency of errors cannot be reduced completely to zero, but it can be reduced to a negligible, essentially infinitesimal, magnitude.
3. Readers may wonder what kind of encoding method could accomplish this. Basically, it is achieved through redundancy, i.e., using more symbols than the minimum necessary to express the information. Frequently, the additional digits function as parity checks, i.e., specifying whether the sum of a block of digits was odd or even. For an example of such encoding, see Shannon, *op. cit.*, p. 80. In addition to the book by Shannon, cited in the previous footnote, this subject is well-presented for the interested general reader in J.R. Pierce, *Symbols, Signals and Noise* (New York: Harper, 1961), chapter VIII.

   It is interesting, although beyond the scope of the present paper, to conjecture how the Bible as we now possess it might give evidence of being the product of such encoding methods. Certainly it is filled with redundancy: Deuteronomy duplicates much of the contents of Exodus, Leviticus and Numbers, and I and II Chronicles duplicate much of I and II Kings. There is much duplication of contents among the first three Gospels, and even some when they are compared with the Fourth Gospel. There is redundancy in the Psalms, the Proverbs, and the New Testament Epistles. The question of whether there is something in the Bible that functions in a manner analogous to parity-checking is more speculative.

   A significant consequence of this is that proper decoding of the information requires processing of the entire ensemble of code-elements in order to receive the full benefit of the effect of the redundancy. If some of the code-elements of the received message are omitted or ignored during the decoding process, inerrancy is lost. This implies that the information contained in the Bible can only be inerrantly decoded if one processes the contents of the entire Bible, and not just part of it. Drawing conclusions from a consideration of only part of the Bible has certainly been one of the major causes of error during the two-millenium history of Christianity. It is significant that Psalm 119:160 says, "The sum of Thy Word is truth."
4. Warren Weaver says in the introductory essay to Shannon's previously cited book: "This is a theory so general that one does not need to say what kinds of symbols are being considered—whether written letters or words, or musical notes, or spoken words, or symphonic music, or pictures. The theory is deep enough so that the relationships it reveals indiscriminately apply to these and to all other forms of communication." (Shannon, *op. cit.*, p. 25.)
5. George I. Mavrodes, "Science and the Infallibility of the Bible," *Journal of the American Scientific Affiliation*, Vol. 19, No. 3, Sept. 1967, pp. 90–92.
6. It is recognized that there is another problem still to be dealt with, namely, the character and integrity of the decoding process by which information is actually derived from the ensemble of message-elements. In other words, errors may still be introduced into the information actually derived from the Bible, but if they are the fault is to be traced to the decoding processes that we are using to derive the information, not to the character of the biblical texts themselves. The same kind of errors would result, for example, if the computers here on earth were incorrectly programmed to process the signals received from distant space vehicles.

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The fire of God, which is His essential being, His Love, His creative power, is a fire unlike its earthly symbol in this, that it is only at a distance it burns—that the further from Him, it burns the worse.

George MacDonald, *Unspoken Sermons*, second series, "The Fear of God".

Book Reviews

ADAM AND EVOLUTION by Michael Pitman. London: Rider and Company (distributed by Baker Book House, Grand Rapids, MI), 1984. 268 pages. $12.95.

Most of the time, I am content to accept a general theory of evolution as the most likely scientific explanation of the vast body of evidence available to us and to remain open to the unravelling of mysteries in the future, even though I realize the many scientific and possibly theological problems that attend such a position. There are two major occasions when such a quiescent attitude deserts me: (1) when I read committed evolutionists who go out of their way to assure me that all is established fact and that few mysteries remain, and (2) when I read committed anti-evolutionists (*a.k.a.* creationists) who go out of their way to assure me that nothing is established fact and that there is no way one could possibly imagine that the present world order came into existence by an evolutionary process rather than by a *fiat* creation. This book lies in the latter category.

The author, a biology teacher at Cambridge with the interesting credentials of an MA in classics and a BA in science, proceeds in a witty and intelligent fashion to repeat what must be hundreds of times a single theme: he cannot imagine how the wonders of the world today could possibly have arisen from a process of evolution. As an alternative, he presents a somewhat ambiguous creationism without deep roots in religious tradition or even in the Bible. In a curious parenthesis near the end of the book, he devotes four pages to outlining the shortcomings of common "fundamentalist" creation movements, in the course of which he indicates a willingness to accept the biblical accounts as myths and dissociates himself from what he terms "Old Testament fundamentalism." Leaning toward a progressive creation perspective, he does not argue for a young earth and, although he mentions that one of the fundamentalist creationists' challenges is "the validity of radiometric dating," he devotes only nine words to this issue.

For the Christian, there can be no debate about the wonder of this world and its apparent elements of design for human life, nor about the attribution of this wonder to the wonderful work of God. Pitman handicaps his case by seeing everything in black and white. If the origin is not by creation, then it must have happened without God. He concludes his book with the following words:

> But the direction of the argument is clear—there has been neither chemical evolution nor macro-evolution. Nor, as some twentieth century churchmen bio-illogically accept, did God involve chance mutations in "creation by evolution." No intelligent creator would leave matters to chance: on the contrary his purpose would be to realize, in plan and in practice, his ideas. Pressing the logic to its conclusion, this book advocates a grand and full-blooded creation. (p. 255)

Confident in his own apprehension of the ways of God, Pitman can make such a sweeping statement in good faith.

The cogency of his case is severely damaged by the introductory chapters that abound in false dichotomies. Following are a few of these misleading philosophical perspectives:

> "Did we evolve by chance . . . Or are we special?" (p. 13)
>
> "Where there is no spontaneous generation there may lurk a Creator." (p. 18)
>
> ". . . we may even speak of the spiritual evolution of a person—the process by which he strives to free his soul from its fetters of mind and body." (p. 20)
>
> "An atheist believes that evolution is the result of chance. Theistic evolutionists believe God, having created the universe, let purposeless chance evolve life. A creationist, dismissing this hybrid view as absurd, contends that an intelligent creator creates complex machinery, such as a living body, deliberately." (p. 22)
>
> "Today creationists may take a broader view. Only out-and-out Fundamentalists hold a literal belief in these versions of creation; others may hold different opinions, or no opinions at all, on the identity of the Creator, but strong views indeed on the reality of intelligence that underlies creation." (p. 23)
>
> "Practically all (clergy) were dismayed at finding God displaced from the centre of creation and chance—blind chance as it used to be called—occupying the throne." (p. 24)
>
> "If creative intelligence *is* wholly material, are not soul or a Creator figments of erroneous calculation?" (p. 26)
>
> "Were the codes designed, or did they evolve?" (p. 27)
>
> "Darwinians are determined that matter came first, and that mind has arisen from it through aeons of trial and error. The origin of nature was a big bang, not a Generator. For the creationist, mind came first and created matter for its instrument to play upon. . . . In this way the work could be reproduced again and again without the composer's attention." (p. 31)
>
> "The universe sprang into existence when, at the beginning of time, nothing nowhere for no reason exploded (Big Bang Theory)." *or* "From mind to molecule; mind preceded matter and created the cosmic drama which it now sustains according to a recognizably lawful programme." (p. 229)

As long as one is committed to such false dichotomies, where one must choose between evolution and creation, between nothing and God, between blind chance and meaningful design, between valueless material and humans possessing souls and spirits, one can hardly come to any other conclusion than that offered at great length by the author. His failing lies not in being critical of science, often turned into scientism by non-scientific extrapolation, but in not being sufficiently open to the greatness of the sovereign God of the Bible whose ways are past finding out.

Reviewed by Richard H. Bube, Department of Materials Science and Engineering, Stanford University, Stanford, CA 94305.

IT'S A YOUNG WORLD AFTER ALL by Paul D. Ackerman. Grand Rapids: Baker Books, 1986.

My wife asked, "Why do you do this to yourself?" She easily discerned that reviewing *It's a Young World After All* was not my idea of fun. What you have here is a loose assortment of "creation science" evidences for a young Earth (*Exciting Evidences for Recent Creation*, as it appears in the subtitle). The geochronological focus here derives from many types of geological, geophysical, and astrophysical considerations. Nearly all of these arguments have been discussed and the corresponding evidences refuted, for example in the *Journal of the American Scientific Affiliation*, *Creation/Evolution*, and volumes such as *Scientists Confront Creationism*, *Is God a Creationist?*, and *The Fourth Day*. Why then bother to sustain the counterpoint at the risk of wasting space in the *Journal* and seeming too reactionary? Answer: Somebody has to do it, ideally one working in the disputed subject areas.

According to the book's back cover, author Paul Ackerman is a member of the Psychology Department at Wichita State University. He is also president of the Creation Social Science and Humanities Society. What better credentials to write on the physical and chemical nature of some time dependent processes! In 131 pages, Ackerman covers not only two dozen or so topics ranging from the old moon dust accumulation problem to polonium halos, but he also gives us his justification for faith in creationism.

Chapter two deals with a perceived scarcity of meteorites in the rock record. Henry Morris' account of this young Earth "evidence" led to Paul Ackerman's "conversion." This age argument follows from an estimated influx of meteorites surviving the atmosphere to fall to the Earth's surface. This quantity (nowhere given) is extrapolated through time ("millions" of years) with a result that "many of them" (meteorites) should be discovered in rock strata. On the contrary, even these potential fragments of "countless" meteors would account for an insignificant volume of material in comparison to the total of accumulated earth-sediment. Additional considerations are the complete recycling of rocks both in the hydrologic cycle and in the plate-tectonic dynamo, the very limited sampling of the Earth's outermost crust (including the oceans), and the possibility of the chemical/physical modification of original materials. Given the above evidence, haystack-needle-hunting would be more logically feasible than searching for ancient meteorites. One further note—the fairly recent recognition of iridium anomalies and microspherules within certain strata may indicate that meteor-derived substances are more abundant than previously believed.

The only other "evidence" I will bother to discuss here is the curious find of a vertically-oriented fossil whale discovered within a unit of diatomaceous earth in California. The concept of slow, gradual sedimentation is supposedly disproven by the cross-cutting nature of this fossil. Please note that (1) the author obviously has no perception that the sedimentation rate of planktonic organisms is directly measureable and that this rate is exceedingly small in many cases (about 1mm per 1000 years); (2) he gives us no idea of the original bedding attitudes of the deposited material; and (3) he does not realize that before solidification into rock, the diatomaceous sediment was in the appropriately-named form of ooze. Upon death, the whale could have sunken into the ooze and thus become entombed. Without further data no one can say more than that the whale died sometime after the millions of diatom skeletons surrounding it.

It is unfortunate that books of this kind make it into Christian bookstores, churches, and evangelical schools without the "balanced treatment" of opposing viewpoints. Ackerman's writing reads like an evangelistic broadside and not a review of scientific evidence. Terms such as "battle," "heroes," "defender," and "triumph" are used in the book's introduction in reference to the conflict between creation scientists and anyone who differs with their dogmatism.

It's a Young World After All and other published examples of the creation science genre serve three harmful purposes: (1) they are bolsters to those who in cult-like fashion have become committed to a pseudo-Christian doctrine; (2) these are apologetic works which are persuasive to those without the scientific grounding needed to evaluate various opinions; and (3) in their scientific deficiency, these books foster bad stereotypes of Christians as fanatical anti-intellectuals.

Reviewed by Jeffrey K. Greenberg, Associate Professor of Geology, Wheaton College, Wheaton, IL 60187.

ORIGINS: A Skeptic's Guide to the Creation of Life on Earth by Robert Shapiro. New York: Summit Books, 1986. 322 pages. Hardcover; $17.95.

Dr. Shapiro is Professor of Chemistry at New York University, and may be familiar to some readers as coauthor of the book, *Life Beyond Earth*. The present book is written for a popular audience, but because of the nature of the questions that are asked, and of the search for answers to these questions, a reasonable understanding of science will certainly be required of the reader. The author has generally avoided highly technical terms and tries valiantly to explain difficult concepts by using simpler illustrations. This approach may detract from the value of the book for some, because analogies are never perfect representations of the real truth.

The major character of the book, the Skeptic, continually asks questions such as, "What does the evidence really show?" or, "Are assumptions made that are not really valid?" As a consequence of this approach, the author comes to the conclusion that nearly all of the currently proposed theories for the origin of life have very little substantial evidence to support them.

In a beginning chapter, the author provides an excellent discussion of the role of doubt in scientific endeavor. He emphasizes some of the same attitudes toward science that this reviewer has tried to instill in his own students, and that were emphasized over a century ago by Claude Bernard:

". . . our object must not be to preserve a theory by seeking everything that may support it and setting aside everything that may weaken it. On the contrary, we ought to examine with greatest care the facts which would overthrow it" (p. 40, *An Introduction to the Study of Experimental Medicine*, H.C. Greene translation). Shapiro notes that this view toward scientific investigation has been forgotten by many today, including a number of those involved in research on origins.

Shapiro is fond of the words "myth" and "mythology", which he carefully defines: "A myth presents itself as an authoritative account of the facts, which is not to be questioned" (p. 34). He classifies the biblical description of creation as a myth because it has to be accepted by faith, without regard to experimental evidence pro or con. He notes, however, that "an idea or account need not be wrong just because it is presented as myth" (p. 34). He classifies many of the current theories for the origin of life as myths as well, because their proponents are so committed to their particular theory that they have lost the capacity to properly evaluate scientific evidence. He draws a parallel to the theory of spontaneous generation of life, which was generally believed prior to the studies of Louis Pasteur. After the work of Pasteur in the 1860's, this theory would have to be classed more as a myth, yet one of its major proponents, the English scientist Henry Bastian, supported spontaneous generation until his death in 1915. Shapiro comments that "a scientific maxim states that discredited theories expire not by the rapid conversion of their followers, but only after the last adherents have died off" (p. 52). He makes some interesting comparisons of the theory of spontaneous generation to current theories on the origin of life.

Although this review is too short to comment in detail about Shapiro's (or the Skeptic's) dismissal of the evidence for current theories of origins, a few major objections follow. (1) In regard to the so-called primordial soup, the most prominent amino acids produced in simulation experiments are glycine and alanine, with only infinitesimal amounts of more complex biomolecules. (2) Investigators always choose experiments providing the highest yield of the desired product. Thus, the intelligence of the investigator has played a major role in the results that have been reported. (3) Current theories for the development of the planet Earth are not in accord with the reducing atmosphere which has been utilized in various simulation experiments for the production of biomolecules. (4) In regard to theories involving either DNA or RNA as the primordial replicating molecules, it is noted that no real evidence has been provided for the production of appropriate precursors in simulation experiments.

Shapiro is just as critical of those who hold "creation science" to be the answer. He questions whether proponents of this view are committed to true science and would classify their views as myth, because they believe in an "authoritative account which is not to be questioned." Although this book does not, in most cases, go into detail with criticisms about particular experiments, it does place considerable emphasis on statistical considerations and probabilities concerning the formation of macromolecules with unique structures.

Shapiro touches on many of the points made previously by C.B. Thaxton, et. al. in their book *The Mystery of Life's Origin: Reassessing Current Theories*. Although the latter book is listed in the appendix of the book being reviewed, no mention of the book by Thaxton, et al. is made in the text. Presumably, this is a consequence of the publication dates of the two books being too close together. In many respects, the two books complement each other. The one by Thaxton, et al. is much more technical and includes many structural formulae and equations, even though the two books touch on many of the same major criticisms of origin research. Both books consider carefully the philosophical aspects of this type of research. They differ in that *The Mystery of Life's Origin* is written by committed Christians, whereas *Origins* is written by one who makes no such claim. Shapiro's particular

Books Received and Available for Review

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

R. Alcorn, *Christians in the Wake of the Sexual Revolution*, Multnomah

D. Basinger and R. Basinger, *Philosophy and Miracle*, Edwin Mellen Press

C. Brown, *Miracles and the Critical Mind*, Eerdmans

B. Bright and R. Jenson, *Kingdoms at War*, Here's Life Publishers

T. Burke (ed.), *The Christian Vision: Man and Morality*, Hillsdale Press

M. Cosgrove, *The Amazing Body Human*, Baker

J. Chartier and M. Chartier, *Caring Together*, Westminster

C. Forbes, *Imagination*, Multnomah

M. Fox, *The Case for Animal Experimentation*, Univ. of California Press

R. Gange, *Origins and Destiny*, Word

D. Garland and D. Garland, *Beyond Companionship*, Westminster

W. Granberg-Michaelson (ed.), *Tending the Garden: Essays on the Gospel and the Earth*, Eerdmans

G. Grant, *The Dispossessed*, Crossway Books

J. Greene, *American Science in the Age of Jefferson*, Iowa State Univ. Press

M. Harper, *The Healings of Jesus*, InterVarsity Press

A. Hart, *Counseling the Depressed*, Word

S. Huse, *The Collapse of Evolution*, Baker

S. Jaki, *Chesterton, A Seer of Science*, Illinois Univ. Press

R. Klay, *Counting the Cost: The Economics of Christian Stewardship*, Eerdmans

C. Koop, *To Live or Die*, Servant

T. Marrs, *Rush to Armageddon*, Tyndale

G. Martin, *Counseling for Family Violence and Abuse*, Word

L. Morris (ed.), *The Christian Vision: Man in Society*, Hillsdale Press

M. Munitz, *Cosmic Understanding*, Princeton Univ. Press

A. Peacocke (ed.), *The Sciences and Theology in the Twentieth Century*, Notre Dame Press

H. Schreck and D. Barrett (eds.), *Unreached Peoples: Clarifying the Task*, Marc

P. Smith, *The Problem of Values in Educational Thought*, Iowa State Univ. Press

H. Snyder and D. Runyon, *Foresight*, Nelson

T. Stafford, *Knowing the Face of God*, Zondervan

J. Stott, *The Cross of Christ*, InterVarsity Press

R. Vath, *Counseling Those with Eating Disorders*, Word

J. Whitehead, *The End of Man*, Crossway

R. Youngblood (ed.), *The Genesis Debate*, Nelson

viewpoint is probably best illustrated by the following quotation from the book: "Perhaps, if all other explanations should fail, in the end we will have no option but to accept the idea of supernatural forces. Until we reach that point, however, we must look for rational ways of accounting for the data" (p. 200). The reviewer must hasten to add, however, that he believes Shapiro treats religion fairly and with much more understanding than most scientific writers on the topic of origins.

An interesting aspect of the book is the presentation of anecdotal accounts of Shapiro's discussions with various investigators, and of his participation in various conferences devoted to the topic of origins.

After noting all of the criticisms of origins research presented in the book, it should be mentioned that Shapiro feels that research on life's origin should proceed in the direction proposed by A.G. Cairns. Cairns' thesis is that the precursors of life as they formed were adsorbed on clay or similar mineral structures. These mineral structures developed catalytic activity and a primitive replicative ability. Shapiro notes that there is no evidence at present for this approach, but believes this to be the direction that research efforts should follow. In the reviewer's view, research in the direction proposed by Cairns will be subject to the same criticisms and problems that Shapiro has so ably pointed out for the origins research effort of the past forty years, and such research is no more likely to bear real scientific fruit.

Overall, I believe this is a book that is definitely worth reading. The bibliographic references in the appendix should provide a general guide for additional reading on this and related topics.

Reviewed by Gordon C. Mills, Division of Biochemistry, University of Texas Medical Branch, Galveston, TX 77550.

SOCIAL PSYCHOLOGY (2nd ed.) by David G. Myers. New York: McGraw-Hill Book Company, 1987. 702 pages, index. Hardcover.

Anyone who has taught a social psychology course should be familiar with the name David Myers. (Myers was a speaker at the 1986 annual meeting of the American Scientific Affiliation.) Dr. Myers, who is John Dirk Werkman Professor of Psychology at Hope College, is an award-winning researcher and teacher. His accomplishments are numerous: fellow of four different divisions of the American Psychological Association, author of numerous journal articles, and consulting editor to *Journal of Experimental Social Psychology* and *Journal of Personality and Social Psychology*. It is only natural, then, that Dr. Myers should author a textbook for the subject at which he is so adept.

Myers wrote this text with the realization that most students taking an undergraduate course in social psychology are not psychology majors, and few of those who are psychology majors will embark on a career in this specialization. Therefore, the book's orientation does not plunge the student into an abyss of social psychological esoterica. The critical information is presented in a highly palatable style.

Social Psychology (2nd edition) is similar in format to the first edition. It is divided into three major units. Unit I, "Social Thinking," covers the ways that persons process social information about themselves and others. Attitude and attribution theories make up the bulk of this unit. Unit II carries the title "Social Influence." In it the reader will find a cogent presentation of the major techniques and social institutions that, in part, determine our susceptibility to influence attempts directed at us. Cultural influences, conformity, and group influences are predominant in this unit. Finally, Unit III, "Social Relations," introduces the reader to the sometimes contrary nature of human relationships. Aggression and altruism, prejudice and attraction are major topics of discussion.

At the end of each of the aforementioned units, Myers includes a chapter that is designed to apply the information contained in that unit to "real world" problems. This feature is particularly useful, given students' penchant for wanting practicality in their disciplines. The three topics chosen by Myers are all currently "hot." "Social Thinking in the Clinic," at the end of Unit I, relies on the popular trend of integrating the findings of social psychological research with clinical treatment modes. "Social Psychology in Court," from Unit II, focuses on the validity of eyewitness testimony and the group processes that play a role in jury deliberation. Finally, in Unit III, Myers tackles "Conflict and Peacemaking."

In addition to its coherent format, this text has a number of features that an instructor would find useful. In chapter one, Myers discusses the role of values in the conduct and interpretation of scientific research. Throughout the text, formal definitions of terms are found in the text margins for easy review by the reader. All chapters contain a "Behind the Scenes" section where selected social psychologists offer their personal thoughts on some aspect of their research. Finally, according to the preface, this edition contains at least 600 new citations. This is truly a new edition.

In summary, Myers' *Social Psychology* (2nd edition) is a well-written overview of the field of social psychology. I would recommend that instructors of social psychology obtain a copy of this text and seriously consider it for use in their course. It lives up to the fine reputation of its author. For those in any discipline who desire to know more about the world of social psychology, this book provides a good starting place.

Reviewed by David E. Johnson, Department of Psychology, John Brown University, Siloam Springs, AR 72761.

THE PERSON IN PSYCHOLOGY by Mary Stewart VanLeeuwen. Grand Rapids: Eerdmans, 1985.

In this informative and closely-reasoned volume, the author sounds a clarion call for radical reform within the

discipline of psychology. The changes which she envisions involve a fundamental reconceptualization of the process of studying persons. While intended for a diverse audience, this book is not easy to read; however, it certainly merits the effort required to digest it. I have read and reread it repeatedly, each time with deeper understanding and additional benefit.

Foundational to discerning the message of the book is a recognition of the dual thrust of its title, *The Person in Psychology*. The author has concerns both for the persons whom we study and seek to better understand, and for those who engage in this research. In the service of these concerns, she very capably exposes the fallacy of proceeding as though our human research subjects are objects to be manipulated, while the researchers themselves, also human, are autonomous agents, free and self-conscious. Consequently, the reforms she proposes involve major changes in our view of both these groups of people. According to the author, we need models of human nature which can do more justice to our agency and reflexivity. We also need a more honest conceptualization of ourselves as researchers, based on an admission of the extent to which our own values and assumptions colour the functioning of our supposedly objective science.

I believe that the author displays a good deal of wisdom in that, while strongly promoting radical change, she does not lose sight of the need for balance. For example, in seeking to correct a reductionistic conception of people, so common in the traditionally "hard" areas of the discipline, we must not rebound into the opposite error of regarding individuals as autonomous to the point of self-deification. Similarly, as the positivistic view of science gives way to a more honest "post-modern" philosophy, which will permit and even encourage candid discussion of control beliefs and assumptions previously undisclosed, we must somehow avoid the anarchy of complete subjectivism. These notes of caution are illustrative of the balanced thinking that characterizes the whole volume.

In the last chapter of the book, the author appeals to us to adopt an interdisciplinary approach in our work. She reinforces this plea by her own example, drawing from philosophy in chapter one, from history in chapters two and three, and from theology in chapter four. Armed with this background, as well as with the grid of varying Christian approaches borrowed from Stephen Evans and summarized in chapter five, she then proceeds to critique five of the major areas of psychology, examining each of them through the lens of a Christian world view. This second section forms the meat of the book. She is clearly most at home in social psychology and behaviourism, skillfully critiquing salient topics in these areas. But she brings thought-provoking insights to the reader in the other areas as well, including a disturbing second look at the western view of "intelligence" and the outline of a biblically-based personality theory—not bad for someone trained in social psychology!

While the author attempts a fair presentation of a range of Christian positions, she admittedly has most sympathy for a "humanizer of science" approach. In fact, I suspect that her priority agenda item may well be encouraging all of us who do research to make room for and give a fair chance to human science methods. While she does not explain very thoroughly what these will involve (and I truly hope that she or someone else will do so soon), the example of the Kitwood research on adolescent values helps to convey at least a flavour of the proposed new paradigm.

I find it difficult to identify weaknesses in this work beyond those that reflect my own biases. Personally, I found the two chapters on history to be of limited value, and I think that the discussion of cognitive psychology is not as balanced and representative of the field as it might be. Otherwise, my only real concern is that the book makes tough reading, which might discourage some people from completing it. However, the effort required reflects more the intrinsic complexity of the issues presented than any unclearness in their expression.

I take my hat off the Mary VanLeeuwen. Although I have perspectivalist leanings myself, she has stimulated me to think long and hard about the adequacy of this view and the possibility of an alternative approach. The mine of this volume is deep, but the treasures of insight to be unearthed are indeed of great value. I heartily recommend it.

Reviewed by Harold Faw, Trinity Western University, Langley, B.C., Canada V3A AR9.

PSYCHOLOGY by David G. Myers. New York: Worth Publishers, 1986. 693 pages. Hardcover; $34.00.

David Myers is an outstanding Christian scholar. He is a professor of psychology at Hope College, and a Fellow of the American Psychological Association. The APA presented Dr. Myers with the Gordon Allport Prize for social psycholgical research in 1978. He has authored *Social Psychology, The Human Puzzle, The Inflated Self*, as well as other books and articles in more than two dozen journals.

Psychology is an introductory textbook for a college course in general psychology. It has a good selection of topics which covers the essentials of the discipline in a logical sequence. It is well written, interesting, and well organized. The graphs, charts and pictures are communicative and helpful for both students and instructors. There are also complete assistance materials for the teacher including overhead projector transparencies, test questions, a teachers' guide and a student workbook. The support material is a major strength of the text.

Psychology is an objective text in the presentation of facts and theories. It raises interesting, important and thought-provoking discussion topics for classroom interaction. It is intellectually honest and current in its content. It also avoids remarks critical of Christian faith, and the sexually explicit illustrations common in so many textbooks. The only weakness is its price.

Myers' book is a thorough tool for the instruction of college students and an excellent resource book on the broad field of

psychology. I recommend it above all textbooks I have used. I know of no other text with so many plusses and so few reservations.

Reviewed by Dr. Billy R. Lewter, Professor of Psychology, Palm Beach Atlantic College, West Palm Beach, FL 33401.

SCIENCE IN THE FEDERAL GOVERNMENT by A. Hunter Dupree. Baltimore, MD: Johns Hopkins, 1986. 481 pages. Paperback; $14.95.

The original edition (1957) had the subtitle, "A History of Policies and Activities to 1940." Its purpose was "to trace the development of science in the United States." The current one deletes the time limitation "to 1940." Nevertheless, despite this come-on, it is essentially a reprint with an additional 10-page preface about the subsequent 46 years.

As the author has hoped, the original edition was to me "a guide and a stimulus," quite readable and informative, when I was a member of the National Science Foundation (NSF). The book itself was a result of an NSF grant given in 1953 to the American Academy of Arts and Sciences with Dupree as the principal investigator. The project had been instigated by the questionable mandate initially in the NSF Act (1950) that the Foundation should develop a national science policy; this study was to be the basis. The author expressed his own feeling of inadequacy owing to his lack of knowledge of the internal histories of many federal agencies.

About 20 percent of the book was devoted to the 41 years from the founding (1787) of the Constitution to the perplexing will (1829) of James Smithson, 20 percent to the next 34 years to the establishment (1863) of the National Academy of Sciences (NAS), 40 percent to the next 53 years to the formation (1916) of the National Research Council, and 20 percent to the final 24 years until 1940. A helpful chronology is at the end (I cannot vouch for its completeness—as a physicist, I noted the omission of the establishment of the National Bureau of Standards in 1901).

The author's additional preface to this edition consists largely of his personal opinions as he has reflected on pertinent events of the subsequent 29 years. As an NSF retiree, I myself would hardly have selected as three major transformations (1953–1955): the shifting of the emphasis from its sponsoring Program Analysis Office to being a primary source of statistics in the federal government; the emerging of social sciences with its subsequent lack of interest in history *per se*; and the action to combine the history and philosophy of science in the NSF with the later disregard for historians.

Dupree fails to mention that the NSF actually gave a grant to the University of California, Berkeley, with him as principal investigator, to continue the study from 1940 to about 1960. Several researches by his graduate students were published, but all work stopped abruptly when Dupree transferred to Brown University for personal reasons. From time to time I encouraged him to continue the project—all to no avail.

One cannot, of course, expect any such survey to contain the details one would require for a study of historical relations. Like any rapid tour, one would need to return to examine the exhibits in more detail. As of this date, the reprint's primary value is that of a classical historical document. I must confess I see little evidence for the author's boastful conclusion in his final paragraph that the nation, enjoying the results of science, has become "more tolerable, more humane, and more able to fulfill its responsibilities to its people." Strangely enough, he does not seem to be concerned at all about education and religion as cultural factors.

Noting the fraying of the scientist's *noblesse oblige* during World War II, owing to the availability of multi-billion dollar appropriations, he discusses his own consultant relationship (1964) with the NAS Committee on Science and Public Policy. This was a failure, owing to the 1965 report by my one-time colleague, E. Teller, which advocated the support of applied sciences in national laboratories. He believes that "in science policy the 1970's were not an inspiring period." Dupree apparently still has the typical low opinion academics have of government research, as expressed in his original book where he referred to the "disinterested, cloistered seeker for pure knowledge and the grubby civil servant chained to mundane, grinding routine investigation." This was precisely my own prejudice until I had first-hand knowledge as a federal employee.

In general, I believe Dupree has little appreciation of the limitations of natural science and an exaggerated notion of the potentialities of the social sciences. He feels that the social sciences have survived because they "avoid the appearance of having a policy of their own." He hopes, possibly through so-called technology assessment, that "*every* research project, no matter how narrowly focused on physical hardware, will have an environmental and a social science evaluation built into it"—an aspiration in line with the American pragmatic and pluralistic society. He concludes: "In the long run, science and American democracy will continue to fit together"; a speculative hope unfounded on historical evidence. It ignores the scientific achievements of the past by individuals under various forms of government.

Reviewed by Raymond J. Seeger, retired from the National Science Foundation, Bethesda, MD 20816.

THE SILICON SOCIETY by David Lyon. Grand Rapids: Eerdmans, 1986. 127 pages. Paperback; $4.95.

This brief book of five chapters deals with the changes caused by the silicon computer chip and the information revolution. The author presents some disturbing questions about how these changes are occurring and evaluates the ethical questions imposed by new technology from a Judeo-Christian perspective. A quote from the first chapter (p. 13)

summarizes the author's convictions: "The conviction expressed here is that Christian Faith may be applied sensitively to the contemporary world of new technology. It promises no slick solutions, but does offer a badly-needed sense of direction. Christianity's high view of human potential to invent and create (our affinity with the creator) leads us to support the drives towards new technologies as means of opening earth's resources to all."

Each chapter has twenty to thirty references, and the book reads exceptionally well. Computers and their influence in our society is a topic about which all Christians should be concerned. We owe David Lyon a debt of gratitude for presenting the questions to us. The answer of how and what kind of influence computers will have is up to us as Christians.

Reviewed by Fred Walters, Associate Professor of Chemistry, University of Southwestern Louisiana, Lafayette, LA 70504.

RESPONSIBLE TECHNOLOGY by Steven V. Monsma (ed.). Grand Rapids: Eerdmans, 1986. 252 pages.

This work from the Calvin Center for Christian Scholarship lives up to the glowing review printed on the jacket by Kenneth W. Hermann. The editor has done a good job of integrating the material into a coherent, readable text. The contents of the book are summarized on page nine with the following comments. Chapters 1 and 2 are the introduction to the topic by defining technology and further developing the focus of their study. Chapter 3 argues against the claim the technology itself is neither good nor evil, thereby strengthening the claim that technology can be done either reponsibly or irresponsibly. Chapters 4 and 5 lay the groundwork for a Christian approach to doing technology. Chapters 6, 7, and 8 consider the scientific, economic and political relationships of technology, deepening our understanding of technology by contrasting these relationships as they are with what they should be if technology is done in keeping with God's normative will. Chapters 9 and 10 consider the technological design process itself, showing how it should be shaped by the normative principles developed in Chapter 5.

The last two chapters (11 and 12) focus on the responsibilities borne by those involved in technology. Since all of us are involved in technology in one way or another, the last two chapters are in essence a call to everyone to live responsibly in an increasingly technological world. In summary, this well-written book makes a significant and much needed contribution to developing a distinctly Christian perspective on the influential role technology plays in our culture, and is recommended to all thoughtful, concerned Christians.

Reviewed by Fred Walters, Associate Professor of Chemistry, University of Southwestern Louisiana, Lafayette, LA 70504.

SPEAKING IN TONGUES: A Guide to Research on Glossolalia by Watson E. Mills (ed.). Grand Rapids: Eerdmans, 1986. Paperback; $24.95.

The recently released *Glossolalia: Behavioral Science Perspectives on Speaking in Tongues* by Malony and Lovekin was met with very positive reviews in the journals I read, and indeed it is an excellent volume. It includes nearly all of the research related to the social and psychological aspects of speaking in tongues, and it has been heralded as perhaps the finest survey on the subject.

Thus it was with some surprise that I learned that another major work on the subject had been released, this one edited by Watson Mills, who has done other volumes on the subject. This book of readings is nearly twice as long as the Malony and Lovekin book, one year newer, and costs less.

A reviewer, cited on the back cover, stated that the book contained "virtually all the important scientific articles on glossolalia," clearly an exaggeration. In contrast, the author states that he includes "a representative sample" of the literature.

Mills' book is a readings' book, in contrast to the literature survey approach of Malony and Lovekin. Thus, the perspective is much broader. Like Malony and Lovekin, the editor attempts to be objective and achieves a careful balance between perspectives. Studies are included which oppose speaking in tongues, others which favor speaking in tongues, while a majority attempt to take a neutral position.

Only two chapters have not previously been published, both written by Mills. These chapters contain some overlap with one another as well as the other chapters of the book. The chapters retain differences in footnotes from the original form. Chapters are abstracted if the original had an abstract, but no abstract is included if the original did not. Biographical background of authors is missing; a serious omission. A name index is included, but not a subject index.

Several interesting chapters are included that are tangential to the topic. I especially enjoyed chapter eleven on Appalachian holiness churches, which includes a brief section on snake-handlers. Chapter sixteen deals with hermeneutical issues, particularly the social context of the Bible. Chapter twenty-three describes linguistic and cultural issues coauthored by missiologist Marvin Mayers. Some eyebrows may lift when higher biblical criticism is used in several chapters.

The book is quite dated. Ignoring the two initial chapters, twenty-three out of the remaining twenty-five chapters are at least ten years old! The other two reprinted chapters were written in 1980. The two "new" chapters by the editor contain only two citations less than ten years old, and the editor's history of glossolalia ends in the late 1960's! Perhaps the age of the chapters is less crucial for the theologically-oriented materials, but much has happened in the last ten years in psycho-social research and in the movement's history (for example, Pat Robertson is not mentioned).

In sum, the volume presents solid primary sources which give good background on the subject from several disciplines. Chapters vary from lightweight popular treatments to heavy theological or statistical studies. This book would be a good supplement to the one by Malony and Lovekin.

Reviewed by Donald Ratcliff, Toccoa Falls College, Toccoa Falls, GA 30577.

CHRISTIANITY IN CONFLICT by Peter Williamson and Kevin Perrotta (eds.). Ann Arbor, MI: Servant Books, 1986. 147 pages. Paperback; $7.95.

Three hundred Christians came together in Ann Arbor, Michigan in May of 1985 to explore the theme "Allies for Faith and Renewal." This was the third gathering sponsored by the ecumenical Center for Pastoral Renewal. As with the earlier two events, selected addresses from the conference have been collected into a volume. The nine contributors represent a diversity of Christian traditions (Orthodox, Catholic, Reformed, Mennonite) and a diversity of roles (clergy, academician, lay person). Yet, all face a common challenge—anti-Christian attitudes and cultural patterns—and a common concern—to mobilize the church to renewal in the face of contemporary secularity.

In the introduction, editor Peter Williamson, of the Center for Pastoral Renewal, sets the tone for what follows. The conference participants are allies, despite their religious differences, for they are "galvanized" by a common foe: spiritual powers in rebellion against God, "secular conceptions of the world" which stand opposed to "divine revelation, objective truth, moral absolutes, and the biblical message. . . . " The decision, therefore, is simple: Whether one's thinking will be determined by the teaching of the New Testament or by the secularized mindset. In this situation of "grave urgency," Christians must be challenged to renewal—to prayer and to being open to the Holy Spirit. To assist in this enterprise is the ultimate purpose of this volume.

While the articles are not arranged in any perceivable pattern, they fall into three general types. A first group, consisting of the two most helpful essays, deals with political issues. The well-known Constitutional lawyer, William Bentley Ball, broaches the topic of religious liberty in the first article. He delineates two trends in religion cases, notes six particular threats to religious liberty, and then suggests six actions to be taken by Christians. One wonders how a lawyer of his stature can continue to perpetrate the mistaken notion that "the religion of secular humanism became officially installed . . . in the public schools" in 1963. Yet, Ball is to be commended for his sane and moderate approach to the problem. He calls on Christians to avoid "silly and irrational" approaches which claim that the judiciary system is in the total grip of the devil.

In a somewhat rambling article, Charles Colson speaks from experience in addressing political power. After decrying both civil religion and privatized faith, he, following Ellul, calls on Christians to see through the "political illusion" that views all problems as political, rather than moral.

Three articles focus on theological issues. Donald Bloesch of Dubuque Seminary alerts the reader to some of the ideologies of the day: conservatism, welfare liberalism, socialism, patriarchalism, fascism, and technological liberalism. He follows Niebuhr in seeing a fundamental contradiction between ideology and faith. Although granting that some ideologies are closer to Christian values than others, those that seem most congruent are often the most seductive, he cautions.

Harold O.J. Brown calls to task certain current distortions of the doctrine of salvation. Most of these, he claims, either forget the words "of God" or limit salvation to one of its aspects. Brown employs a strained and unhelpful analogy from ancient Greek categories of physics (air, earth, fire, water) to combat what he (erroneously) sees as the four major distortions: pietistic evangelicalism, liberation theology, modernism, and universalism.

The feminist critique of the continuing use of the traditional trinitarian names is examined and found wanting by the only female contributor to the volume, Deborah Malacky Belonick, representative of the Orthodox Church in America to the Faith and Order Commission of the NCC. While her argument, based almost exclusively on patristic writings, is interesting, the article's place in the volume is unclear.

The third set of essays issue warnings to the American churches. Catholic educator James Hitchcock offers a fascinating challenge to evangelicals to learn from the "unravelling of American Catholicism" which came with the church's arrival in the mainstream of American life.

The weakest articles come from three members of the ecumenical community, The Sword of the Spirit, which is disproportionately represented in the volume. Ken Wilson speculates that current crises are part of God's strategy for overcoming the parochialism of the divided Christian denominations. This judgment theme is also sounded by Bruce Yocum. He anticipates further opposition for Christians in society and sees this as the process whereby God will purify the church. In the closing article, Stephen B. Clark, president of The Sword of the Spirit, seeks to asess the status of Christianity in American society by looking to factors that indicate either its advance or retreat. He concludes that a crucial problem is Christian conformity to the world. While not advocating following the example of the Amish, whom he admires, Clark sees a key element in the church's strategy as

lying in greater separation, the construction of stronger relational ties among Christians, in order to develop a real alternative to secular society.

While the essays in the volume are hampered by space limitations, and therefore are not without significant problems, as a whole they form an important challenge to Christians who are settling down in the world. There is a spiritual battle raging, the contributors rightly maintain, one which believers can overlook only at their peril. At the same time, the volume is unfortunately one-sided. The world is seen too much as a scene of conflict. This outlook leads to an oversimplified approach to life that pits the evil against the good, with the good too readily equated with theological conservatism and traditionalism. Yet, the body of Christ is not only served by radicals of the left, whose voices are so readily heard, but also by conservative radicals, whose positions are represented in this book.

Reviewed by Stanley J. Grenz, Associate Professor of Systematic Theology, North American Baptist Seminary, Sioux Falls, SD 57105.

THE NEW TESTAMENT IN ITS SOCIAL ENVIRONMENT by John E. Stambaugh and David L. Balch. Philadelphia: Westminster Press, 1986. 194 pages, index. Hardcover.

This is volume two of a nine-volume series edited by Wayne A. Meeks of Yale University entitled *Library of Early Christianity*. The series explores the Jewish and Greco-Roman contexts within which the New Testament developed. If the volume in hand is representative of the rest, readers from biblical scholars to interested laymen will have access to a massive amount of solid information in language free of pedantry and writing that is a pleasure to read.

Stambaugh is a classicist and Roman historian at Williams College with a special interest in ancient cities and religions of the Roman empire. Balch is a New Testament scholar at Brite Divinity School interested in ethical patterns in the New Testament as situated in Greek and Roman philosophical and rhetorical traditions, and in applying modern sociological questions to the first century.

The authors set out for themselves no little task. Their goal is to:

> . . . discuss the political, religious, economic, and social features of Palestine and of the cities of the Roman empire and synthesize the results of recent scholarly work, to help the reader understand the relationship between the earliest Christians and the world around them.

It is the opinion of this reviewer that they have succeeded admirably well.

Their method is to distill many studies and present the broad picture of life in the Roman world from the top to the bottom of the social spectrum: from rural to urban; from private to public; and from casual relationships to legal technicalities. It seems as if one is reading a handbook our government published on another country, although the writing is far superior. Best of all is their regular reference to Bible passages that illustrate the presence of particular social factors that would otherwise be unknown to the vast majority of Bible readers.

The spectrum of biblical studies has been most known by the extremes of claiming the New Testament church to be wholly-other-than the Roman world (fundamentalism) and virually-indistinguishable-from it (secularized liberalism). Happily, this work makes clear that the first century church was made up of people very much a part of their world even while they struggled to be not of it.

There are ten pages of end notes, six pages of chapter by chapter suggestions for further reading, ten pages of subject and biblical index, and sixteen pages of useful color maps.

The authors have shown mastery of much literature as well as a keen sense of humor. I only question their use of the term "Judaizers" as referring to Gentiles friendly toward Judaism but not becoming converts. It is my understanding that the term refers to Jewish-Christians who claimed that Gentiles must obey Jewish Law before becoming true Christians. Otherwise the work is alive with Greco-Roman culture, solid New Testament understanding, and discussion illustrating the sociological imagination.

Reviewed by Larry Riedinger, Sociology Graduate Student, University of Louisville, Louisville, KY 40215.

THINE IS THE KINGDOM: A Biblical Perspective on the Nature of Government and Politics Today by Paul Marshall. Grand Rapids: Eerdmans, 1986. 160 pages. Paperback.

The author, senior member in political theory at the Institute for Christian Studies in Toronto, has attempted to do some preliminary work toward the development of what could be termed a Christian theory of government and political action. The intended primary audience is English and evangelical, but this should present little difficulty for American, and even less for Canadian, readers.

Marshall wants to help create a framework within which Christians can be "Christianly" political. This framework consists of biblical understandings of the nature of justice, stewardship, humanity, and the modern world with discussions of the welfare state and international relations as major cases in point. These major agendas each have many parts (the table of contents fills a little over three pages!), so the reader is treated to many of the issues involved. While reading I felt as if I had in my hands something akin to "A Prolegomena to Systematic Christian Political Theory," which would be followed by a more massive work analgous to a systematic theology.

As a preliminary work, Marshall does a good job of covering a lot of the bases. The writing is clear and flows well, and the reader is treated to a warm sense of humor.

His general approach is to orient his message in such a way that he succumbs to neither pious promotions of idealizations nor "Christian" political positions which reflect more Right or Left ideology than biblical. He also makes clear his sympathies for and criticisms of those positions.

Finally, Marshall brings up a problem which does my sociological heart good. He discusses the problem of contextualizing Christian action. His answer is solidly Christian political organizations. These are not, however, like Right or Left "Christian" PACS (Political Action Committees). They are more like communities (koinonia) that are small models of the world-wide Body of Christ, and they should maintain an international perspective with brothers and sisters in Christ in other countries.

The only problem I see with the book is a weakness in historical perspective. Marshall points out that evangelicals are weak in political thinking, to which I heartily agree. He then lists nearly two millenia of Christian thinkers who applied themselves to political questions and makes it clear that we ignore them at our peril. He then writes the whole book with hardly any reference to any of them. In fact, most of the noted sources do not strike me as primary sources.

He also seems to have fallen for the current vogue of blaming everything on humanism—ecological disaster, in this case. He seems to think that humanism is a very recent phenomenon and is the prime cause of industrial capitalism's rape of the Earth. However, humanism goes back at least four centuries and some Christian political thinkers were heavily influenced by humanistic thought. John Calvin is a prime example. He also takes no note of the thoughts of Max Weber and R.H. Tawney (the latter an Englishman and a Christian), and their important works dealing with the inseparability of modern rational capitalism and Reformation theology. There is also only the slightest reference to Karl Marx, but that may be planned so that he will not alienate the intended readership.

Despite my historical uneasiness with the book, I could make good use of it as one of the texts in a course on political economics.

Reviewed by Larry Riedinger, Sociology Graduate Student, University of Louisville, Louisville, KY 40215.

THE ABSENCE OF TYRANNY: Recovering Freedon in Our Time by Lloyd Billingsley. Portland, OR: Multnomah Press, 1986. 202 pages. Hardcover; $11.95.

According to Lloyd Billingsley, "freedom is the absence of tyranny." It is a scarce commodity in a time when "ideologues" world-wide demean freedom in favor of exalting statism, redistributionism, and authoritarianism—all in the name of "justice." Freedom, says Billingsley, must be fought for—intellectually and militarily. And fight he does. By synthesizing the best of classical conservative social and economic thought (Adam Smith, Edmund Burke, J.S. Mill), the criticisms of respected anti-communist writers such as George Orwell and Malcom Muggeridge, and the writings of neo-conservatives and evangelical conservatives, Billingsley fires a salvo of criticisms at the ideological dismissal of freedom in our age.

Billingsley uses the term "ideology" pejoratively, following the usage of Kenneth Minogue's work, *Alien Powers: the Pure Theory of Ideology* (1985), which he depends on heavily. Ideologists, whether secular or religious, are enemies of freedom, seeing it as no more than a pretense for exploitation. But the ideologue does not argue logically; instead, his rhetoric is littered with special pleading, *ad hominem* fallacies, emotionalism and unconvincing arguments. Billingsley finds ideology infecting Christians and cites examples from the evangelical left (developing the criticisms he made in *The Generation That Knew Not Josef* [1985]).

With an epigrammatic style peppered with wit, Billingsley has written an insistent and passionate defense of freedom. In so doing he rejects the moral equivalence of "the superpowers," defends the free market, and rails against statist bureaucracies in our midst which he sees as tyrannical in their own regard.

Although he cites Christian sources, Billingsley makes his case largely without the aid of Scripture. He is critical of liberal evangelicals who, he thinks, twist Scripture under the guise of being "prophetic," which "is often a shortcut to a platform of authority as well as a clever way of placing the wildest pronouncements beyond the pale of examination." Yet Billingsley's lack of integration of Scripture weakens his effort and causes him to reject the (supposedly) "ideological" notion of "structural evil" when, in fact, the Bible does speak of collective evil. But it does so without endorsing the ideological errors of undermining individual responsibility, fostering guilt-mongering or advocating suicidal utopian measures. Billingsley's own citations of the statist-bureaucratic structures of the West and the outright totalitarianism of the Soviets are examples of structural evil. The conservative tradition from which Billingsley draws has roots in biblical sources that he has not fleshed out.

Although the book is not lacking in documentation, Billingsley has primarily written a manifesto and issued a challenge rather than develop fine-tuned arguments. This does make him vulnerable to oversimplification and overstatement. Yet it also gives him the freedom to explore issues provocatively, catch our attention, keep our interest, and prick our conscience. This book has a vital message: Tyranny is more abundant than absent world-wide. Freedom needs to be preserved and recovered; it evaporates too easily.

Reviewed by Doug Groothius, Research Associate, Probe Ministries, Seattle, WA 98105.

HUMAN RIGHTS AND HUMAN DIGNITY by John Warwick Montgomery. Grand Rapids: Zondervan Publishing House, 1986. 218 pages. Paperback.

In 1776, Thomas Jefferson and the other signatories to a new nation's Declaration of Independence, could state forthrightly and categorically: "We hold these truths to be self-evident . . . that all men are endowed by their Creator with certain unalienable rights. . . . " It is a commentary upon our times that the book *Human Rights and Human Dignity* must now be written to reconstruct that once self-evident truth.

John Warwick Montgomery is well-qualified to write this definitive Christian apology for the metaphysical foundation of human rights and human dignity. Montgomery is Dean and Professor of Jurisprudence at the Simon Greenleaf School of Law, Orange, California, and Director of its annual summer program at the International Institute of Human Rights, Strasbourg, France.

In addition to the LL.B., Montgomery holds eight other earned degrees, including an A.B. with distinction in Philosophy (Cornell University), a B.D. and S.T.M. (Wittenberg University, Springfield, Ohio), a M.Phil. in law (University of Essex, England), and a Ph.D. (University of Chicago). He has authored "over one hundred scholarly journal articles and more than thirty-five books in English, French, Spanish and German."

Montgomery's credentials in philosophy, theology and law are most evident in this work. It is a scholarly study of the first order. The primary audience for this book will be other like-minded scholars and students intent upon a singular critique in the field of human rights. The generous references (440 in all), appendices of major international human rights declarations, and list of further readings give the serious inquirer a well-spring of research material.

The book moves from a statement of need and present human rights protections to a broader evaluation of accepted human rights philosophies. Montgomery raises and discards, in turn, such secular philosophies as Compte's relativism, Bentham's utilitarianism, Hart's realism or legal positivism and its successors, various rationalistic systems flowing from Kant, and the Marxist view of human rights.

Montgomery finds each humanistic philosophy lacking in its basic proposition of an absolute or ultimately inviolable standard for human rights or human dignity. The lack of a higher view of mankind leaves open the "floodgates to indiscriminate rights for fauna, flora, and even inanimate objects." Montgomery finds these approaches to be fatally flawed by relativism, since the source of human rights must invariably become mankind's individual conscience or a society's collective sensibilities.

While all of these systems posit a framework for the existence of basic human rights, none satisfactorily answers the issue of a motivation for enforcing these rights in a social order. " . . . (I)t is ultimately the human heart that holds the key to respect for others," concludes Montgomery. Once again, "the philosophers have shown themselves to be long on the questions and short on the answers."

Montgomery posits his answer to this void in the closing chapter of the book. Universal rights and human dignity were conferred upon mankind by the Creator in the creation. Mankind alone received the *imago Dei*. Our motivation for enforcing the rights of others comes from the act of redemption. We have received grace and are now called to become, as Luther said, a "little Christ" to our neighbors.

Montgomery uses two chapters between his stated problem and solution to develop the "essentiality of transcendence" in finding a basis for human rights. First, he critiques the various "religious" solutions to the human rights dilemma. Montgomery rejects Buddhism (depends on man's goodness), Islam (fatalistic, chauvinistic), Judaism (legalistic burden to the human spirit) and classical religions (lack specifics). In the second, and determinative, chapter, Montgomery proposes a "revelational solution." He chooses the rubric of law and the rules of evidence to "prove" the reliability of Scripture and the revelational veracity of Christ's person and witness. It is a curiously forthright evangelistic chapter in the middle of a laborious philosophical dissertation. Upon the weight of this logic, however, depends the remainder of Montgomery's rationale for universal human rights and human dignity.

The reader searching for an action agenda or an international blueprint for human rights cooperation will be disappointed. Montgomery finds no worth in the idea that God has used a general revelation to develop a human rights catalogue from secular or relativistic philosophies. In the last chapter, Montgomery also separates himself from process theology, existential theology, situationalism, liberation theology, monasticism, and neo-Calvinism (Barth, Moltmann). He does appear to embrace Lutheranism, however, with both its view of God's covenant with man as the source of human rights and its allowance for one to suffer an injustice even while seeking a right for another. "The activist obnoxiously pushing for the futherance of his own rights and interests is replaced by the Christian employing his full energies to defend the rights of others."

As an uncompromising remonstrance for a Christian definition of human dignity and human rights, the book persuasively accomplishes its task.

Reviewed by John Brown, III, President of John Brown University, Siloam Springs, AR 72761.

DEATH OF THE SOUL: From Descartes to the Computer by William Barrett. New York: Anchor Press/ Doubleday & Company, 1986. 173 pages. Hardcover; $16.95.

William Barrett is a distinguished American philosopher now teaching at Pace University in New York. He is credited with introducing existentialism to the United States. In the

1940's and 50's he was associate editor for *Partisan Review*, the "voice of the New York intelligentsia."

Despite his imposing credentials, Barrett, in style and sympathies, is a philosopher for the common man. He writes so that the musings of philosophy may be understood in the street, and so that the experiences of ordinary people may enrich philosophy. He is a notable part of a generally welcome trend toward an appreciation of the truth found in everyday life.

Death of the Soul is largely a lament over how far theories of mind and self have come from our experiences of these things. Barrett reviews the last 350 years of Western philosophy, a period in which "the labor of a good part of our culture has been reductive: to undermine the spiritual status of the human person." His focus is on major philosophers: from Rene Descartes, who dreamed of mathematical certainty and wrenched conscious man from the machine of nature; through Immanuel Kant, whose reasoned attempts to reconcile moral man with a vast, amoral universe resulted in the separation of reason from faith, and science from religion; to present day promoters of artificial intelligence, whose mechanical models of the mind complete the death of the soul—in theory, that is.

Barrett fights against a "deranged rationality" infecting our times. He criticizes the "sheer verbalism" of modern philosophy, cut off from ordinary intuition. He attacks the modern tendency, fostered by scientific materialism, to dissect and abstract human experience, forgetting that "life, seen in its entirety, is essentially a spiritual process."

His simple point is that philosophy could benefit from a heavy dose of common sense. His major plea is for us to stay in touch with the "I" of human experience, the actual and real person who experiences life as a unity of thoughts, feelings, sensations and creative ideas, and for whom God is real.

The book flows in the direction of a reconciliation: of man with nature; of philosophy with real life; of past insights with present dilemmas; of scientific understanding and spiritual longing; of God and society. Such a reconciliation would clearly benefit the modern philosopher, nervous about the implications of an immaterial consciousness, and the common man, uncertain of the validity of his faith in a scientific age.

Though the general outline of such a reconciliation is here, the reader's expectations of it are left unfulfilled, met finally with the promise of a "future work." Nor does Barrett clearly distinguish between mind, soul and spirit—distinctions one might expect from a Christian believer. It may be that such distinctions violate Barrett's point that the human being has become too divided in theory. Yet one waits to see how his holistic view may differ from those of Eastern mysticism now emerging in our culture.

In any event, *Death of the Soul* is a delightful and informative survey. Barrett pulls no punches when it comes to criticizing his colleagues "in a period in which triviality has almost become an occupational hazard among philosophers." His treatment is lucid and occasionally humorous. (Of the diminutive Professor Kant he says: "The good people of Konigsberg would have regarded him differently if they had known the thoughts he was harboring.") And he is never far from the mundane: a sleeping dog is used to illustrate the alienation of man from nature, and a web-spinning spider outside his window to explain the limits of our scientific theories.

For the scientist and believing Christian, Barrett's book provides a sympathetic and scholarly groundwork on which to confront the assumptions of scientific materialism. "We do not understand the mind," he says, "unless we are able to grasp it as part of the total Being within which the human person exists and functions."

Reviewed by Bill Durbin, Jr., Virginia Beach, VA 23464.

THE TRUTH OF VALUE: A Defense of Moral and Literary Judgment by Paul Ramsey. Atlantic Highlands, NJ: Humanities Press, 1985. 139 pages.

The author of this work, a professor of English and poet-in-residence at the University of Tennessee at Chattanooga, is well qualified to address this topic of importance to ASA members. He is equally at home, it appears, in logic and mathematics (citing from Aristotle to Frege), philosophy (Kant, Hume, Berkeley and Wittgenstein), science (Toulmin, Popper), linguistics, and ethical theory (Moore) as in poetics, literary criticism and English grammar. He brings the soul and mind of a poet to question whether values are real or should be excluded from the actual world as (supposedly) seen through the lens of positivistic science. He speaks of an "assumption wiggling within and beneath a woodpile of queries—the assumption that we can know, plainly, facts and that we cannot know value . . . " (p. 27). The refutation of this usually uncontested assumption is the burden of his book. His command of our language enchants even the unpoetic; he speaks of those who "billow the rhetoric," of words that "writhe." Yet his efforts will doubtless cause the reader to think twice when using tritely words like *fact, value*, and the dichotomies *subject-object, subjective-objective*.

A tour of Ramsey's brief book would include glimpses of one unclear, value-ridden concept: Fact. Fact-worshipping science, if the fact/value dichotomy holds, is worthless. "But science is worth much, intrinsically and instrumentally. Something has gone wrong" (p. 6).

Other interesting sites to visit: (1) He effectively refutes Hume's attempt to locate value in the emotions (chapter 2). (2) He wrestles with proofs for the reality of moral and aesthetic value. In so doing he devastates the usual is/ought dichotomy. "One cannot even say an is-statement, a pure and mere fact, in the sense intended: no statement is pure description, utter description, set free from all value, because statements *are* evaluations. The problem is not crossing the bridge from the is-statement to the ought-statement. It's getting across the bridge in order to start with the is-

statement" (p. 35, emphasis author's). (3) He allows the reader to observe his application of moral and aesthetic laws: they are not "tight"; they require thought and explanation. Then, too, the human *heart* and its "*confusions*" are not cured by mere "reason" (p. 44). (4) "*Culture*" is the magic word which, *a la* Houdini, makes things appear and disappear. Cultural relativism is disposable. Between Strict Rationalism and Strict Skepticism, which are uninhabitable, lies the land of Faith in Experience in which all must dwell. (5) Goodness, like being, is not a "property" of things, but a necessary means by which we grasp the world.

Two final quotes may enable readers of this review to sense Ramsey's attitude toward science as empiricism:

> What is true in what the empiricist sees about science is a good bit: Methods, results, discipline, the exclusion from consideration a number of possible judgments and issues. But to assume thereby that those procedures of science are value-neutral is false, and untrue (unfaithful) to science itself. Science is valuable because of virtuous achievement of a difficult kind. A scientific observer is never mere observer, select though he must, since it is the requirements and disciplines and fulfillment of science that sets the parameters and habits of observing. That's true of pure science—the very adjective "pure" suggests the valid ideal of knowledge conceived as a good; and true as much for the investigators at work on something where human choice, morality, valuing, set the end and some of the terms: e.g., cancer research (p. 93).

> Since empiricism must adopt, use, and deal with language so to construct its case, and since empiricism in content flatly denies that there is value or truth of value, yet must assume and use the reality it denies at every point of its operations, empiricism is incoherent and incompatible with the real world. What is compatible with language and experience? The reality of value. "But to admit that much is to open the door towards theism, toward Christianity."

> Yes, it opens it wide, an opening which explains some of the fierce resistence to the move (p. 103).

Ramsey's book will be appreciated by scholars of many fields. It is must-reading for men and women of science.

Reviewed by Gilbert Brewster Weaver, John Brown University, Siloam Springs, AR 72761.

CHRISTIAN HOPE AND THE FUTURE by Stephen H. Travis. Downers Grove, IL: InterVarsity Press, 1980. 143 pages.

In the preface of this book, we have Travis' stated purpose for writing: "Christianity without hope is an impossibility. But hope for what? Hopes expressed in the New Testament raise difficult questions both for the reader seeking to understand what the authors meant and for the interpreter attempting to convey what those hopes can mean for us today. I have tried in this book to analyse significant contributions to the modern debate about these questions, to draw attention to some key issues, and to indicate some conclusions of my own."

Travis says that "eschatology is a slippery word because its meaning has been changed so much that it is in danger of being meaningless." He uses eschatology to mean such things as the "parousia" (the Greek word for the second coming of Christ), the resurrection of the dead, heaven and hell. Focusing on the past twenty years, Travis also gives particular attention to increasing the reader's understanding of the apocalypse and its place in the discussion. He emphasizes that all of these aspects of eschatology are related to each other because they are all related to Christ.

Those whose views are discussed include Gerhard von Rad, P.D. Hanson, R.J. Bauckham, Ernst Kasemann, J.D.G. Dunn, Wolfhart Pannenberg, Jurgen Moltmann, Carl E. Braaten, Rudolf Bultmann, C.H. Dodd, J.A.T. Robinson, Oscar Cullman, W.G. Kummel, John Hick, Paul Badham and John Macquarrie.

Although Travis does not agree with all insights of the apocalyptists, he urges the reader to consider three of their basic beliefs: the meaning of history can only be found beyond history; human life can only find its true fulfillment in a transcendent future beyond death; and all people stand subject to God's judgment.

The discussion of the parousia includes realized eschatology and inaugurated eschatology. Travis acknowledges that the apocalyptists are right in their emphasis that with the coming of Jesus the salvation of God came to men in a new way: the kingdom of God has arrived; but, because of their abolition of the parousia, the question of the future of Jesus Christ and the question of the goal of history are left unanswered. Travis agrees with Aldwinckle that the parousia will be an event that marks the climax of our present historical order, but will itself be beyond history in that it will introduce a new order discontinuous with the present course of history. The parousia will be a meeting between a real Christ and a real community of people.

From his discussion of the future life, Travis identifies what he considers to be the main obstacle to belief in a traditional doctrine of life after death: the modern understanding of man as unitary. Because of this, it seems unreasonable to believe either in an immortal soul which survives the death of the body or in the resurrection of a body which obviously disintegrates after death. Travis' conclusion, after he considers all the arguments, is that a Christianity without a personal, fulfilled and yet corporeal life after death is a contradiction in terms.

The main purpose of the chapter on the judgment of God is to evaluate the various views on whether salvation will be

experienced by all or only some and to suggest a coherent understanding of divine judgment. Travis states that the final judgment is God's ratification of the relationship or nonrelationship with him which individuals have chosen in this life. If they have fellowship with God now, they will enter into a fuller experience of his presence then. If they do not know him now, they will not know him then. If this is so, we can see that both heaven and hell are best thought of not as reward or punishment for the kind of life we have lived, but as the logical outcome of our relationship to God in this life. Travis cautions us to not become dogmatic about the specifics of the future life because of the ambiguity of biblical evidence. He says that while the New Testament clearly teaches the seriousness of judgment based on our moral choices, it does not encourage us to be dogmatic about the fate of any particular individual. There is room for differences of opinion, room for reverent agnosticism, but also for worship, action and hope in the light of "what no eye has seen, nor ear heard, nor the heart of man conceived, what God has prepared for those who love Him" (I Cor. 2:9).

Reviewed by Emily Egbert, Lebanon, PA 17042.

WHO DO AMERICANS SAY THAT I AM? by George Gallup, Jr. and George O'Connell. Philadephia: Westminster Press, 1986. 129 pages. Paperback; $9.95.

On the cover of this book there is a come-on: "What Christians Can Learn From Opinion Polls." Statistical data are given in 35 tables and are based on a combination of the findings of the Schuller Ministries Studies, a special Gallup Poll, the Princeton Religion Research Center, the U.S. Census Bureau, et. al. It is regrettable that there is no indication here of the size of each sampling or of the total number of respondents, or of the statistical validity in each table, or when data collected under different conditions has been combined.

After the authors give some brief historical insights, they venture some thoughts about the lessons that can be learned with respect to American's beliefs about Jesus Christ. "Did Christ live?" Ninety-one percent said that He did. "Was He God?" Seventy percent said that He was. Forty-two percent believed Jesus was God incarnate, but twenty-seven percent viewed Him as divine only in the sense of being the "best man." Forty-one percent said that Jesus' most appealing personality trait was love for humankind.

I personally question the assumption that "polls can accurately reflect 'who' believes 'what' " inasmuch as most questions are hardly definitive; there is no certainty as to what is intended or as to what is understood by the respondents. The answers, too, have to be subjectively interpreted. The authors, therefore, supplemented the formal questionnaires (the big picture) with informal interviews (the little picture). Along this line the authors then consider "Jesus as Viewed Through the Ages," based on the view of eleven historical figures.

Next is a chapter on "Jesus' Influence on Americans Today" which also exhibits the uncertainties associated with self-analysis. As people get older they tend to express more satisfaction with Jesus. Respondents were asked to select four of sixteen suggested answers as to the "Most Important Ways to Try to Follow Jesus": forty-eight percent selected obeying the Ten Commandments; forty-four percent, forgiving those who have wronged you; thirty-four percent, putting others' needs before your own; thirty-one percent, living so as to draw others to Jesus.

"What Can Opinion Research Teach Us?" is the boastful heading of chapter five. Although eighty-two percent of Americans are nominal Christians, only forty-two percent attend church services in a given week. They generally rank health, family, love, and friends ahead of religion in their hierarchy of values. Not surprising, therefore, was the biblical ignorance shown. Although seventy percent knew that Jesus had been born in Bethlehem, only forty-two percent connected Him with the Sermon on the Mount, and only forty-six percent knew the names of the four gospels. Respondents thought that the best way to strengthen faith was by praying alone, followed by helping others, attending religious services, and reading the Bible.

The report states that "a concerned laity can be a powerful influence in church affairs." It notes, however, that only ten percent feel that they are "very close" to following Jesus. Thirty-seven percent said that they needed help in putting their faith into practice. They also expressed a need for help to handle suffering and to be more effective parents.

The report suggests that in this atomic age the transition from childhood dependence to perilous adulthood is doubly difficult. Although fifty percent of college students regard religious beliefs as "very important," only thirty-nine percent attend a religious service every week.

The surveys indicate that there is a growing conviction that religion, rather than science, can answer the current problems of the world. The outspoken Malcolm Muggeridge blames the weakness of the modern church on the weak response to the teachings of its ministers. In the final chapter, "Where Do We Go From Here?", Gallup himself deplores the hunger and poverty in a land of abundance. He considers nominal Christians to be assenters, not believers. He notes that the highly, spiritually committed are generally downscale economically and socially. He proposes that a new pastor: (1) learn more about the members of a congregation and encourage small group fellowship; (2) worship daily; (3) challenge the practical faith of individuals through Bible study; (4) have face-to-face contact with needy neighbors; and, (5) pray.

In an afterword, R.H. Schuller, admitting uncomfortableness with statistics, advocates a new reformation of ideas for people. What is needed, says Schuller, is some kind of catalytic changing action for an unchanging church. This is a report worth considering despite my own reservations as a student of statistics.

Reviewed by Raymond Seeger, retired from the National Science Foundation, Bethesda, MD 20816.

MAKING SENSE OUT OF SUFFERING by Peter Kreeft. Ann Arbor, Michigan: Servant Books, 1986. 184 pages. Paperback; $5.95.

This book fits into an ever-expanding genre which attempts to explain how a loving and all-powerful God can permit suffering. Perhaps the most famous of the lot is *The Problem of Pain* by C.S. Lewis. Others include *Destined for Glory* by Margaret Clarkson, *A Loving God and a Suffering World* by Jon Tal Murphree, and *Where Is God When It Hurts* by Philip Yancey.

Whenever I read this type of book, I start with high expectations and end with mixed feelings. My high expectations are that the author will say something new, will cast a bright light, will lead us out of the maze of paradox and confusion. My mixed feelings come from appreciation for the author's noble attempt and disappointment that nothing original has been added to the continuing discussion. As a matter of fact, at least twice Kreeft disarms the reader by confessing that he does not know whether his book is different from those already in existence, and furthermore he does not care (pp. 19, 20). His defense: "I think the people who try the hardest to be original end up being silly or else saying old stuff in camouflaged new ways" (p. 19).

However, the fact that there is little new in Kreeft's book does not mean that it is valueless. It has many virtues, among them an easy-to-read, fluid style. The approach is an enticing "stay with me until the end and you won't be sorry." It includes a lot of pungent quotations: "From heaven the most miserable earthly life will look like one bad night in an inconvenient hotel" (St. Teresa); "Doubts are ants in the pants that keep faith moving" (Frederick Beuchner); and "Philosophy is a rehearsal for dying" (Socrates). He quotes most frequently from C.S. Lewis, but Pascal, Dostoyevski and Kierkegaard are favorites also.

The most important chapter in the book is chapter ten, in which Kreeft gives his answer to the problem of suffering. His view is that the Answerer is more important than the answer. The answer is someone, not something. The answer is not a word but the Word; not an idea but a person. Kreeft believes that Jesus did three things to solve the problem of suffering: He came; He transformed the meaning of our sufferings; He died and rose. I am a little puzzled as to why Kreeft thinks this solves the problem of suffering, since these facts about Jesus have been well known for nearly 2000 years, but for most thinkers the problem remains.

Kreeft's ten chapters mostly contain straight prose, but occasionally the author breaks into dialogue with the reader. He has used the dialogue format in five other books which he has authored, because he believes it is a natural mode of communicating to most people. He points out that it was the method used exclusively by Plato. Unhappily, the reader may sometimes feel frustrated, because some of his questions are not asked. Some topics which I think should have received more discussion include: pain and animals, mental illness and suicide, determinism and responsibility, and universalism and the reprobate.

This book has already received high praise from writers Elisabeth Elliot, Philip Yancey and William Kirk Kilpatrick whose comments appear on the book's back cover. Another writer, Sheldon Vanauken, contributes a foreward which commends and recommends Kreeft's book. Because Kreeft writes in such an engaging way, I am happy to add my recommendation. This book will be helpful to the neophyte who is curious, the unbeliever who is searching, and the believer who needs reassurance.

Peter Kreeft is a professor of philosophy at Boston College. He has several popular books in print including *Between Heaven and Hell* and *Heaven: The Heart's Deepest Longing.*

Reviewed by Richard Ruble, John Brown University, Siloam Springs, AR 72761.

THE CHRISTIAN FRAME OF MIND by Thomas F. Torrance. Edinburgh: Handsel Press, 1985. 62 pages. £3.75.

This little book seeks to intensify and develop the arguments Professor Torrance has made in *Divine and Contingent Order* and *Transformation and Convergence in the Frame of Knowledge.* The author continues to demonstrate the need for Christian theology to appreciate the kinds of epistemological struggles which have been waged in modern science's efforts to grasp reality in all its depth. A theological science appropriate to the Church in the world's future must apprehend God in such a way that the Gospel is given real expression with the actual truth of the world's nature and being. To this end, four short essays are presented, each with a rather sweeping view of the implications of this need.

In chapter one, three Fathers of the Early Church are highlighted so that fundamental concepts of Creation, Redemption, and the Mind of Christ with the Church are examined together. The Christian doctrine of creation *ex nihilo*, with its implication of the contingent nature and rationality of the cosmos, is explored to point out the significance of the idea of Man in the image of God.

We must learn the value of the Mind of Christ and it is here, claims Torrance, that we can turn to the Fathers and find valuable thought for our own times. St. John of Chrysostom is exemplified as one who, refusing to separate the Creator from the Redeemer, is able to see in Jesus of Nazareth that human being whose mind gives us the kind of light by which we may truly worship God, the maker of all things. It is under the compelling reality of His person that we may be taught to see the world and the creatures of it as God intended them to be or as they ought to be. It is in this light that we may learn how to comprehend both theological and natural science.

This possibility is explored in the remaining chapters. The Word of God as the commanding Voice of God, speaking into existence both the form and the content of what has been

made, must be taken seriously for the independence and the freedom of the universe to be taken seriously. This assertion of the Church should be seen as being supportive of scientific culture and, in particular, of the advance in modern science with the realization of the Einsteinian Universe and its grasp of contingent intelligibility and the rational character of contingent reality. Mankind has been crowned as the Priest of Creation as well as of Sacraments, and it is the duty of the race to serve God's love for the world as people of science as well as of faith. It is through the dynamic structure of the God-world-man relationship, established and sustained by the creative love of God Himself, that we may realize that what has been ruined by sin and evil may be set right by those redemptive orders. This will require, Torrance argues, the restoration of an ontology of mind whose depths have been actually transformed by the Word of God, with the result that the divine order is truly brought to bear upon the structures of created reality so that they are made able to be faithful to the love and goodness of God even in the face of the appearances of injustice and bad management.

In the last chapter, Torrance gives us suggestions as to what this might mean for university life and education in our culture. I think this is a very timely contribution to our thought, since recent concerns for the level of education in our society and the frequent turmoil and attacks in and upon our campuses continue to grow. The struggle to relate our thought to the reality of God in the world is an on-going battle for which peace and good will are profoundly necessary. If we fail to provide those atmospheres in which this struggle can be made, if we fail to nourish that kind of integrity and faithfulness intrinsic to both theological and scientific creativity, then we have failed to effect that kind of reconciliation our fragmented society requires. This wholeness is the only means the world possesses in order to achieve the in-depth kind of healing we require in our time.

Reviewed by John McKenna, Fuller Theological Seminary, Pasadena, CA.

THE MIND POLLUTERS by Jerry R. Kirk. Nashville, TN: Thomas Nelson Publishers, 1985. 221 pages. Paperback; $6.95.

I must admit that I began reading this book with more than a few images in my head of book burnings and witch hunts. I thought that, at the very least, I owed it to my profession to remember the coursework in civil liberties, my "sophisticated" understanding of the First Ammendment, or my "informed" grasp of the subtle nuances of social and political pluralism in a free society. When I read chapter one ("A Time to Stand"), the author's account of his personal struggle, and of his eventual, reluctant involvement in anti-pornography politics, I was reminded of similar passages in Jerry Falwell's *Listen America!* and became further convinced that this book would be something less than challenging. However, not only was I surprised, I was convicted and convinced.

Jerry R. Kirk is the pastor of the College Hill Presbyterian Church in Cincinnati, Ohio, and president of the National Coalition Against Pornography. He has written this book for a lay audience. It is not, therefore, a sociological treatise, nor a thorough theological exposition; but, refreshingly, it is not an emotional tirade lashing out at pornographic straw men of its own creation either. Rather it is a simply-stated, compelling case for action against obscenity and pornography.

Part I details what Kirk calls "A Survey of the Damage." His premise for this section is that most mature Christians have not, with good reason, involved themselves in pornographic materials. In fact, in his experience, Christians do not envision much beyond the "soft porn" of *Playboy*. They have become, according to Kirk, victims of a desensitizing marketing technique which presents pornography in healthy, beautiful, and photographically-appealing packages. Consequently, most Christians do not really realize the extent of the sexual perversion and debauchery presently available.

Kirk illustrates his points only insofar as he must, but it is enough. Even without pictures, printed descriptions of mutilations, child abuse, beastiality, and sadomasochism make moving, disturbing, even sickening reading.

Part II is entitled "Action Plan for Change." Kirk details a step-by-step approach for dealing with pornography and obscenity in one's community. In it he reveals political sophistication and a developed sense of effective relations with the press. Here again, the advice does not lose credibility through an emotional delivery, but is offered in rational, experience-backed observations.

Kirk's primary assumptions seem to be:

1. Any form of public sexual exposure is immoral, and in printed and pictorial form constitutes obscenity and pornography.
2. Obscenity and pornography are not harmless ideas to which some subscribe but are a threat to the moral climate of society.
3. Obscene and pornographic materials promote the promiscuous use of drugs and attack family life.
4. Obscene and pornographic materials cause sex-related criminal behavior.

Some of the researchers he quotes stop short of the cause and effect assertions Kirk seems comfortable with in the pornography-to-crime sequence. But Kirk argues, like air and water pollution, moral pollution affects us all.

Whether the Christian reader agrees with all of Kirk's assumptions or wishes to fine-tune them, he or she will find much in this volume to provoke thoughts. If the reader recognizes a pornography or obscenity problem in his or her community, this book is an excellent springboard to intelligent action.

Reviewed by Rex M. Rogers, Assistant Professor of Political Science, Cedarville College, Cedarville, OH 45314.

Letters

Questions about the "Point of Need"

Raymond Brand's article, "At the Point of Need," (*JASA*, March 1987) accepts without question the false thinking of the neo-malthusian movement, and that leads him to erroneous conclusions. Is he unaware of the voluminous scientific literature that refutes the tendentious nature of the documents he cites? It is disconcerting that the Club of Rome reports, the Brandt Commission, and Global 2000 (*Globaloney*, as Herman Kahn called it) should be so complacently cited when he says, "The needs of mankind have been amply documented" in such writings. Even a quick look at the massive book *The Resourceful Earth*, (Basil Blackwell, 1984) edited by Kahn and Julian Simon would have made him wonder at what he was doing. In this response to Global 2000, we have a resolute refutation of the whole movement that Prof. Brand has uncritically accepted, written by specialists in physics, economics, nutrition, geography, mathematics, biology, demographics, forestry, geophysics, agriculture, political science and oceanography.

But even an ignorance of the scientific literature should not have kept Prof. Brand from recognizing the weaknesses in what he was doing. For the writings he relies upon are utterly naturalistic in their assumptions. There isn't the slightest understanding in them that the earth was created by a just and loving God, that its resources are not going to "run out" before their creator intends, that the exercise of stewardship is not in conflict with the responsibilities that God has placed upon us. His failure to get straight the bad theology of his sources has led him to place us in impossible situations. "However, the Christian is morally obligated to aid every human being despite the cost to the resources of planet earth." Implicit in that is a contradiction between our resources and our responsibilities. But no such contradiction exists.

The earth is overflowing with God's bounteous provision, as the Bible teaches. The "shortages" which plague us are a result of human sin and stupidity. From the energy crisis that began in the early seventies to the man-made famine in Ethiopia (the drought does not account for the severity of the disaster) the shortages testify not to the paucity of resources, but to the policies of coercion that keep the resources from our use. If there were any doubt about that, the plunging commodity prices of the last few years should have dispelled it. Prof. Brand speaks of the military expenditures in Ethiopia, but he does not consider the cheap food policies that are endemic in the countries without sufficient food production: politicians with their power base in the cities put price controls on food, thus making it uneconomic for peasants to produce and rendering shortages inevitable. The remedies for food shortages that he suggests will be unavailing if nothing can be done about the political oppression of those countries, oppression which is often assisted by foreign aid. We ought to be aware that these countries once fed themselves nicely without the "appropriate technology" that is now thought to be so essential. And the larger numbers of people are no barrier to that, as some nations with very high density populations have demonstrated.

If Christians want to do something about poverty that so exercises Prof. Brand it will have to be done by understanding the harmful cultural and institutional realities of those areas, which is just what the Bible leads us to expect. The work of P.T. Bauer of the London School of Economics is indispensable in illuminating these issues. (See especially, *Dissent on Development: Studies and Debates in Development Economics*, London: Weidenfeld and Nicolson, 1971.) But Christian academics persist in viewing the situation as Prof. Brand does—with the materialist fallacies that are endemic in the bulk of the literature. It does no good for intellectuals to profess evangelical convictions, often from schools with elaborate statements of biblical inerrancy, if they are unable to evaluate the various literatures from the perspective of a Christian world view.

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Raymond Brand Replies:

The opportunity to respond to the letter of Herbert Schlossberg is welcomed since other readers may have similar misimpressions.

Although the neo-malthusian movement is admittedly not Christian in its assessment of the *total* needs of mankind, and in some of the solutions proposed by its proponents, nonetheless it contains elements of truth that need to be understood by Christians. Two critical points are the finite nature of earth's resources and the essential ecological concept of the carrying capacity of an ecosystem or the earth as one biosphere.

The approach of Julian Simon, Herman Kahn, and other cornucopians in the disciplines indicated by Schlossberg has not escaped my attention. Students in one of my biology courses this semester have just completed an assigned reading by Julian Simon which appeared in the *Futurist* in 1983. Simon is obviously a visionary, but his focus seems to overlook the real world and settle for the Biblical millenium on non-theological grounds. Fortunately, both the applications of science and development work in the 3rd World provide realistic insights into what can be accomplished in Jesus' name. Such a course of action avoids the non-action of the infinite resources view as well as the extreme pessimism of the end-of-the-world-tomorrow belief.

As to the point of my critic's second paragraph, "writings with naturalistic assumptions," I would refer again to a substantial dependence on my part to many of the decidedly Christian reference sources given at the end of the paper. Of these, the *Earthkeeping* book edited by Loren Wilkenson has as its central theme the understanding and exercise of Christian stewardship of the earth's resources. I agree that no inherent contradiction exists between resources and responsibilities when both are properly understood. Thus, my value judgment on the significance of the human person ahead of the earth's resources is rooted in the importance that God places on personal relationships. Relief aid often exceeds carrying capacity and leads to further difficulties down the road if not followed up with development that is culturally and institutionally sensitive, as pointed out later by Schlossberg.

Far be it from me to suggest or imply that God has not provided bountifully or that sin does not have a role in the problems which beset us. Not only do military budgets, city politicians insensitive to rural needs, coercion, *etc.*, add to the plight of the poverty-stricken, but an extreme irony is the exploitation of fertile soil for cash crops for export. However, space did not permit an elaboration of the political and social implications essential for viable solutions. Appropriate technology may not be essential, but wherever employed wisely it has been most useful. Expansion of human populations and increased density have, however, been involved in the rapid depletion of tropical rain forest within recent years.

The stimulating work of the largely ignored economist P.T. Bauer on development economics first came to my attention when I became involved with students on internships in the 3rd World. If economics had been treated in depth, I would have emphasized the work of Herman Daly which concentrates on economic theory related to no-growth economies (e.g., *Ecology, Economics, and Ethics* edited

by Herman J. Daly, 1980). It is worthwhile to note that many implications and principles implicit in Christian stewardship are evident in Daly's work. These views were expressed as he participated recently in the workshop/seminar on stewardship of resources at the Au Sable setting in Michigan.

Hopefully, each of us will continue to sharpen our Christian world views with assistance from the pages of *Perspectives on Science and Christian Faith*, which includes provocative letters to the editor from widely divergent viewpoints.

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Clarification Needed?

The March issue was a great source of interest to me since many points of value were raised. I shall confine my remarks to a few statements in two of the articles therein. Professor Raymond Brand's was a fine article indeed, but there seems to be a conflict on one point. He writes that "the Christian is morally obligated to aid every human being despite the cost to the resources of the world", but later seems to admit that resources *are* finite and that the Genesis 1:28 command has indeed been fulfilled. Certainly both statements are correct, but aiding those less fortunate without seeking out the cause of their condition and correcting the cause would be very foolish indeed. I submit that science has been the main scholastic endeavor which has ameliorated the health problems of the earth, has improved food plants and increased production and has, in general, cared for the natural resources of God's earth. Since the time of Malthus, many writers have cautioned about balancing the reproductive potential of human beings with the carrying capacity. Clearly, they have not spoken loudly or often enough because conditions are definitely out of balance. Within the lifetime of many of you, when the world's population will be eight billion, you will see both the need and the aid increasing to the point that millions will needlessly die of starvation. Some group or groups will certainly have to take the blame for this type of unpremeditated "murder." How blind can man be? Family planning is said to be the answer, but only if we mean two children per family (one is better).

Professor Pun's fine article brought back many memories and was very enjoyable. He writes of Calvin's holistic view of theism where God directly involves Himself in the results of Creation. Judging by the wording of our prayers in our houses of worship, I would venture to say that most Christians are theists. Professor Pun then defines deism as a belief that Creation is an elaborate machine governed by natural laws. Those of us who are Christians and also scientists seize upon deism, provided that it is recognized that neither the creation nor the natural laws could have logically come into being without divine intervention. The author hints at this interpretation when he writes, "While God allows regularity of natural laws to govern His creation, He does not determine outcomes of the physical processes." He also says that "God used natural selection to propagate those species most adaptable to survive." I agree with both of his statements. Yes, selection can preserve or weed, but it is not a species-producing mechanism in the strict sense since the environment can only act on what is presented to it; gene changes resulting from mutation or hybridization are the changes acted upon by selection. Also, and for some time now, it has been recognized that pure chance can preserve new life forms especially in small populations. Although there are hundreds of animal hybrids known, it is apparently not as important there as it has been in the plant kingdom. When, however, two unlike genomes fuse, new enzymes are possible which can (and probably have) provided new phenotypes.

As a closing statement, I must say that, to be on the safe side, man should quickly grasp the notion that the ancient command to govern means "to manage." Animals and plants *are* precious to God and man *must* grasp the frightful consequences of the population bomb, fragments of which are even now exploding. Controlling this "bomb" should be our number one priority.

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The "Days" of Genesis

Hummel's "Interpreting Genesis One" in the *Journal*, September 1986, and *The Genesis Connection* from which it is taken, are so good that I hate to write anything that may appear to be negative. But one matter should be corrected, and we need to talk about some others. First, Genesis 4:3 and Joshua 24:7 cannot be used to show that *yom* (day) can mean either "time" or "season," for *yomin* (days) appears in the text. I found it in my interlinear. The literal "many days" of Joshua (so ASV) certainly matches "a long season" (KJ) or "a long time" (RSV). I believe the claim that the meaning of *yom* is not restricted to the daylight period or a 24-hour period is correct, though the wrong evidences are cited. I trust that an expert in Hebrew will supply the correct references for the second edition/printing.

I wish we could sit together and talk about the rest, for then I could learn something more. But perhaps this brief statement will draw some more people into the conversation. I think Wiseman's view is dismissed too quickly. It is compatible with everything Hummel says about literary form and polish, about antipagan polemic, about the interpretation and application of the text. But it adds to these a rationale for the evening-morning-day structure. It also allows a plausible explanation for what seems to me rather abrupt. This brevity has apparently also puzzled others, for Hummel semi-asks, "If God created light instantaneously, was the first day then mostly one of rest like the seventh?" On day one we find the production of light, its separation from darkness, and day and night named. So we ask, "Is that all?" But if this was a vision given by God of the phenomena of light to some ancient saint, I can understand that this is about all that could be uttered. The experience of the glory of light would render the individual speechless. It would be plenty for one night.

Wiseman, by arguing that the colophons in Genesis 2:4 and 5:1 indicate that Adam was the original owner of the documents, reminds me that the revelations may be much earlier than Moses. I understand that *tehom* (deep; Genesis 1:2) is cognate to Tiamat, the primordial source of heaven and earth in the Babylonian myth. This suggests that the story was known to Abraham or Jacob, the last patriarchs to live in Mesopotamia, as much as the reference to the *tanninim*, noted by Hummel, suggests contact with the Canaanites. Would the Babylonian myth be well enough known in Egypt or Sinai for inclusion by Moses, unless he was working from a much more ancient source? Granted, God could have given him the very language, but this dictation theory of inspiration does not stand up well. I note that the message comes through whether one knows of the mythological references or not, but I doubt that the references would be there without the knowledge. So it seems to me that the message was included by Moses, but I doubt that it originated with him. I think this fits also the inclusion of the history of the patriarchs. It must have been handed down from generation to generation unless it came to Moses by direct revelation.

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