PERSPECTIVES On Science And Christian Faith

JOURNAL OF THE AMERICAN SCIENTIFIC AFFILIATION

In this issue . . .

At the Point of Need

A Theology of Progressive Creationism

Psychological Effects of Abortion

New Reproductive Technologies

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

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Putting Things in Perspective

Once again we are able to offer our readers perspectives on several important issues that our society is facing and for which Christians need to carefully and seriously evaluate the several options which these issues present. This time our authors present Christian evaluations of the needs of developing countries, progressive creation, the psychological effects of abortion, and the rapidly proliferating reproductive technologies.

Ray Brand emphasizes the "science as servant" theme which was so prominent at the ASA-RSCF meetings at Oxford in 1985. He evaluates research funding priorities in the light of the problems of the developing countries and the biblical emphasis on God's concern for the poor. Where should Christians invest their research time and money?

Pattle Pun proposes a theological basis for progressive creationism, which he elaborates as an alternative to recent creationism and theistic evolution. He accepts physical death before the Fall and considers natural selection to be one of the mechanisms for God's creative activities.

James Rogers, James Phifer, and Julie Nelson report on an analysis they have made of some of the studies, previously reported in the literature, on the psychological sequelae of abortion. They point out inadequacies in both the methods and the statistics found in the literature, especially in regard to the claim of no negative psychological impact on the women involved.

Gareth Jones proposes some possible Christian responses to infertility problems such as adoption, surrogate motherhood and artifical insemination. Any of our readers who saw the NOVA television program last year on these reproductive technologies will certainly be aware of the mind-boggling possibilities in this field and the ethical, legal, and theological issues involved. How far can Christians go when we are trying to follow God's directive to "be fruitful and multiply," but are faced with a bewildering array of options?

Shorter presentations (Communications), but no less significant, include two papers from the Oxford meeting that were previously published in *Science and Faith*, the Newsletter of RSCF. David Livingstone uses the case of evangelicals and evolution to illustrate the need for getting away from the old warfare model of the relations of science and religion. Colin Russell analyzes recent critiques of science and concludes that Christians should welcome recent changes with caution at the same time that we welcome the decline of a dogmatic positivism. Michael Bozack presents an intriguing analysis of the similarities between the thermodynamic triple point and the doctrine of the trinity.

Finally, we want to welcome two new members of the editorial staff of our *Journal*. Nancy Hanger is our new Managing Editor and Richard Ruble will be our new Book Review Editor. I want to publically thank Ann Woodworth and Bernie Piersma for their fine work for the *Journal of the American Scientific Affiliation*. The new year has ushered in yet another change; the *Journal* has been renamed *Perspectives on Science* and Christian Faith," a more descriptive title; although the "old" title, *The Journal of the American Scientific Affiliation*, will remain as sub-title for the *Journal*.

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At the Point of Need*

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Science as servant is the theme emphasized in this paper. In particular, the applications of science in appropriate technology for developing countries are explored. Present priorities for the funding of research and development in affluent western nations are questioned in the light of Biblical principles which emphasize the Christian's responsibility to the poor. Commitment of the Christian who is a scientist to theoretical or pure research is not at issue, but, considering the needs of people in developing countries at this point in world history, there are some extremely expensive areas of research that should not be pursued now.

The people of the third world are in need. To personalize this plight, George Hoffman of TEAR foundation in London, England recently stated, "You must meet a person at the point of his need in order to meet his total need." Today, it might be food, water, or medicine; tomorrow, improved agricultural technology, sustained clean water supply, and public health education. Viewed from a Christian vantage point, however, the long-term solution must address the total person including the most basic need of spiritual renewal through restoration to fellowship with God through Christ. Scientists who are Christians are in a unique position to provide many improvements in the physical quality of life for Third World people as well as that extra insight and opportunity for individuals to become light and salt in their society. In keeping with "the use of science as servant" (one of the themes of the 1985 American Scientific Affiliation conference at Oxford, England, which was co-sponsored by the Research Scientists Christian Fellowship), this paper will suggest a redirection of research and technology to meet the needs of people in the developing nations of the world. It should not be implied that other areas of research are necessarily unethical or even undesirable in principle. Rather, in the practice of good stewardship of our resources, some areas of research may be too expensive to be attempted at this point in world history. An example of this is the proposed superconducting super collider (SSC) of the United States which has a bottom line estimate of over three billion dollars.¹ In harmony with such Kingdom values as justice and

^{*}This paper was originally presented at St. Catherine's College, Oxford University, as a part of the conference "Christian Faith and Science in Society," held in Oxford, England, July, 1985. It has been revised and edited for this published format.

concern for the poor rather than the secular values of material prosperity and affluence, this paper will review some specific and practical examples of the use of science and technology within the conceptual framework of appropriate technology in development.

Few Christians can argue from Biblical grounds that what the world needs is more bombs. Yet, more nations then ever before, at ever increasing intensity, continue to build and stockpile military weapons, with the result that in 1985 global military expenditures amounted to \$940 billion.² But, the Bible is clear that we are to care for God's world and be our brother's keeper (Gen. 1, 2). Should not the Christian who is a scientist make decisions about research in light of the Kingdom rather than national priorities? Should she/he not also influence the powers that be to channel more research and development funds to meet global human need? A pattern for reordering funding priorities using Christian principles in the area of energy resources has been set forth in. Earthkeeping, a book edited by Loren Wilkinson.³ In contrast with the present day high priority for research and development on fossil fuels and nuclear power, good stewardship suggests that we should concentrate efforts on solar and other forms of renewable energy.

Christian faith is centered in the Lord Jesus Christ revealed in Holy Scripture. By virtue of both Creation and Providence, Christ is not only related to all things (Col. 1:16), but He understands their interrelationships. In one sense, as Francis Schaeffer pointed out in a book about ecology and Christian faith, humans too are related to all things because of a common Creator.⁴ Unfortunately, humans have not yet understood many of these interrelationships.

You no doubt remember the fundamental principle of ecology, "that everything is related to everything else." This is in harmony with the Christian belief that God is not only the one who set it up this way, but also that in Christ all things consist (Col. 1:17). The primary goal of many scientists who are Christians should be to apply what we already know to the needs of society. Some may feel called to pure research, but, in making decisions as Christians, hard questions need to be asked based on Kingdom, not secular, values. God has not prevented humans from exploring the moon, sending space probes to distant planets, or discovering the latest sub-atomic particle. But each individual must wrestle with the emphases in Scripture on hunger and poverty and God's concern that justice roll down to improve the quality of life for every human on earth.⁵

The Christian is morally obligated to aid every human being despite the cost to the resources of planet earth.

In setting priorities to fund research and develop technology, it is critical for the Christian to keep social justice in focus. As global human needs are accurately assessed, the commitment to do good to all men sets constraints on the pursuit of some categories of expensive research. One of the oft-quoted justifications given to the general public in the defense of multi-million dollar research projects is that applications of value are. bound to follow in the next or succeeding generations. In the dim, terminal light of the nuclear winter scenario, this justification merits little support since few would survive to experience these applications. Recent articles by Harwell and Grover document the extent and severity of such a nuclear winter scenario.⁶ The essential goal of this paper is to show how several ecological principles and their related technologies are applicable now to some of society's most pressing problems.

Early in the book of Genesis the message is clear that we are to care for God's earth. In recent years, Christians have responded positively to the challenge of



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RAYMOND H. BRAND

1st World	Most advanced industrialized nations: United States, Can- ada, Japan; Most non-communist nations of Europe, Austra- lia, and New Zealand
2nd World	Communist nations: Soviet Union, China, and Eastern Europe
3rd World	States with one or more major resources that should allow them to become more developed nations without significant foreign aid: Oil-rich nations such as Saudi Arabia, Mexico, and Iran; Morocco (phosphate), Malaysia (tin, rubber, and timber); Zaire and Zambia (copper), Brazil, Algeria, and Libya
4th World	Nations with some raw materials that could eventually be- come more developed but only with a combination of aid from today's more developed nations and strong government programs for population control and increased self-reliance: Peru, Liberia, Jordan, Egypt, India, Nicaragua, Honduras, Ecuador, Sudan, Zimbabwe, and Pakistan
5th World	Ample human but few natural resources; without strict pop- ulation control and massive foreign aid, these countries face mass starvation and continuing poverty: Chad, Ethiopia, So- malia, Rwanda, and Bangladesh

Table 1The Five Worlds*

°From Living In The Environment by G. Tyler Miller. See reference 15.

historian Lynn White (when he placed blame for environmental problems on the Judeo-Christian doorstep)⁷ by publishing a number of books on the proper stewardship of God's creation.⁸ Articles in this *Journal* have also addressed this theme recently.⁹

From quarks to biomes, the scientific search continues to expand and the knowledge gained brings power and the opportunity to exploit. The admonition of the writer of Proverbs, "With all thy knowledge seek understanding," is increasingly germane (Prov. 4:7). We should use the knowledge of science in the service of mankind. The applications of science need not continue to expand military technology into outer space in a competitive duel for control of the globe. Cooperative societies can also survive, as demonstrated by sociobiology's altruism as well as by several examples of insect/plant symbiosis from non-sentient nature.

The needs of mankind have been amply documented in a series of books referred to as the Club of Rome Reports, published from 1972 to 1982.¹⁰ In addition, the Brandt Commission Report, the *Global 2000 Report to* the President, the Worldwatch Institute's State of the World yearbooks, and the CHEMRAWN II conference proceedings have also attempted to chart pathways for solutions to global problems.^{11, 12, 13, 14}

What are these needs of people in the developing nations? The best answer should rightly come from the spokesmen from those countries. However, I shall attempt to summarize these needs from my experience in Central America, from student interns that I have sponsored in Haiti, Honduras, Ecuador, Indonesia, and India, from experiences on a faculty committee selecting and supervising students in international internships, and from recent publications of others about developing nations. First, it is necessary to review the status and location of developing nations which can no longer be effectively considered in one block. G. Tyler Miller differentiates world nations into five categories as indicated in Table 1.¹⁵

Using this classification, it would seem best to concentrate research and development efforts on 4th and 5th world nations. This course of action differs from Garrett Hardin's triage and life-boat ethics approach

POINT OF NEED

Table 2					
Problems of Developing Nations (and some so	lutions				

1	Human Population Growth	(Population Stabilization)
2.	World Famine and Acute Hunger	(International Aid)
2. 0	Sopitation and Public Health Improvements	(Pure Water Supplu)
⊿	Samation and Fublic realth improvements	(Education)
4.	Interacy	(Education)
5.	Chronic Hunger	(Improved Agriculture)
6.	Deforestation and Erosion of Topsoil	(Reforestation)
7.	Depletion of Energy Resources	
8.	Too-Rapid Urbanization	(Improved Quality of Rural Life)
9.	Traditional Values and Technology Conflicts.	(Appropriate Technology)
10.	Unemployment	.(Increased Small Business Opportunities)
11.	Nuclear Winter of Nuclear War	(World Peace)

which places a higher value on ultimate human survival as a species than on aiding each individual alive in the world today to survive. However, the Christian is morally obligated to aid every human being despite the cost to the resources of planet earth. This moral imperative implies that resources need to be judiciously managed to retain some useful measure of effectiveness.

Needs call for solutions. In Table 2 are some selected problems of developing nations that are particularly amenable to the applications of science and technology. To maintain hope, sanity, and a proper perspective, a partial solution is included in parentheses opposite each need or problem. This list is not all-inclusive, in order of priority, or particularly new or inspired. However, it focuses on critical areas of need to raise the awareness level and to suggest areas for involvement.

It should be emphasized that this list and the remainder of the paper do not attempt to explore the intricacies of the political, economic, social, and spiritual factors that also need resolution. No one item can be considered in isolation. Note that the first three and number five are closely interrelated and even number four is a means of progress towards alleviation of many of the other problems. Such connections do not surprise or discourage the ecologist who is mainly concerned with complex interrelations and interactions in nature. Four of the eleven problems are discussed below in some detail. Consideration of the remaining seven is reserved for a later paper.

Human Population Growth

Human population growth, especially that of the developing nations, is thought by many to be one of the most critical areas of concern. Over five billion people populate the earth in 1987. In the Far East, India with 730 million and China with just over one billion account for almost 40% of the world's population. In Table 3 some selected growth rates are compared to assess possible future trends. Recall that a 2% growth rate, which is the world average, results in a doubling of the world population in 35 years. (Average annual rate is now 1.63%.¹⁶) For the year 1985 presented here, growth rate measurably slowed in western developed nations such as England (0.1%), United States (0.7%), West Germany (-0.2%), and Sweden (0.0%). However, in Central America and Africa, many countries have growth rates above the world average: Guatemala (3.5%), Honduras (3.4%), Kenya (4.1%), Nigeria (3.1%), and Libya (3.5%).¹⁷

Reducing these growth rates is not a simple matter of advocating family planning and disbursing birth control devices. An educational approach includes increased efforts toward literacy. Cultural factors involve deep societal traditions of large families as a means of economic security. Preferences for male children increase the family size if the first few children are girls. Suggestions that we wait for the demographic transition to run its course are based on the questionable assumption that the cultural values and economic factors of 19th century Europe are sufficiently similar to those of present-day developing nations. Continued research in the area of human reproduction and birth control resulting in practical implementations for developing countries should have high priority. If present research efforts to enhance the success of Y chromosome bearing sperm are successful, should this type of sex control be promoted? Christians should be in the forefront of such efforts since other bioethical issues such as abortion are involved. Abortion as a method of population regulation can not be condoned. The People's Republic of China embarked on an intensive program to curb births by promoting one-child families, resulting in a 1.1% growth rate according to the 1985 Population Reference Bureau Chart.¹⁷ Although government programs did not adopt coercive methods similar to the unsuccessful ones in

Table	3
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(Wor	ld Average	1.63%)	
Western Developed Nations		Central America and Africa	
England	0.1%	Guatemala	
United States	0.7%	Honduras	
West Germany	$\dots (-0.2\%)$	Kenya	
Sweden	0.0%	Nigeria	
		Libya	

Human Population Growth Rates (1985)¹⁷

India in the 1980's, the strong tax incentives, limiting of educational and food supports to one child families, and other pressures resulted in increased abortions.¹⁵

Are we ready to concede that humans have fulfilled the Genesis command (Genesis 1:28) to replenish or fill the earth and do our part to achieve population stabilization? The interpretation of this command in our day has a different context than when it was first given to Adam. It involves not only numbers of people but also the concept of carrying capacity. How many people can the earth support at a moderate standard of living without jeopardizing its resource base? Some ecologists would claim that the present five billion inhabitants are already beyond the sustainable society level. If the United States standard of living was the norm for the world, then many more would readily agree that we

How many people can the earth support at a moderate standard of living without jeopardizing its resource base? Some ecologists would claim that the present five billion inhabitants are already beyond the sustainable society level.

Sanitation and Public Health Improvements

On a recent summer internship in Africa, one of our biology students made a public health survey of seven

villages for the mission that sponsored his overseas experience. The two villages that had wells for their water supply had 50% less infant mortality than the other five villages using surface water supplies. Over 125 years have passed since the scientific discoveries of Pasteur, Koch, and Jenner documented the role of bacteria in disease and the prevention of infection with sanitary practices and vaccination. Almost sixty years have elapsed since Fleming's discovery of penicillin in England. Today, however, large segments of the human population in Central and South America, Africa, and the far eastern countries of India, Bangladesh, and Indonesia have yet to experience the benefits of these far reaching discoveries for the benefit of human health. William Cobern, one of the ASA global resources and environment commission members with four years experience in Sokoto, Nigeria, wrote to me recently that clean water and a sanitary sewer system in this city would do much more to improve health than their present hospital, which was not much cleaner than the outside streets. He indicated that hospital workers and even nurses simply do not believe in the germ theory of disease. Malaria, schistosomiasis, river blindness, and ascaris infections take their annual toll in mortality and sub-normal health existence.

In the setting of priorities for health care, should we not attempt to provide equal treatment for all of God's humanity the world over? Can we continue to spend several hundred thousand dollars for the surgical correction of one heart condition to extend the life of the already elderly when the life expectancy of many in the world is still below fifty? Would not the better choice be the expenditure of these funds for the continuation of promising research on the development of vaccines for parasitic diseases through immunogenetic techniques? Millions of dollars in research are channeled to find a cure or better treatment for cancer which, with certain exceptions such as leukemia, is largely a disease of the aged. The method for the reallocation of financial resources is beyond the scope of this paper, but for developing countries, the total cost of digging wells, constructing latrines, and immunizing

have passed the optimum limit. The exact number may never be known or accurately predicted from modeling projections, but the existence of finite resources and the necessity to live within the boundaries of energy and other resources has been firmly established as a valid ecological prinicple.

young children against just two or three major infectious diseases would make only an insignificant dent in the multi-million dollar research budget of just one agency, such as the National Institute of Health in the United States.

Can we continue to spend several hundred thousand dollars for the surgical correction of one heart condition to extend the life of the already elderly when the life expectancy of many in the world is still below fifty?

Chronic Hunger

Several areas of the world are now experiencing severe famine and crop failures with thousands dying of starvation and many more subject to disease and malnutrition because of inadequate diets. Ethiopia and several other independent nations of West Africa in the Sahara and Sahel regions are among those severely affected. Along with massive aid efforts from many nations has come an increased awareness that longterm solutions for chronic hunger through comprehensive development programs sensitive to local cultures must be cooperatively put in place to mitigate the suffering from future cyclic incidents. It is unfortunate that funding priorities often delay the needed development programs. Ethiopia, for example, now expends forty-two percent of its budget for military purposes.¹⁸ A recent book edited by Earl Scott entitled Life before the Drought reviews the history and practical knowledge of the indigenous peoples of the Savanna-Sahel zones. With considerable ecological insight, Scott reveals the close cooperative arrangements worked out by the Fulbe (Fulani) nomadic and Habe (Hausa) sedentary groups of northern Nigeria. Contrary to other competing and warlike conflicts of many nations, these two groups started with casual contacts and are evolving toward a mutualistic relation that under certain situations can be perceived as one ethnic group.¹⁹ Many examples exist where foreign intervention, food aid, and development projects have harmed more than helped, but it is Scott's opinion that modern technology can fuse with local customs and cultures if sufficient efforts are made to incorporate the creative insights of the indigenous population. Although the Green Revolution was helpful in some locations, the dependency created for increased fertilizer, specialized genetic seed stocks, and the costs to sustain this introduced agricul-

ture indicate that it is not the best solution for most developing countries. A particular case of disastrous intervention in Northern Nigeria was reviewed by Scott to indicate that we must be more sensitive to local cultural and environmental conditions if our desire is to be part of the solution instead of adding to the problem. Critics of the recovery projects promoted by the United States Agency for International Development, in collaboration with a local Senegal organization, point out that forcing the production of rice for the urban market requires expensive inputs and increases health hazards from malaria and schistosomiasis. In this instance, the production of the local staples, millet and sorghum, using inexpensive tools and organic fertilizer available locally would have led to maintaining stable food production and been less destructive to the environment. In an article, "The Third World in the Global Future," Peter Raven in the November, 1984 issue of The Bulletin of Atomic Scientists states, "For tropical countries, only sustainable local agricultural productivity-not food exports-will lead to stability." Carrying this one step further, ASA member Martin Price of the ECHO organization has suggested that we need to replace the concept of subsistence farming, which sounds rather dull and drab, with attractive alternatives and incentives so that there will be a flight from the city to the rural areas instead of the present trends in the Third World toward urban shanty-towns. As many of you know. Martin has combined action with his suggestions and is involved in developing fruits, vegetables, and other grains that are native to the regions where they will be used. Although small in scale, this effort, which utilizes missionary contacts and student interns, is a model worthy of expansion and implementation in other locations.

Traditional Values and Development Technology Conflicts

In the June, 1985 issue of the Journal of the American Scientific Affiliation, Ramon and Bube include several cautions and constraints that are relevant to the involvement of helping those in developing countries. They state, for example, that "an integrated development must be adapted to the needs and possibilities peculiar to the local region of the specific country where the development is to take place."20 Since Schumacher's Small is Beautiful, the concept of appropriate technology has had a steady growth in acceptance and expansion in use as lessons from experience have improved the interactions and reduced the problems of implementation.²¹ One of the most active groups in bringing together the sources of information is known as Volunteers in Asia, a group of young people associated with two universities in California. Details about their three volume publication entitled Appropriate

Technology Sourcebook are included in the list of references for this paper.²²

In many parts of Africa the woman with the hoe represents the state of technology. Even the wheel and cart are not part of the rural economy. As recently as two years ago in a large valley of interior Honduras, I saw an irrigation system that was introduced for the first time using a water wheel similar to those used in China many centuries ago. At this particular site a Christian missionary who has spent seventeen years in evangelistic and educational work has just begun to broaden his efforts to include irrigation projects and small business ventures in woodworking and metal trades. The confidence established in this long predevelopmental period has resulted in enthusiastic acceptance of these forms of appropriate technology.

The need of the hour in this geographic area, and I suspect in many others, is not the technological breakthroughs of genetically engineered plants requiring continued dependence on developed countries for fertilizers, seeds, and technical expertise, but appropriate technology adapted to local situations. An excellent illustration of this latter approach is the successful project at the University of Nairobi in Kenya, Africa. A microbiological resource center there, similar to others throughout the world, has developed various strains of the nitrogen-fixing *Rhizobium* bacteria and has determined the parameters affecting the survival of rhizobia in soil. Since 1975, more than 10,000 farmers have used these cultures to improve production on their farms.²³

Technology transfer is thus not a simple one-way transaction. In the area of public health, for example, one of my student interns, with the aid of a native Honduran trained medical doctor, compiled a useful study in Spanish on traditional medicine. In many cases modern treatment can be integrated with long standing, traditional customs, and the doctor-patient relationship is enhanced as well as physical health improved.

Future progress in meeting the needs of our human neighbors world-wide will be facilitated if we encourage one another in the Christian faith to influence science for the benefit of society. Let us resolve to support those areas of scientific research and application that hold promise of not only meeting the food and health needs of developing nations, but are also consistent with the principles of Scripture that teach the careful management of our ecosystem resources and a prudent use of monetary sources. In the closing chapter of the 1986 State of the World book, Lester Brown states, "expenditures on weapons research, in which a half-million scientists are now employed, exceed the combined spending on developing new energy technologies, improving human health, raising agricultural productivity, and controlling pollution."22

REFERENCES

- ¹G. Fraser (ed.), "Supercollider design submitted," Cern Courrier, International Journal of High Energy Physics, Vol. 28, July-August, 1986, p. 12.
- ²L. R. Brown (ed.) et al., State of the World, 1986, W. W. Norton & Co., New York, p. 196.
- ³L. Wilkinson (ed.), Earthkeeping: Christian Stewardship of Natural Resources, Eerdmans Publishing Company, Grand Rapids, 1980, p. 271.
- 'F. Schaeffer, Pollution and the Death of Man, Tyndale House Publishers, Wheaton, 1969.
- ⁵R. Sider (ed.), Cry Justice, the Bible on Hunger and Poverty, Paulist Press, New York, 1980.
- ⁶M. Harwell and H. Grover, "Biological effects of nuclear war I and II," *Bioscience*, Vol. 35(9), October, 1985, pp. 570–84.
- ⁷L. White, "The historical roots of our ecologic crisis," *Science*, Vol. 155, March 10, 1967, pp. 1203-07.
- ⁸R. Elsdon, Bent World, InterVarsity Press, Downers Grove, 1981; W. Granberg-Michaelson, A Worldly Spirituality: The Call to Redeem Life on Earth, Harper & Row, 1984; J. Sheaffer and R. Brand, Whatever Happened to Eden, Tyndale House Publishers, Wheaton, 1980. Also references 3 and 4 above.
- ⁹F. Van Dyke, "Beyond Sand County: A Biblical perspective on environmental ethics," *Journal of the American Scientific Affiliation*, Vol. 37, March, 1985, pp. 40–48; L. Walker, "Resource managers and the environmental ethic," *Journal of the American Scientific Affiliation*, Vol. 38, June, 1986, pp. 96–102.
- ¹⁰D. H. and D. L. Meadows, et al., The Limits to Growth, (Universe Books, New York, 1972) and D. H. Meadows, et al., Groping in the Dark: The First Decade of Global Modeling, (John Wiley, New York, 1982) are the first and last of this series of eleven books.
- ¹¹W. Brandt (ed.), North-South: A Program for Survival, MIT Press, Cam-

bridge, Mass., 1982.

- ¹²Council for Environmental Quality, The Global 2000 Report to the President, Vol. I, II, III, Pergamon Press, New York, 1980.
- ¹³L. Brown (ed.), State of the World, 3 vols., W. W. Norton and Co., New York, 1984, 1985, 1986. Worldwatch Institute reports on progress toward a sustainable society.
- ¹⁴L. W. Shemlit (ed.), Chemistry and World Food Supplies: The New Frontiers, CHEMRAWN II, International Union of Pure and Applied Chemistry, Pergamon Press, New York, 1983.
- ¹⁵G. T. Miller, *Living in the Environment*, 4th ed., Wadsworth Publishing Co., Belmont, 1985.
- ¹⁶World Population News Service, *Popline*, Vol. 8, No. 5, Population Institute, Washington, D.C., May 1986, p. 4.
- ¹⁷World Population Data Sheet, Population Reference Bureau, Inc., Washington, D.C., 1985.
- ¹⁸S. J. Ungar, "The military money drain," Bulletin of Atomic Scientists, Vol. 41(8), September, 1985. p. 33.
- ¹⁹E. Scott (ed.), Life Before the Drought, Allen & Unwin Publishers, 1984, p. 74.
- ²⁰J. Ramon and R. Bube, "Appropriate technology for the third world," *Journal of the American Scientific Affiliation*, Vol. 37(2), June, 1985, p. 69.
- ²¹E. Schumacher, Small 1s Beautiful, Harper & Row Publishers, New York, 1973.
- ²²K. Darrow and R. Pam, Appropriate Technology Sourcebook, Vol. 3, Volunteers in Asia Publication, Rev. ed., 1981, Stanford, Calif.
- ²³R. Colwell, "Microbiological Resource Centers," Science, Vol. 233, No. 4762, July 25, 1986, p. 401.
- ²⁴See reference 2 above (p. 199).

A Theology of Progressive Creationism

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By elaborating on a Calvinistic system of revelation and providence, progressive creationism attempts to delineate the immanence of God in His providential involvement in His Creation. Natural selection is viewed as one of the processes utilized by God in His creative activities. However, God is transcendent in that He is not dependent on the Creation for His completion. Evil is allowed but not purposed by God. The human Fall affects God's creation in terms of its eventual disintegration. Physical death existed before the Fall as necessitated by the food chain. Man was maintained immortal by God's special sustenance. Man is separated from God after a historical rebellious act. Physical and spiritual death entered the human race as a result. However, God overrules all evils.

The Theological Themes of Progressive Creationism

In the continuing debate between theologians and scientists on the controversy about evolution, several recurrent perspectives emerge among those who take seriously the Christian claim of sin and the need for redemption by the blood of Christ. Among these views are those advocating a recent creation, theistic evolution, or the "Creation Myth" of Neoorthodoxy. Each position dwells on what it perceives to be the essence of Scriptural teaching and the scientific explanation of the origin of life in general and of man in particular. However, there has been a polarization between those who cherish a literal interpretation of the Scripture at the expense of the validity of scientific explanation and others who accept the evolutionary paradigm without seriously examining its implications for the foundation of the Christian doctrine of original sin. We have shown previously that microevolution is well documented scientifically while macroevolution remains speculative.¹ We now attempt to present a theological system that utilizes the strengths and avoids the weaknesses of these positions in the debate-Progressive Creationism. The term "Progressive Creationism" was coined by Bernard Ramm.² However, Ramm did not provide substantive theological content for this position. Indeed, some have charged that Progressive Creationism is not substantially different from Theistic Evolutionism, which allegedly compromises the exegetical integrity of the Book of Genesis.³ This paper attempts to define Progressive Creationism through the development of five theological themes, given below.

1. Unity of God's Revelation in Nature and Scripture

John Calvin made significant contributions to understanding the sovereignty of God and, in addition, delineated the two distinctive modes of revelation from God. His entire monumental treatise, the *Institutes of the Christian Religion*, was based on the two-fold revelation of God: *knowledge of God the Creator* and *knowledge of God the Redeemer*. For him, God's general revelation through nature and God's special revelation through Scripture are complementary and necessary in order for men to have a saving knowledge of the Creator and the Redeemer. Calvin describes the beauty of God's creation revealing the divine wisdom as follows: There are innumerable evidences both in heaven and on earth that declare his wonderful wisdom; not only those more recondite matters for closer observation of which astronomy, medicine, and all natural science are intended, but also those which thrust themselves upon the sight of even the most untutored and ignorant persons, so that they cannot open their eyes without being compelled to witness them.⁴

Calvin is clearly suggesting that the closer observation of all natural science is intended to uncover God's wisdom in His creation. The input to our understanding of the Creator offered by science is to be scrutinized and respected in our holy meditation of God's inestimable wisdom:

There is no doubt that the Lord would have us uninterruptedly occupied in this holy meditation; that, while we contemplate in all creatures, as in mirrors, those immense riches of his wisdom, justice, goodness, and power, we should not merely run over them cursorily, and so to speak, with a fleeting glance; but we should ponder them at length, turn them over in our minds seriously and faithfully, and recollect them repeatedly.⁵

Calvin does not espouse a natural theology of Universalism, that man can come to know God through general revelation apart from special revelation. Rather, he stresses the importance of Scripture as a guide and teacher for anyone who would come to God the Creator. But Calvin has definitely departed from the medieval mindset which condemns science when it appears to be contrary to Scripture, as exemplified by the Copernican controversy over heliocentricity. Calvin never suggests that we should interpret God's creation from Scripture alone. He shows great respect for the natural scientists who, by their close observation of nature, can bring us to a better understanding of God the Creator. In other words, Calvin maintains that general revelation of God through nature is a valid though incomplete avenue of knowing Him. Because of our depravity, we fail to know and worship God the Creator, but with the aid of the Holy Spirit, Scripture reveals to us the knowledge of God the Creator more intimately and vividly. Revelation in Scripture complements revelation in nature to enlighten us in our efforts to understand our Creator. Therefore, God, the final cause of the universe who is known through Scripture alone, can also be partially revealed to us through the understanding of the secondary causation in nature gleaned through science.

2. Immanence of God in His Providential Control over Creation

Calvin also had a wholistic view of God's involvement in His creation, whereas popular deism glorifies reason instead of revelation. Following the success of the Scientific Revolution, the creation is thought by deists to be an elaborate machine governed by natural laws set up by a creator who is no longer involved in the activities of his creation. As a result, humans have become the masters of their own destiny and of that of the whole creation. Emile Brehier, a historian of philosophy, summarizes the differences between deism and Christian theism as follows:

We see clearly that a new conception of man, wholly incompatible with the Christian faith, had been introduced. God the architect who produced and maintained a marvelous order in the universe had been discovered in nature, and there was no longer a place for the God of the Christian drama, the God who bestowed upon Adam "the power to sin and reverse the order." God was in nature and no longer in history; he was in the wonders analyzed by naturalists and biologists and no longer in the human conscience, with feelings of sin, disgrace, or grace that accompanied his presence; he had left man in charge of his own destiny.⁶

In reaction to deism, Calvin stipulates that creation and providence are inseparably joined:

Moreover, to make God a momentary Creator, who once for all finished His work, would be cold and barren, and we must differ from profane men especially in that we see the presence of divine power shining as much in the continuing state of the universe as in its inception.... Faith sought to penetrate more deeply, namely, having found him Creator of all, forthwith to conclude He is also everlasting Governor and Preserver—not only in that He drives the celestial frame as well as its several parts by a universal motion, but also in that He sustains, nourishes, and cares for, everything He has made.⁷



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In short, Calvin has presented to us a world view that is consistent with God's revelation. It is based on the assumption that the world and the universe were created by the Creator who sustains them by His providence. The creation exists moment by moment only by the direct sustenance of God the Creator. Both the creation and the Creator are part of an external reality rather than an illusion in the mind of man. The deistic implication of Recent Creationism suggests that God's involvement with His creation consists only of miraculous intervention. However, in the context of the Scripture there is no distinction between supernatural or natural, since we are to see His sustaining power in all things. A miracle is an extraordinary event which is accomplished by God as a sign of some purposes of His own. However, God is equally involved by means of His providential control which allows the probabilities determined by natural processes to work for His purposes.

The input to our understanding of the Creator offered by science is to be scrutinized and respected in our holy meditation of God's inestimable wisdom.

3. Scripture in General and Genesis in Particular, a Historical-Theological Interpretation

The bitter debate between the fundamentalist and liberal camps in Biblical hermeneutics has led to the dichotomization of the scientific history and the redemptive history in Biblical theology. According to Langdon Gilkey, many theologians have "used Biblical and orthodox language to speak of divine activity in history, but at the same time continued to speak of the same events in purely naturalistic terms."⁸ The emphasis on the existential encounter with God through the Bible attempts to reestablish the relevancy of the Scripture for modern man. Yet it does not succeed in recovering the theological dimension of the Bible. B. S. Childs proposes a new Biblical theology to use the canon of the Scriptures as a context from which to interpret the Scriptures in relation to their function within the community of faith that treasures them.⁹ He returns us to Calvin's emphasis on learning from both the Old Testament and the New Testament in concert, where God unfolds more and more about Himself and His will for humans in the course of Biblical history. The theological center of the Old Testament as revealed in the New Testament is the testimony of Christ, The Messiah (John 5:39). However, this does not necessarily imply that the Bible is to be interpreted by "the theology of the Cross," as George Murphy advocates.¹⁰ Luther, who originated such a theology, tends to propagate a theology of paradox.¹¹ According to Luther, Christians live in an earthly kingdom as well in a heavenly kingdom, and are accountable to both man and God. Thus we are to live in perpetual tension, especially when the demands of these two kingdoms clash. The emphasis on the existential nature of human evil without provision for an adequate historical foundation of Theistic Evolutionism seems to perpetuate this paradoxical mindset; that is, we have to deal with human evil although we are not sure how it came into being historically.

Therefore, a unifying concept must be constructed in the context of both the Old and the New Testaments, since the two Testaments are mutually interpretive. The methodology in Biblical hermeneutics must be a historical-theological one. Hasel summarizes this method succinctly:

This is to say that the Biblical theologian engaged in doing either Old or New Testament theology must claim as his task both to discover and describe what the text meant and also to explicate what it means for today.... The Biblical witnesses are themselves not only historical witnesses in the sense that they originated at particular times and particular places; they are at the same time theological witnesses in the sense that they testify as the word of God to the divine reality and activity as it impinges on the historicality of man. Thus the task of the Biblical theologian is to interpret the Scriptures meaningfully, with the careful use of the tools of historical and philological research, attempting to understand and describe in "getting back there" what the Biblical testimony meant; and to explicate the meaning of the Biblical testimony for modern man in his own particular historical situation.¹²

The unifying principle throughout the Old Testament seems to be the self-revelation of God through the nation of Israel. The beginning of the history of Israel was marked by the promise of a great nation to Abraham through whom all the people of the earth will be blessed (Gen. 12:2-3). An underlying theme in the Old Testament appears to be that God will raise up a deliverer for men in general and for Israel in particular (Is. 7, 9, 11, 53, 61, 62; Zech. 6; Mic. 5; Mal. 3; Psm. 8; Dan. 9, 12; Ezek. 34; Jer. 23; Job 19, etc.). The book of Genesis by definition is the book of beginning. It centers on the beginning of the chosen nation of Israel through whom God is to reveal Himself to the world. Genesis traces the history of man from the origin of his rebellion from God through God's choosing of Abraham, through whom the people of the earth will be blessed. The rest of the book is devoted to the preparation of Israel through the lives of the patriarchs. God's sovereignty in the midst of man's rebellion is stressed throughout the book.

4. Natural Selection As One of the Processes Utilized by God in His Creative Activities

Fred Van Dyke questions the validity of natural selection—which depends on resource scarcity, competition, differential survival and reproduction—as a creative mechanism employed by a benevolent God before the Fall of man.¹³ Before attempting to address this charge, one has to clarify several presuppositions, discussed below.

Moreover, to make God a momentary Creator, who once for all finished His work, would be cold and barren, and we must differ from profane men especially in that we see the presence of divine power shining as much in the continuing state of the universe as in its inception.

1. One has to question the extent to which we can impose human emotion or volition onto the non-human world. It is true that man, as part of God's creation, is made of that same "stuff" of life which is traceable to the most basic matter of the universe (i.e., "dust of the ground"-Gen. 2:7). But only man was created in the image of God. Other than the devil himself, man is the only agent who wilfully turned away from God. When Paul mentions the creation groaning in travail, awaiting its deliverance from the bondage to decay when the sons of God are revealed (Rom. 8:19-22), he apparently is using metaphorical language to describe the solidarity of man with the creation. The redemption of the natural world from evil and decay is a corollary of the redemption of the body of man which has been condemned as a result of sin. Paul does not seem to teach that the non-human world has a will of its own which can turn back to God by faith in order to be saved (Eph. 2:8). Scientific studies on the volition of animals are inconclusive.

2. Adam and Eve were admonished to multiply and subdue the earth, and have dominion over the animal world before the Fall (Gen. 1:28). This command seems to involve man's control over the reproduction of other creatures and their utilization of natural resources. Death is certainly one of the ways to control population growth. As one biologist put it, if animal reproduction were not controlled, then even "a lone aphid, without a partner, breeding 'unmolested' for one year would produce so many living aphids that, although they are only a tenth of an inch long, together they would extend into space twenty five hundred light years."14 Having dominion over animals seems to involve, in part, the subduing of their activities by selective breeding and elimination. In addition, the word "subdue" seems to mean more than to reign over. It seems to mean "conquer and subject." The same word is used in contexts of conquest in the face of opposition (Zech. 9:15; Josh. 18:1; II Sam. 8:11, etc.). It seems that some principle was already at work in the earth which man was enjoined to conquer for God. The Bible is silent about the source of this principle. It may have been due to the activity of Satan in his assumed form of the serpent (Gen. 3). However, God's sovereignty seems to have overruled this principle since the creation was pronounced good (Cf. Gen. 1:31; see also below).

3. Man is described in his original relationship to the rest of creation as being an eater. Other life forms are also introduced as part of a food chain:

I give you every seed-bearing plant on the face of the whole earth and every tree that has fruit with seed in it, they will be yours for food. And to the beasts of the earth, and all the birds of the air and all the creatures that move on the ground ... I give every green plant for food. (Gen. 1:29–30, NIV)

Although carnivorousness, the eating of animal flesh, is not mentioned here, this omission may or may not be construed as an argument for vegetarianism. Animal sacrifice was needed for the skin garments for Adam and Eve (Gen. 2:21). Abel's animal sacrifice was accepted over Cain's offering of fruits by the Lord. It seems that there is no compelling reason to justify the claim that animal killing is permitted only after the Fall. Genesis does not provide a theological ground for differentiating between the *nature* of plant and animal life. Biologically, the modern understanding of the cell theory and the genetic basis of life has unified the living world. The biochemistry of digestion and decay of food stuff made of plants or animals is quite similar, barring minor differences in the varieties of digestive enzymes. Moreover, unless one completely abandons the fossil record of life, one has to acknowledge the presence of carnivorousness long before man's appearance. Even if one were to argue that man's eating was limited to the consumption of only seeds and fruits, such consumption would necessarily decrease the reproductive potential of the thing eaten since seeds carried by fruits give rise to new plants. Therefore, one may postulate that the existence of physical death in the non-human world is necessary in order to account for the operation of a food chain before the human Fall. As Wilkinson puts it:

A dying sun gives heat to a dying plant which gives food to herbivores who die to feed carnivores, who are eaten before and after death by bacteria who themselves die in incomprehensible numbers. $^{15}\,$

The understanding of these presuppositions—that one cannot impose human volition on the non-human world, that man's dominion in the created world implies his control of the reproductive pattern of the non-human life forms, and that the food chain necessitates physical death in the things eaten—seems to lead to the conclusion that physical death was present in the creation before the human Fall. The usual implications of death—pain, suffering and condemnation—are not necessarily associated with the non-human world. Since God utilizes death to maintain life, then natural selection, which is based on differential fecundity and mortality, could be one of the processes God employs to bring forth the varieties of life forms in His creation.

A unifying concept must be constructed in the context of both the Old and the New Testaments, since the two Testaments are mutually interpretive. The methodology in biblical hermeneutics must be a historical-theological one.

5. Creation As Good-The Incarnation Necessitated by the Fall of Man

The Creation was good (Gen. 1:31). The Creation is not the result of the Fall. For "the heavens declare the glory of God; the skies declare the work of His hands' (Psm. 19:1), and "His name is majestic in all the world" (Psm. 8:9). From the perspective of many theistic evolutionists, particularly that of Teilhard de Chardin and of process theologians, Creation, the Incarnation and Redemption are organically integrated so that they are but three stages of a single action performed by God in relation to His creation. In the cosmic evolutionary scheme of de Chardin,¹⁶ Christ is the culmination of the progressive unification of the universe. The God of process theology is not the Creator but rather a creature who only gives the initial aims and lures the creation towards its perfection during which process he himself is perfected by its growth.¹⁷

Calvin addresses the problem of the necessity of the Incarnation.¹⁸ God's decrees for the Fall and the Incarnation run together. Christ would not have to be incarnated if Adam did not sin, for Christ was the second Adam (I Cor. 15:47; Rom. 5:12–21). He was made like man in all respects except sin (Heb. 4:15). He was reckoned as a descendant of Adam (Luke 3:38). Colossians 1:15–17, quoted by de Chardin and his

associates to support the idea that the Incarnation is a necessary stage of God's creative plan, is taken out of context. Paul seems to suggest that the fullness of God indwells Christ so that Christ can reconcile to Himself through His blood, shed on the cross, all things on earth or in heaven which have been alienated from God (Col. 1:19-20). God's eternal purpose is to predestine us to be adopted as His sons through Jesus Christ before the creation of the world (Ephes. 1:4-5). All things were created by the pre-existent Christ and for Him. But the necessity of Christ's Incarnation hinges on the Fall of man.

As a result of human sin, the ground was cursed (Gen. 3:17). The creature is subject to frustration (Rom. 8:20). It seems possible that the condition described by the second law of thermodynamics, the increase of randomness in the universe, is a result of the human Fall. The food chain, operating efficiently before the Fall, would now be subject to the same fate; although we still see many examples of its effective operation today. Man's immortality was apparently maintained before the Fall by means of God's special sustenance, perhaps through the Tree of Life. As a result of man's sin, God's special sustenance was removed (Gen. 3:24). Death and evil entered the human race. Mankind and the creation need to be reconciled to God through the Incarnation and Atonement of Christ (Col. 1:20). However, man is to be made a new creation in Christ (II Cor. 5:17), and is not to be restored to his pre-Fall status. Therefore, Scriptural references such as Isaiah 11:6 and 65:25, which abolish predation, seem to be referring to the millenial kingdom or to the new heaven and the new earth, and cannot be used to refer to the original creation.

One may postulate that the existence of physical death in the non-human world is necessary in order to account for the operation of a food chain before the human Fall.

Evaluation of Conservative Positions on the Issues of Creation and Evolution

All of the conservative positions evaluated below acknowledge that God is the Creator, and that man and the rest of the creation are sustained moment by moment by God. Another tenet shared by these positions is the unilateral dependence of the creation on the transcendent Creator.

1. Fiat Creationism (or Recent Creationism)

This view is currently the most prominent view of "Creationism" and is often synonymous with it in the popular mind. Despite being ridiculed by some scientists as some kind of a cultic movement,¹⁹ it has gained momentum and visibility in some legal circles. One spokesman for the movement, Wendell Bird, has gained a respectable hearing in the Yale and Harvard law journals.^{20, 21} Although the courts in Arkansas and Louisiana have ruled against Creationists, the public awareness raised by the Creationist movement has yet to be fully appreciated. Despite the insignificance of its support among academicians, there is considerable grass-roots support among conservative Protestant Americans.²² The widespread support of Recent Creationism is based essentially on its high regard for Biblical authority and its concern for moral and traditional values.22

It is apparent that the most straightforward understanding of the Genesis record, without regard to all of the hermeneutical considerations suggested by science, is that God created heaven and earth in six solar days, that man was created in the sixth day, that death and chaos entered the world after the Fall of Adam and Eve, that all of the fossils were the result of the catastrophic universal deluge which spared only Noah's family and the animals therewith. Since many outspoken scientific and theological proponents of evolution are also known for their agnostic or humanistic views.23 the Creationist movement alleges that many scientific assumptions, such as the principle of uniformitarianism, are colored by humanistic presuppositions.²⁴ It follows, therefore, that many of the conclusions drawn by geologists and anthropologists on the age of the earth and the fossils are questionable. It was the Creationists who alerted the American public to the dogmatic claim by some scientists that evolution is a fact, and who went to court in Arkansas, California, Louisiana, and Texas to require the teaching of Creation science alongside of evolution in the public schools.25

However, the Recent Creationist position has two serious flaws. First, it has denied and belittled the vast amount of scientific evidence amassed to support the theory of natural selection and the antiquity of the earth.^{23, 26, 27} Secondly, much Creationist writing has "deistic" implications. Although Creationists would probably not admit that their position could suggest that the Creator only intervenes in the creation occasionally to perform creative acts and miracles, the stipulation that the varieties we see today in the biological world were present in the initial Creation²⁸ implies that the Creator is no longer involved in His creation in a dynamic way. Rather, the creation is seen as having been left to its own devices for the expression of the variability potential endowed to it in the beginning. This deistic implication is contrary to Hebrews 1:3, which stipulates that all things are upheld by the word of His power.

2. Theistic Evolutionism

Many theistic evolutionists accept the historicity of the Bible, but some allegorize the Genesis account in order to treat the whole Creation account as a "poetic" representation of spiritual truths of humans' dependence on God their Creator and of their fall from God's grace by a symbolic act of disobedience. They accept the processes of organic evolution as the method God chose to create humans. Such theistic evolutionists are the dominant voice among many scientifically oriented theologians; they are the "Christian Darwinists."²⁹ Darwin rejected the notion of a designer, for which William Paley argued eloquently in Natural Theology, and averred that the directive organization of living things is the result of a natural process-although he deferred to the Creator as the initiator of the process.³¹ Darwin's views changed later as he increasingly denied the Christian faith. The Christian Darwinists, on the other hand, see the process of natural selection as a way to explain God's immanence in nature and the omnipresence of His creative power. Thus, they see God's providential hand behind the process of mutations selected by the favorable environment which endows the living system with the capacity to leave more offspring and become the dominant variety. Seen in this light, the Christian Darwinists maintain a more wholistic theological position concerning God's providence than do the Recent Creationists, who have to posit a repetitive divine intervention in cataclysmic proportions.

However, Theistic Evolutionists have to deal with two theological obstacles:

a. The exegetical problems in the Genesis account of creation.

Although Theistic Evolutionists tend to interpret the creation account in Genesis figuratively, it is contrary to the context of the text. There seem to be eleven historical narratives in the first thirty-seven chapters of Genesis, each delimited by the phrase, "These are the names [generations, descendants] of . . . " (Gen. 2:4, 5:1, 6:9, 10:1, 11:10, 11:27, 25:12, 25:19, 36:1, 36:9, 37:2). The contents are linked together to form a roughly chronological account of primeval and patriarchal life.^{31, 32} While few would doubt the historicity of the patriarchs of Israel, it seems unwarranted to assume the creation account to be allegorical while the rest of these narratives are historical. The New Testament also regards certain events mentioned in Genesis 1 as actu-

ally having transpired (e.g., Mark 10:6, I Cor. 11:8–9). Calvin suggests that the historical account of the sixday creation shows God's goodness towards man in lavishly preparing the world for the habitation of man, the climax of God's creation.³³

More recently, Blocher³⁴ has suggested that the creation account in Genesis should be interpreted "historico-artistically." That is, as a framework of seven days used anthropomorphically by the author of Genesis to outline a theology of sabbath. Blocher traces the anthropomorphic usage of the word "days" back to Augustine.³⁵ Aquinas also recognizes the difference between the work of *distinction* (days 1–3) and the work of *adornment* (days 4–6), although he interprets a day as a 24-hour solar day.³⁶ The difficulties of the creation of the heavenly luminaries after the creation of light, and the inconsistencies of the timing sequence of the creation of plants as recorded in Genesis 1 and 2, are resolved by the anthropomorphic use of "days."

While Blocher's framework hypothesis is attractive for its resolution of some of the apparent conflicts between Genesis 1 and 2, it remains unclear at what point one can draw the boundary line between an allegorical account, where only the spiritual meaning prevails, and a historical-theological account, where both what actually transpired and its spiritual meaning are significant. The assumption that Genesis 1 represents a "wide-angle" perspective of God's creative activities and Genesis 2 gives these activities a "closeup" examination may help in our understanding of the creation account. The seemingly conflicting chronological sequences of the creation of plants, animals and man may be resolved by assuming an overlapping of the creative eras, whereby some of the creative activities may have been contemporaneous or overlapping.³⁷ In addition, the New International Version (NIV) translation of Genesis 2:4-5, "When the Lord God made the earth and the heavens, no shrub of the field had yet appeared on the earth and no plant of the field had yet sprung up ... there was no man to work the ground," seems to suggest that the shrub and the plant had not yet grown in the "field" or "level place" partly for lack of a farmer. Then God created Adam and put him in the Garden of Eden to take care of it. The emphasis seems to be on the caretaker role of man instead of on the chronology of creation. Moreover, verse 19, "Now the Lord God had formed out of the ground all the beasts of the field and all the birds of the air," seems to suggest that these animals were created before Adam so that they could be brought to him for naming. Therefore, the conflicts in the chronology of creation in Genesis 1 and 2 may be more apparent than real. The origin of sin and evil and the Christ-Adam juxtaposition seem to demand a historical Adam, to which conclusion Blocher also subscribes. If the "close up" creation

account of Adam and Eve in Genesis 2 is theologically and historically significant, is it not also applicable to the "wide angle" account of creation in Genesis 1?³⁸

In addition, the Hebrew word *nephesh*, translated as "living soul" (Gen. 2:7), of man is also used to describe other living creatures in Genesis 1:20–21 and 24. The distinction of man and beasts is that man was created in the image of God and other creatures were not. Therefore, in Genesis 2:7, man becomes a living being for the first time, just as other creatures. This would seem to rule out the interpretation that man is genetically derived from some previously existing living forms.³²

While Blocher's framework hypothesis is attractive . . . it remains unclear at what point one can draw the boundary line between an allegorical account . . . and a historical-theological account.

While Genesis 1 through 3 were written to include important theological truths for all humanity, both geologically and chronologically speaking, the theological meaning seems to be intimately connected with the historical meaning. The concordist position, which attempts to decipher the historical and theological meaning of the creation account, may be trying too hard to combine science and theology, especially since science is constantly changing.³⁴ However, it is a reluctance to dichotomize the theological and the historical dimensions of God's revelation which prompts the concordists to keep on trying. The proposal of the overlapping day-age model is one such attempt.³⁷ Genesis, for the concordists, is more than Heilgeschichte. It records what actually transpired in space and time as revealed by God to a faithful observer. It is an account of the origins of the universe, of mankind, of sin, and of the nation of Israel, through whom the stage for God's deliverance of the fallen human race is set.

b. The origin of sin and evil.

George Murphy proposes several solutions to this theological question from the perspective of a theistic evolutionist³⁹:

i. The first humans, the first to reach reflective consciousness and to be endowed with the image of God, consciously turned away and refused to obey the word of God.

This position seems to have scientific and theological obstacles. Scientifically, if one wants to be completely consistent with the evolutionary paradigm, one has to postulate that a population of pre-existing hominids acquired reflective consciousness and the image of God; for populations evolve, not individuals. Individuals are either eliminated or selected. Evolution occurs when gene frequencies in large populations are changed. Therefore, Neo-Darwinian evolution depends on the gradual accumulation of changes in gene frequencies in populations of organisms. The "hopeful monster" that arose by saltation or sudden drastic changes⁴⁰ may have led to the evolution of the first human couple from their hominid ancestors. However, the lack of an experimentally testable mechanism to explain the saltation process has long plagued this theory. Recently, the theories of neutral mutation and punctuated equilibrium have been postulated.⁴¹ These theories suggest that a gradual selective process cannot account for macroevolutionary changes. However, the random process proposed as a substitute for the gradual natural selection mechanism is difficult to test by means of controlled experimentation.

As an exception to the evolutionary paradigm, one can postulate that God chose two of the evolving hominids to be Adam and Eve, and endowed them with the image of God, just as He chose Noah and Abraham from the wicked generations in which they lived. While this position conflicts with the aforementioned interpretation of Genesis 2:7, it also requires an extraordinary act of God in the selection of only two individuals from an evolving population of hominids. For some Progressive Creationists, the extraordinary act that God utilizes to create man from the dust of the earth is as logical, if not more consistent, since no satisfactory natural mechanism is sufficient to account for the evolution of Adam and Eve. This should not mean that we bring in God for a supernatural event when we cannot see a natural cause. The transcendent God and His extraordinary act of bringing Adam and Eve into existence does not imply "God-of-the-Gap" deism. This stipulation simply stresses the special importance that God attributes to the creation of man, who is created to 'glorify Him and enjoy Him forever." God's providence does not preclude His using extraordinary acts not explainable by known natural means for a special purpose of His own. The act of creation ex nihilo itself demands a transcendent God performing an extraordinary act to put together the natural processes in His creation.

Theologically, natural selection does not explain the efficacy of the Fall, for it leads to man's death. The Fall was a moral predicament not necessitated by any natural processes. The unity of the human race as derived from a single source and the origin of human death and sin from a single human couple (Rom. 5:12-21) necessitate the Incarnation and the redemptive work of Christ. Christ is the second Adam who is to give life to the fallen human race through His obedience and atoning death. He is not the culmination of human evolution.

The major weakness of the existential emphasis of sin and the Fall is the inconsistency of allowing God to act on a personal level through existential encounter while denying God's action in history through creation.

An alternative to this dilemma would be to dispose of the historicity of the "unique" human couple who sinned and were banished from God's blessing, and to recognize the existential nature of evil and the need for redemption. However, this dualistic approach seems to compartmentalize reality if pressed to the extreme; the spiritual realm and the physical realm become independent of each other. The weaknesses of this position will be addressed in the section dealing with Neoorthodoxy.

ii. Evils are "the Shadow of Creation."

In the early Church, Origen propounded the view that there was a spiritual fall in which man's soul was affected,⁴² and that the creation is only a testing ground reflecting what has happened in the spiritual realm. Therefore, in essence, the Creation is seen as the result of the Fall, through which man is to be united to Christ, thus becoming redeified to the pre-Fall state in heaven. This leads to the Manichean implication that the Creation is evil. The necessity for Christ's atoning death is also called into question. One may conclude that such a view is contrary to the doctrine of the goodness of the creation (Gen. 1).

In conclusion, one may say that, although the emphasis of Theistic Evolutionism on the dynamic involvement of God in His creation, by means of His directing of the process of change in the biological world, is much preferable to the Recent Creationists' formulation of God's occasional intervention in creation, nevertheless some Progressive Creationists find the special creation of Adam and Eve in the midst of God's providential control of His world to be a more meaningful and less problematic solution than that supplied by Theistic Evolutionism.

3. The "Creation Myth" of Neoorthodoxy

Neoorthodoxy puts much emphasis on the suprarationalistic or paradoxical aspect of Christian teaching and tends to ignore natural theology. Its view of Creation may be illustrated by its treatment of the creation account as "myth." Langdon Gilkey defines "myth" most succinctly as a way of talking about God as a figure who transcends history in the dramatic sense of an agent within history.⁴³ He further distinguishes between the anthropological and theological usages of myth.⁴⁴ While anthropological myths are essentially fables, and so untrue, theological myths are true in the sense that they are concerned with the ultimate or existential issues of human destiny, using symbols to describe the transcendent or the sacred. Thus, in this view, the creation myth would have more religious significance for man's salvation than would the literal history of creation, for scientific or literal facts have no religious value. By emphasizing the religious meaning of Creation and the Fall and the existential realities of evil and sin, Neoorthodoxy, together with many Theistic Evolutionists, affirms the need for redemption through a personal encounter with the Savior who atones for sin by His death and resurrection.

The major weakness of the existential emphasis on sin and the Fall is the inconsistency of allowing God to act on a personal level through existential encounter while denying God's action in history through creation. The religious truth, as revealed by a personal encounter with the incarnate Word through whom all of the Scripture should be interpreted, seems to be divorced from the historical truth of the Bible. The lack of interaction between the religious truth as expressed in mythical language and the historical truth as expressed in scientific language seems to imply that reality is comprised of several levels of truth that are independent of each other. This dualistic overtone seems to contradict the unity of God's general revelation through nature and His special revelation through the Scriptures.

Progressive Creationism: A Definition

Ramm defines "Progressive Creationism" as follows:²

Progressive Creationism can be further desribed, briefly, as follows:

- It posits that God is involved in His creation in a dynamic way by shaping the variation of the biological world through mechanisms such as natural selection, thus avoiding the deistic mentality of the God-of-the-Gaps theory.
- 2) It stresses the historicity of Adam and Eve and gives the creation of Adam and Eve special significance, since it was an extraordinary act of God that is not explainable by known natural causes.
- 3) It focuses on the unity of God's revelation in nature as well as in Scripture and tries to maintain the historical and theological integrity of the creation account.

Progressive Creationism overlaps with Theistic Evolutionism and Recent Creationism in many respects. If Theistic Evolutionism and Recent Creationism are on the left wing and the right wing of the evangelical spectrum respectively, Progressive Creationism is somewhere in the middle. It attempts to utilize the strengths of both positions and tries to avoid their weaknesses.

A Synthesis: Creation Was Good; Sin Comes from the Fall; God Overrules

The Scriptures seem to teach that the devil was a fallen angel who rebelled against God (Rev. 12:3,4; Isa. 14:12-17; Ezek. 28:13-19) and who is always trying to interfere with God's plan (e.g., Job 1:6-12; Ephes. 6:11-12). It is clear that the serpent which tempted Adam and Eve is more than a wild beast; that he is a spiritual being intent upon luring man away from God (Gen. 3:1-5). The devil apparently existed before the creation of man. However, the Creation is not the result of the angelic fall. For "the heavens declare the glory of God; the skies declare the work of His hands" (Psm. 19:1, NIV), and "His name is majestic in all the earth" (Psm. 8:9). God is sovereign despite the angelic rebellion. Death in the physical world was in existence before the Fall of man and it may not be the result of evil. The fact that animals and man had to eat, as recorded in the creation account (Gen. 1:29,30), suggests a kind of death for that which had been eaten. Although carnivorousness was not mentioned before the Fall, this does not eliminate the possibility of animal death. The fossil record is replete with carnivores who existed long before the appearance of man. God used natural selection to propagate those species most adapted to survive, thereby ensuring that the resources in His creation not suffer from depletion and that the population of the creatures remain under control. He has allowed natural selection to maintain a finely tuned ecological balance. The creation is moment by moment

In Genesis one, the pattern is development from vacancy to the finished creation at the end of the sixth day. In manufacturing, the pattern is from raw materials to finished products. In art the pattern is from unformed materials to artistic creation. In life the pattern is from the undifferentiated ovum to the adult. In character the pattern is from random and uncritical behaviour to disciplined and moral behaviour.

sustained by the providence of God for He "sustains all things by His powerful word" (Heb. 1:3, NIV).

The scientific mechanism of mutations selected by the favorable environment to become dominant varieties is the manifestation of God's providence in being directly involved in His creation by shaping the future of the development of life. On the one hand, this position avoids the "deistic" implication of the Recent Creationists who deny the role of natural selection in microevolution. On the other hand, it clothes the chance events, which humanists claim are free and blind and which they find to be the basis for biological evolution,45 with providential meanings. This stipulation of the providential role of natural selection does not necessarily violate the methodological naturalism that is the essence of the scientific approach. While God allows regularity of natural laws to govern His creation so that scientists can describe natural phenomena by physical laws, He does not determine the necessary outcome of physical processes. Scientifically, the classical Newtonian determinism has been replaced by the probabilistic world view of quantum physics. The principle of complementarity, which explains the dual nature of light as both corpuscular and wave-like, can also be applied to relate science and Christianity.^{46, 47} The lack of certainty in describing the momentum and the position of electrons at the same time, as spelled out by Heisenberg, also allows for God's providence in terms of probability.48 William Pollard starts out from the indeterminacy of the atomic world to implicate God's providential control in allowing the probabilities determined by natural processes to work for His purposes.49

If Theistic Evolutionism and Recent Creationism are on the left wing and the right wing of the evangelical spectrum, respectively, Progressive Creationism is somewhere in the middle. It attempts to utilize the strengths of both positions and tries to avoid their weaknesses. consecrated by the Word of God and prayer" (NIV). This passage seems to suggest that "good" is used in contrast with "evil," so that we can receive everything God created with thanksgiving because it is not evil. Death in the physical world does not necessarily represent evil. Natural selection is evil only when it is exploited by man. In certain situations, death actually means peace for the righteous when God overrules (Isa. 57:1-2).

Death in the physical world does not necessarily represent evil. Natural selection is evil only when it is exploited by man.

The fact that man had to eat seems to suggest that his body needs the nourishment derived from the digested food. He may have to die physically too if he is not maintained by the proper diet. It is possible that man was maintained physically immortal by the fruits of the Tree of Life which man was allowed to eat before the Fall. One of the reasons why the fallen couple was expelled from the garden of Eden was to prevent them from eating of the Tree of Life and living forever (Gen. 3:22). It will not be until the time of the new heaven and the new earth that the Tree of Life will again be freely accessible to the heavenly citizens (Rev. 22:1,2). God apparently sustained the life of Adam not only by the fruits from the Tree of Life, but also by protecting him from any attack by the wild beasts so that He could bring them to the man for naming (Gen. 1:10). The commandment to subdue the earth and rule over all the living creatures seems to have been an exhortation (Gen. 1:28, Psm. 8:6) which will be totally fulfilled in the true man, Jesus Christ, who will be crowned Lord to the glory of God the Father (Phil. 2:9–11).

As a result of man's fall, sin and death entered the human race because all sinned (Rom. 5:12–21). The death experienced by Adam and Eve was, most importantly, their spiritual separation from God. Physical death also ensued, for they were no longer sustained by God through the Tree of Life. God also removed His providential help from them. The Edenic curse (Gen. 3:14–19) ordained that women would have to suffer through childbirth, the ground would no longer cooperate fully with man, and that man would have to labor for his livelihood. Murder and treachery appeared (Gen. 4). Man also may have lost his cultural attainments following the Fall (Gen. 4:12), although they were apparently rediscovered later.³⁰ God will only

God called His creation good. This does not necessarily mean that there was no physical death in the creation before the Fall. I Timothy 4:4-5 states that "everything God created is good, and nothing is to be rejected if it is received with thanksgiving, because it is

allow special providential control to return to those "who love Him and have been called according to His purpose" (Rom. 8:28, NIV). "The creation was subjected to frustration not by its own choice, but by the one who subjected it" (Rom. 8:20, NIV). Therefore, in a metaphoric sense, the creation waits in eager expectation for the sons of God to be revealed. The redemption of nature is the corollary of the redemption of the body. Man is not sinful because he is a creature but because of his rebellion against God. In the final consummation,

the whole man and the world of which he is a part will be delivered from the influence of evil. Creation and mankind as such are not evil. Man is sinful only insofar as he exalts himself above God and refuses to humble himself to acknowledge his Creator Lord. The redeemed mankind is transposed into God's new creation (I Cor. 5:17), which will be consummated in the resurrection of the body (I Cor. 15) and in the new heaven and new earth. It is not the restoration of the original pre-Fall creation (Rev. 21:1).

REFERENCES

- ¹Pun, P. 1982. Evolution: Nature and Scripture in Conflict? Grand Rapids: Zondervan, pp. 174-230.
- ²Ramm, B. 1954. The Christian View of Science and Scripture. Grand Rapids: Eerdmans, p. 76.
- ³Morris, H. M. 1984. "Recent Creation Is a Vital Doctrine," Impact, 132, June 1984
- ⁴Calvin, 1960. Institutes of the Christian Religion, John R. McNeil, (ed.). Translated and indexed by Ford Lewis Battles. Philadelphia: Westminster, Vol. I, Book I, Chap. V, p. 53.
- ⁵Calvin, op. cit. Vol. I, book I, chap. XIV, p. 180.

....

- Brehier, E. 1967. The History of Philosophy, translated by W. Baskin. Chicago: University of Chicago Press, Vol. 5, p. 15.
- ⁷Calvin, op.cit. Vol. I, Book I, Chap. XVI, pp. 197–198.
- "Gilkey, L. 1965-66. "Secularism's Impact in Contemporary Theology," Christianity and Crisis, XXV. 66.
- Childs, B. S. 1970. Biblical Theology in Crists. Philadelphia: Westminster, p. 33
- ¹⁰MUTPHY, G. 1986. "Chiasmic Cosmology: A Response to Fred Van Dyke," Journal of the American Scientific Affiliation, 38, 124.
 ¹¹Cunliffe-Jones, H. 1978. A History of Christian Doctrine. Philadelphia:
- Fortress, pp. 338-344.
- ¹²Hasel, G. 1972. Old Testament Theology: Basic Issues in the Current Debate, revised and expanded 3rd edition. Grand Rapids: Eerdmans, pp. 169-170.
- ¹³Van Dyke, F. 1986. "Problems of Theistic Evolution," Journal of the American Scientific Affiliation, 38, 11.
- ¹⁴Dillard, A. 1974. Pilgrim at Tinker Creek. New York: Harper's Magazine
- Press, p. 167 [citing Edwin Way Teale].
 ¹⁵Wilkinson, L. 1976. "A Christian Ecology of Death: Biblical Imagery and the Ecological Crisis," *Christian Scholars Review*, V(4), 322.
- ¹⁶Teilhard de Chardin, P. 1971. Christianity and Evolution. New York: Harcourt Brace Jovanovich.
- ¹⁷Cobb, J. B. Jr. 1969. God and the World. Philadelphia: Westminster.
- 18Calvin, op. cit. Vol. 1, Book II, Chap. XXIV, pp. 471-472.
- ¹⁹Kornberg, A. 1982. In A. T. Ganesan, Shing Chang and James A. Hoch (eds.), Molecular Cloning and Gene Regulation in Bacilli. New York: Academic Press, p. xxi.
- ²⁰Bird, W. 1978. "Freedom of Religion and Science Instruction in Public Schools," Yale Law Journal, 87, 515-570.
- ²¹Bird, W. 1979. "Freedom from Establishment and Unneutrality in Public School Instruction and Religious School Regulation," Harvard Journal of Law and Public Policy, 2, 125-205.
- ²²Aulie, R. 1983. "Evolution and Special Creation: Historical Aspects of the Controversy," Proceedings of the American Philosophical Society, 127(6), 418-462

²³Pun, op. cit. pp. 298-300.

- ²⁴Whitcomb, J. Jr. and H. Morris 1961. The Genesis Flood. Philadelphia: Presbyterian Reformed Publishers.
- ²⁵Kornberg, op. cit. p. xxi. Also see Minnery, Tom. "Creationists Tenacity

- Secures Subtle Change in Science Texts," Christianity Today, Nov. 7, 1980, p. 64.
- ²⁶Young, D. 1977. Creation and the Flood. Grand Rapids: Baker.
- ^{\$7}Young, D. 1982. Christianity and the Age of the Earth. Grand Rapids: Zondervan.
- ²⁸Moore, J. and H. Slusher (eds.) 1977. Biology, A Search for Order in Complexity. Grand Rapids: Zondervan, pp. 451-453.
- ²⁹Moore, J. R. 1979. The Post Darwinian Controversies: A Study of the Protestant Struggle to Come to Terms With Darwin in Great Britain and America, 1870-1900. Cambridge: Cambridge University Press.
- ³⁰Darwin, C. 1859. The Origin of Species, Mentor ed. London: The New English Library (1958), p. 450.
- ³¹Harrison, R. K. 1969. Introduction to the Old Testament. Grand Rapids: Eerdmans, pp. 548-551. ³⁸Buswell, J. O. II 1963. Systematic Theology of the Christian Religion, vol. I.
- Grand Rapids: Zondervan, p. 156. ³⁰Calvin, op. cit. Vol. I, Book I, Chap. XIV, p. 161.
- ³⁴Blocher, H. 1984 In the Beginning: The Opening Chapters of Genesis, translated by D. G. Preston. Downers Grove: InterVarsity Press, chap. 2.
- ³⁵Augustine. The City of God, translated by Henry Bettenson. London: Penguin Books (1972), Book XIII, p. 430.
- ³⁶Aquinas, T. Summa Theologica, Vol. I. Translated by Fathers of the English Dominican Province. New York: Bezinger Brothers (1947), pp. 229-233, 247.346-359.
- ³⁷Pun, op. cit. pp. 262-263.
- ³⁸Hummel, H. D. 1979. The Word Becoming Flesh. St. Louis: Concordia, p.
- ³⁹Murphy, G. 1986. "A Theological Argument for Evolution," Journal of the American Scientific Affiliation, 38, 19.
- "Goldschmidt, R. B. 1940. The Material Basis of Evolution. New Haven: Yale University Press
- ⁴¹Pun, op. cit. pp. 220-224.
- Cunliffe-Jones, op. cit. pp. 77-84.
- ⁴³Gilkey, L. 1959. Maker of Heaven and Earth. Garden City: Doubleday, p. 265
- "Gilkey, L. 1970. Religion and the Scientific Future. New York: Harper and Row, p. 66.
- ⁴⁵Monod, J. 1971. Chance and Necessity. New York: Knopf.
- "Haas, J. 1983. "Complementarity and Christian Thought: An Assessment. I. The Classical Complementarity of Niels Bohr," Journal of the American Scientific Affiliation, 35, 145-151.
- ⁴⁷Haas, J. 1983. "Complementarity and Christian Thought: An Assessment. II. Logical Complementarity," Journal of the American Scientific Affiliation. 35, 203-208.
- ⁴⁸Jeeves, M. 1969. The Scientific Enterprise and Christian Faith. Downers Grove: InterVarsity Press.
- "Pollard, W. 1958. Chance and Providence. New York: Scribner.
- 50Pun, op. cit. pp. 266-268

Validity of Existing Controlled Studies Examining the Psychological Effects of Abortion

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> Numerous studies have been concerned with the potential psychological sequelae (potential psychological risks) of abortion but conclusions reached are inconsistent. This paper is based on a comprehensive review of studies addressing the question of post-abortion psychological sequelae. Controlled studies were categorized according to research design and then systematically examined for experimental validity. Poor use of methodology and research design surfaced as an explanation for differing conclusions across the literature. As a further means of examining the integrity of comparisons in the literature made between woman having and not having abortions, the maximum likely statistical power was calculated for each controlled study. As a whole, the literature exhibited grossly substandard power characteristics. An effort to isolate the best study to date was made, and a summary of the conclusions from this study is presented. We conclude that the question of psychological sequelae to abortion is not closed.

Since the United States Supreme court made the decision in 1973 to legalize abortion on demand, the number of abortions performed per year has risen dramatically. In the United States there are more than one and one-half million abortions performed yearly, and of every 100 women of childbearing age, about five obtain an abortion (Henshaw, Forrest and Blaine, 1984). In addition to concerns over medical safety, numerous questions have been raised about the potential psychological risk (the technical term is psychological *sequelae*) that may accompany elective abortion. There is a large scientific literature that attempts to determine what, if any, psychological risks are involved in having an abortion.

PSYCHOLOGICAL EFFECTS OF ABORTION

Discovering the truth about the emotional impact of abortion should be of great interest to all. Unfortunately, representatives of both sides of the abortion debate often exercise a high degree of selectivity in their review of the psychological sequelae literature, publicizing only findings that support their position on the matter. This is unfortunate because when thoughtfully approached, it becomes evident that the question of possible sequelae to abortion exists apart from the ethics of the action. This is true for two reasons. First, doing what is "right" or "wrong" may or may not result in changes in the emotional state. For example, evangelical Christians base the correctness of an action on their interpretation of the Scripture. Relative to a directive or principle found in Scripture, an emotional reaction or the absence of the same in women who have had abortions is of little consequence in providing moral guidance. Second, one key issue in determining the morality of abortion is the question of the "rights of the unborn." A woman's psychological reaction to abortion offers little direction concerning whether or not these rights have been violated.

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In this paper we do not wish to address questions surrounding the morality of abortion. Rather, we want to provide a review of the psychological sequelae literature aimed at determining the scientific merit of existing studies. Certainly it would be reprehensible to overstate or understate a scientifically validated finding for a "higher" moral cause. Likewise, it would be reprehensible to pass on as "scientific" the claims of studies that exhibit little experimental validity.

To determine the level of rigor that exists in the psychological sequelae literature, we have undertaken a review of this literature from a methodological and statistical perspective. To locate articles we have relied upon computer searches of Index Medicus, Psychological Abstracts, Science Citation Index and the National Institute of Mental Health data base in addition to examination of the bibliographies of all articles located. This search yielded over 300 studies; seventy-six were either clinical case studies or experimental research. In turn, these studies were organized into four categories according to research design: case studies (17), controlled studies (14), retrospective-uncontrolled studies (20) and prospective-uncontrolled studies (23). Each of these four types of research designs have strengths and weaknesses, some of which will be described below.

Unfortunately, there are many inconsistencies in the conclusions drawn by the authors of the studies we located. For example, Wallerstein, Kurtz and Bar-Din (1972) found adverse reactions in fifty percent of the cases studied, while Osofsky and Osofsky (1972), in a study published the same year, concluded that there were few, if any, adverse psychological reactions. When results are this varied, both pro-life and prochoice camps are able to find "evidence" to support their position. Under such circumstances, the need to consider the methodological and statistical practices underpinning each study becomes self-evident. A review of the foundations on which the literature rests sometimes can differentiate between studies that can be trusted and those that come to unwarranted conclusions. If severe methodological flaws in the current literature do exist, these inadequacies, not the conclusions reached, should be the focus of attention. Thus, it is the experimental validity rather than the conclusions of existing studies that provide the focus of this paper.

Conceptualizing Validity

We elected to adopt a conceptualization of experimental validity proposed by Cook and Campbell (1979) to help systematically determine how seriously the conclusions of a given study should be taken. Experimental validity can be categorized into four different types: statistical conclusion validity, internal validity, construct validity and external validity. Statistical conclusion validity is concerned with the extent to which a study permits valid inference about covariation between the independent variable (the presence or absence of abortion) and the dependent variable (some

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measure of psychological sequelae). Internal validity refers to the extent to which the observed effects of the outcome variable (psychological sequelae) may be attributed to the treatment (abortion) rather than alternative causes (age, marital status, religious background, etc.). Construct validity pertains to the extent that the outcome measures, treatments, samples and settings utilized in the research represent the theoretical constructs of interest. In the present context, high construct validity would imply (among other things) that the measuring device used to assess risk was reliable and accurate. Finally, external validity refers to the validity with which conclusions can be generalized to and across populations of persons, settings and time. Having high external validity would mean that the conclusions about abortion and psychological risk found in a given study could be safely applied to women other than those actually involved in the study.

A review of the foundations on which the literature rests sometimes can differentiate between studies that can be trusted and those that come to unwarranted conclusions.

Statistical Conclusion Validity

We will first discuss statistical conclusion validity as it relates to the post-abortion sequelae literature. There are two types of errors one can make when using a statistical hypothesis test to decide whether an experimental group differs from a control group (i.e., an abortion group differs from a non-abortion control group). Type I error refers to concluding from sample data that there is a difference on the outcome variable (i.e., incidence of psychological trauma) when such is not *really* the case for the two comparison populations. In effect, you have drawn random samples that look different, but both samples have come from the same population (with regard to the outcome parameter of interest). On the other hand, a Type II error occurs when, on the basis of sample data, it is decided that the samples have come from the same population when really each is from a different population.

Ideally we want to carry out hypothesis tests with a low probability of Type I error (e.g., set alpha, the probability of Type I error, at .05 or lower) as well as a low probability of a Type II error (e.g., we want power, the probability of correctly accepting the alternative hypothesis, to be .95 or higher). Indeed, both types of error can simultaneously be held to a low probability of occurrence if there are sufficient resources to collect adequately large comparison samples.

In reality it is often too expensive, time consuming or otherwise difficult to collect sample sizes that will allow one to sufficiently protect against both types of errors. Also, investigators without adequate statistical background and/or access to statistical consultation may not understand how crucial adequate sample size is, particularly as it relates to the possibility of making a Type II error. In such instances, investigator motivation may be insufficient to overcome barriers that work against securing adequate sample sizes.

When resources or motivation are insufficient to protect against *both* a Type I and Type II error, the research should not be carried out. But often it is. The very typical course of action is to maintain protection against a Type I error while tolerating a high risk of a Type II error. In other words, common practice would have us, in the face of limited resources, defend the null hypothesis at the expense of possibly missing a true alternative hypothesis.

An example from the pharmaceutical industry will clarify the usual practice and why it occurs. Suppose it is considered desirable to take a new drug to market but it is too expensive to test the drug against a control product using a large sample size. Most would argue that it would be better for the pharmaceutical firm to err in the direction of not introducing a new drug (that really is better) than to introduce a new drug (thought to be better but that really is not). The implication would be that alpha be kept small at the cost of decreasing power (i.e., increasing Type II error probability). After all, if we falsely conclude that the new drug is better and thus commit a Type I error, society must bear the considerable cost of producing and distributing the new drug only to ultimately discover that it is no better or even worse than the old drug. Protecting from Type I error at the expense of increasing the risk of a Type II error may mean that no one gets a new and better drug, but at least we will not replace a time-tested solution with a solution that does not work. As it turns out, Type I errors are usually more costly to society than Type II errors. Avoiding a Type I error will usually guard the status quo and therefore protect traditional practices and thinking.

It can be argued that under certain circumstances traditional wisdom is on the side of the alternative hypothesis, and to guard it, one must (if resources are limited) increase the risk of a Type I error in order to lower the risk of a Type II error. Indeed, it might be argued that this is the case regarding the question of

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	Sample Size		Harmonic	Relative		Date	
Researcher	N	n_a	n_b	Mean	Power	Country	(Data Collected)
David, et al.	98,612	27,234	71,378	39,426	.99+	Denmark	1974-75
Brewer	7,660	3,550	4,110	3,809	.99+	England	1975-76
Jansson, et al.	30,329	1,773	28,556	3,338	.99+	Sweden	1952 - 56
Meyerowitz, et al.	111	93	18	30	.12	U.S.A.	1963-69
Sclare, et al.	42	21	21	21	.10	Scotland	1960-68
Hamill, et al.	128	81	47	59	.17	Scotland	1971 - 72
Greenglass, et al.	126	63	63	63	.17	Canada	1972 - 73
Niswander, et al.	68	49	19	27	.12	U.S.A.	1971 - 72
Athanasiou, et al.	114	76	38	51	.16	U.S.A.	1970 - 72
McCance, et al.	300	192	108	138	.27	Scotland	1967-68
Drower, et al.	157	88	69	77	.19	South Africa	1974 - 75
Brody, et al.	152	94	58	72	.19	Canada	1968-70
Simon, et al.	78	32	46	38	.13	U.S.A.	1955-63
Todd, et al.	102	81	22	35	.13	Scotland	1968-70

 Table 1

 Statistical Power for Fourteen Comparative Studies That Examine the Psychological Sequelae of Abortion

Notes: For the purpose of power estimation, we have assumed the following: 1) that "ideal" experimental arrangements exist throughout the literature; namely, that all existing studies perfectly measure an identical outcome parameter that reflects level of depression and that perfect subject equivalency exists at baseline across the two conditions; 2) that post-event depression will be five percent greater in women experiencing abortion than women who carry to term, i.e., that there will be 25% postabortion depression vs. the 20% postpartum depression rate reported by Hopkins, et al., (1984), and 3) that a one tailed z test with alpha set at .05 on transformed proportions is used as the test statistic.

Power values were determined as outlined by Cohen (1977). In accordance with Cohen's guidelines for unequal sample sizes, the abortion and control group sample sizes (n_a and n_b , respectively) were converted to a single harmonic mean which was used to enter the power tables.

psychological risk and abortion. For example, the traditional or "status quo" view, many would maintain, is that women who undergo abortions evidence greater emotional risk than those who do not. According to these individuals, the "usual" expectation historically has been that if contrasted to a non-abortion control group, women electing abortion should evidence greater emotional stress. It would therefore follow that under conditions of limited resources, studies that compare an abortion to a non-abortion control group should raise the risk of a Type I error (i.e., falsely concluding there is a "difference") in order to lower the risk of a Type II error (i.e., falsely concluding there is not a "difference") on the grounds that doing so would protect the prevailing, traditional view. To do this, however, would mean using an alpha of greater than .05, which we all know is never done!

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We do not claim the foregoing argument, but we do maintain that when a large number of individuals believe strongly that a difference between experimental and control groups exists, as is the case in this country regarding the sequelae to abortion question, a statistical decision procedure with good power characteristics (i.e., a low risk of a Type II error) *must* be utilized out of respect for these individuals. In a word, those who are against abortion and believe it to increase psychological sequelae deserve quality studies with good statistical power characteristics. This is true, if for no other reason than that the popular press will label published studies with low statistical power that claim abortion has no psychological effect as "scientific," and in so doing give them a prestigious status. However, the popular press will not bother to explain, because they will not understand, that there was a good chance of arriving at that conclusion due to limited statistical power, quite aside from whether the conclusion is really true. As scientists who understand these concepts, we have a moral responsibility to make sure that the public is not misled by the absence of "statistically significant" differences in studies with low statistical power.

We have just completed an examination of the existing studies that compare a post-abortion group with a control. After making certain assumptions, we have calculated the level of statistical power present in each study. Our conclusion (see Table 1) is that 11 of the 14 existing studies exhibit statistical power that is not likely to exceed, but could be less than, .27. We hold that the majority of currently available comparative studies exhibit grossly substandard power characteristics even under assumptions that, if anything, overestimate power levels.

Internal Validity

Internal validity, as noted earlier, refers to the extent to which effects on outcome variables are due to the independent variable (i.e., abortion) rather than to other competing causes. Existing controlled studies addressing the issue of psychological sequelae invariably utilize a quasi-experimental design, termed the "static-group comparison" design in Campbell and Stanley's (1963) classic text. Experimental and Ouasiexperimental Designs for Research. (This design is termed the "nonequivalent control group" design if pre-treatment measures are available.) Because it is not possible to randomly assign women to conditions, the abortion and control groups cannot be equated at baseline by chance. Two threats that are endemic to these designs, mortality and selection, will serve to illustrate the serious problems that can plague a study if such threats are not countered.

Mortality becomes a threat when subjects who exhibit certain characteristics of potential importance to the conclusions of a study drop out of one treatment group but not the other. Differential dropout can lead to discrepancies between treatment groups on critical background variables, thus making comparisons at the end of the study impossible to interpret. This is a particularly serious problem in the sequelae to abortion literature due to certain findings reported by Adler (1976). She reviewed 17 studies dealing, to varying degrees, with psychological sequelae. She found sample attrition ranging from 13 percent (Barnes, Cohen, Stockle and McGuire, 1971) to 86 percent (Evans and Gusdon, 1973). In her own study, Adler followed up non-responders and found them most likely to be young, Catholic, and unmarried. Each of these characteristics has been associated with a greater likelihood of negative sequelae (Adler, 1975; Pavne, Kruita, Notman, and Anderson, 1976; Osofsky and Osofsky, 1972), Adler concluded that experimental mortality may result in the underestimation of the incidence of adverse responses to abortion.

Selection is a threat when, at the outset of the study, subjects assigned to the experimental condition differ from control subjects on baseline characteristics. In this event, differences or similarities between the experimental and control groups found at the end of the study may be due to the treatment (presence or absence of abortion), one or more baseline differences, or the interaction of the treatment with one or more baseline differences. The threat of selection is usually countered by randomly assigning subjects to conditions, but this, as noted earlier, is impossible for abortion sequelae research. If random assignment cannot be used to equate groups at baseline characteristics on selected variables to rule out possible important differences. Selection was indisputably a potential threat to the internal validity of more than 50 percent of the studies we reviewed because baseline measures simply were not collected. Without carefully establishing the baseline comparability of women who receive an abortion to those who do not on at least such rudimentary characteristics as age, number of children, education, socioeconomic status, social support, marital status and physical health, the meaning of differences or similarities in the incidence of sequelae will remain speculative.

Those who are against abortion and believe it to increase psychological sequelae deserve quality studies with good statistical power characteristics.

This short discussion should suffice to make the central point that as long as the static-group comparison and the nonequivalent control group designs, without adjustment to compensate for sources of invalidity, remain the standard designs used in abortion sequelae research, then numerous threats to internal validity will cloud our understanding of the psychological significance of abortion.

Construct Validity

Construct validity refers to the extent to which the outcome measures, treatments, samples and settings utilized in the research represent the theoretical constructs of interest. In the abortion sequelae literature, the main concern relates to the construct validity of the dependent variable (some measure of psychological sequelae). In other words, are sequelae being accurately measured? Standardized assessment measures such as the MMPI, the Center for Epidemiologic Studies Depression Scale (Radloff, 1977) or the Symptom Checklist-90 (Derogatis, 1977) have rarely been implemented in psychological sequelae research. Results have typically been derived from a variety of self-report questionnaires, interview schedules, rating scales and clinical opinions. These are almost always of undetermined psychometric adequacy.

We would like to illustrate some of the difficulties in the way psychological sequelae have been assessed with some examples. Niswander and Patterson (1967), Ewing and Rouse (1973), Kretzschmar and Norris (1967) and Bracken, Hachamovitch and Grossman (1974) devised their own self-report questionnaires to assess the psychological reaction to abortion. However, in virtually all instances no attempt was made to validate these instruments or even assess their reliability (i.e., consistency and preciseness). A variety of relatively simple methods have been devised for determining reliability (test-retest, parallel forms and splithalf techniques), but none of these were conducted. Clearly, the use of measuring devices with unknown reliability can potentially distort the conclusions one makes about the psychological impact of abortion.

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Other studies have implemented structured or unstructured interviews as the assessment measure (Patt, Rappaport and Barglow, 1969; Wallerstein, Kurtz and Bar-Din, 1972; Osofsky and Osofsky, 1972; Ford, Castelnuovo-Tedesco and Long, 1971; Peck and Marcus, 1966). It is common knowledge that psychiatric interviews can be highly unreliable and are subject to the specific orientation, level of expertise, biases and expectations of the interviewer. In virtually all cases reviewed, no attempt was made to assess inter-rater reliability (the degree to which two interviewers come to similar conclusions about the same subject), or to control for interviewer bias and expectancies. For example, Osofsky and Osofsky (1972) attempted to quantify such behaviors as crying and smiling during an unstructured interview. These behaviors could easily be influenced by characteristics of the interviewer, but no attempt was made to control for such factors.

Without carefully establishing the baseline comparability of women who receive an abortion to those who do not . . . the meaning of differences or similarities in the incidence of sequelae will remain speculative.

In general, we found little evidence to suggest that construct validity for the dependent measures used to assess sequelae was at an acceptable level. The list of potential threats to construct validity we found is too great to enumerate in this presentation. However, it includes, in addition to the above problems, such practices as obtaining information concerning the level of emotional adjustment from sources other than the patient (Meyerowitz, Satloff and Romano, 1971; Jacobs, Garcia, Rickels and Preucel, 1974; Pare and Raven, 1970; Lask, 1974); conducting follow-up assessment immediately after the abortion in the recovery room (Braken, Hachamovitch and Grossman, 1974; Osofsky and Osofsky, 1972; Moseley, Follinstad, Harley and Heckel, 1981); interviewing patients at unsystematized follow-up intervals ranging from one to five years (Kretzschmar and Norris, 1967) or several months to seven years (Meyerowitz, Satloff and Romano, 1971); and including patients who not only received an abortion but were also sterilized concomitantly, thus subjecting the subject to two treatments simultaneously and rendering any form of causal interpretation impossible.

External Validity

External validity refers to the ability to generalize findings across populations, settings and time, and is critical if the information is going to be useful apart from its experimental setting. However, the majority of existing studies utilize small, self-selected samples of women who had their abortion at one specific hospital. Such selection bias would likely limit the generalizability of any conclusions reached, even if the conclusions were made under conditions of high internal validity. For example, Niswander and Patterson (1967) asked the attending physician to approve or disapprove the mailing of a questionnaire to each of the patients, thus eliminating those patients of whom it was thought that the recollection of the abortion experience would be too painful. Abrams, DiBiase and Sturgis (1979) sent questionnaires only to those patients whom they felt were likely to respond. In both of these cases, the subject selection procedure could seriously alter the generalizability (external validity) of results.

Generalizability of results would be greatly enhanced if subject selection were stratified across the various settings in which abortions are performed. Indeed, the distribution of such settings can be approximated. In 1982, 82 percent of abortions in America were performed in non-hospital facilities: 56 percent in abortion clinics, 21 percent in other clinics, and 5 percent in physicians' offices (Henshaw, Forrest and Blaine, 1984). Eighteen percent of abortions were performed in hospitals. Unfortunately, no study of which we are aware has attempted to make the

Psychological diagnoses were used as an outcome criterion by some researchers. However, none of these studies utilized psychodiagnostic classification schemes with established psychometric adequacy such as the Research Diagnostic Criteria (Spitzer, Endicott and Robins, 1978) or DSM—II/III (American Psychiatric Association, 1968, 1980). Further, even these diagnostic instruments must be correctly applied by the practitioner if their inherent reliability is to be realized, but rarely was inter-rater reliability assessed. Without such reliability coefficients, the degree of confidence that one can have in the specific raters used in a given study is unknown.

research sample utilized in the study representative of these known demographic characteristics. The distribution of settings for the research sample being used is often not even specified.

A second obstacle to external validity is highlighted by the widely varying definitions of psychological sequelae that are used across the various studies in the area. In one respect, the search for abortion related sequelae of many different kinds enhances generalizability. However, to the degree that our confidence in findings is lessened because results of studies that use different definitions of sequelae are difficult to pool, generalizability is retarded. This may contribute to the inconsistencies found among results in the literature. Some studies define negative psychological reactions to abortion in terms of psychological symptomatology such as depression, anxiety or guilt. Another may attach importance to the number of symptoms, while others rely on the subjective experience of the woman as she reports it in a self-report questionnaire. The resulting ambiguities make the literature difficult to summarize as there are no subgroups of studies that consistently measure the same dependent variable defined in the same way. It therefore goes without saying that the literature contains few replications of procedures or findings. Given small sample sizes and virtually no replication across investigators, the potential for nongeneralizable (not to mention unreliable) conclusions is substantial.

Clearly, the use of measuring devices with unknown reliability can potentially distort the conclusions one makes about the psychological impact of abortion.

Lastly, generalizability across *time* is a crucial issue. Approximately half of the studies we reviewed were conducted from 1967 to 1973 when abortion laws were being liberalized. During this period, therapeutic abortions were granted on medical and/or psychiatric grounds. The remaining studies were conducted in the mid-to-late 1970's under abortion-on-demand. (Note that some of these studies were not published until the early 1980's). It is highly questionable as to whether conclusions drawn from studies utilizing women granted abortions on therapeutic grounds only, as was the case until 1973 in the United States, are generalizable to the current social milieu characterized by abortion-on-demand. Furthermore, as no new studies have been conducted in the current decade, the generalizability of conclusions from the more recent studies to the present is also open to question.

Generalizability of results would be greatly enhanced if subject selection were stratified across the various settings in which abortions are performed.

Which Studies are Best?

It now should be clear that considerable ambiguity surrounds the question of post-abortion sequelae because numerous methodological problems exist in the literature. In the midst of the confusion arising from generally poor methodology, it is only natural to ask whether some of the existing studies are more trustworthy than others. Certainly when studies of relatively high and low validities conflict, the conclusions of the higher quality studies should be given the most weight. As Mintz (1983) has stated, "literally no number of anecdotal reports, uncontrolled trials or poorly designed experiments can outweigh one carefully planned and executed controlled experiment if it results in clear and divergent findings" (p. 74). On this same issue, Smith, Glass and Miller (1980) write: "The important question in surveying a body of literature is to determine whether the best designed studies yield evidence different from more poorly designed studies. If the answer is yes, then one is compelled to believe the best ones" (p. 64).

Pursuing this line of thought, we would like to critique what we consider to be the "best" study done in this area to date. Danish researchers David, Rasmussen and Holst (1981) have carried out the only study we located that exhibited the minimum criteria of a control group, pretest measures, adequate sample size, an attempt to equate non-equivalent groups at baseline, and assessment tools with adequate validity and reliability. It is our hope that the ensuing critique of this study, which in our opinion is one of the few acceptable studies (but certainly not without problems), will highlight in a concrete way the issues that the clinician and/or woman considering abortion must keep in mind when examining the research.

Utilizing the computer linkage of the Danish national case registry, the above authors studied the

PSYCHOLOGICAL EFFECTS OF ABORTION



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RATE PER 10,000 WOMEN

Figures 1A - 1E Abortion rates per 10,000 in Denmark and England

Note: Dato for Denmark from David Rasmussen and Holst, 1981 Data far England from Brewer, 1977



DENMARK VS. ENGLAND

England

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Figure 1E





Figure 1D

Postportum Postabertian

J. L. ROGERS, J. F. PHIFER AND J. A. NELSON

comparative risk of admission to a psychiatric hospital within three months of an abortion or term delivery for all women under age 50 residing in Denmark. Data on admission to psychiatric hospitals was obtained on 71,378 women carrying pregnancies to term, 27,234 women terminating unwanted pregnancies, and on the total population of 1,169,819 women aged 15 to 49. In determining the incidence rates, only first admissions were recorded; women with an admission during the 15 months prior to the delivery or abortion were excluded.

Figure 1A contrasts women who delivered, women who had abortions, and all women in Denmark aged 15 through 49 on incidence of psychiatric hospitalization. Incidence rates were highest for women who were post-abortion (18.4 per 10,000), next highest for women who were postpartum (12.0 per 10,000), and lowest for all women (7.5 per 10,000). In Figure 1B the incidence rates have been further broken down by age category. Only in women aged 35 through 49 is there a reversal in the direction found in the composite data. Here, women who delivered evidenced a higher rate of psychiatric hospitalization than women who aborted (22.2 per 10,000 vs. 13.4 per 10,000). It appears that the pregnancy event (birth or abortion) interacts with age; women who are post-abortion are at greater risk except in the age category 35 through 49, where the relationship reverses.

Given small sample sizes and virtually no replication across investigators, the potential for nongeneralizable (not to mention unreliable) conclusions is substantial.

Incidence of psychiatric hospitalization between postpartum and post-abortion women in each of three marital status categories is depicted in Figure 1C. Differences across conditions are relatively small for women who were currently married or never were married, but are extreme when considering women who were separated, divorced or widowed (16.9 per 10,000 postpartum vs. 63.8 per 10,000 post-abortion). Apparently, women who have suffered from a separation with their husband also have a more difficult time dealing with the termination of the pregnancy. Lack of an emotional support system may be more prevalent for women who are estranged or whose husbands have died. Finally, Figure 1D compares postpartum and postabortion women across four levels of parity, or number of prior children. Regardless of the number of prior children, women who were postpartum evidenced a lower rate of psychiatric hospitalization than women who were post-abortion. However, these differences are more extreme for women with zero or one prior child (13.8 per 10,000 vs. 22.4 per 10,000 with parity of zero; 9.7 per 10,000 vs. 23.3 per 10,000 with parity of one). This may suggest that women who have one or no offspring are a greater post-abortion psychological risk than those with several children.

Our review of the post-abortion sequelae literature suggests that the majority of studies published in this area are greatly flawed.

Although these findings may seem reasonable to those not acquainted with the post-abortion sequelae literature because they mirror traditional expectations, it is apparent to anyone who has read this literature that these outcomes stand in stark contrast to conclusions reached by the majority of researchers. The majority of researchers conclude that there is no greater occurrence of post-abortion sequelae than postpartum sequelae. A study representative of this literature was done by the English researcher Brewer (1977) and was published in the prestigious British Medical Journal. Brewer places the post-abortion rate at only 3 per 10,000 while the postpartum rate was placed at 17 per 10,000. (See Figure le for a comparison to David, Rasmussen and Holst). Indeed, these findings led Brewer to conclude that "... childbirth is more hazardous in psychiatric terms than abortion " (p. 477). However, our analysis indicates that the Danish study by David, Rasmussen and Holst rests upon a much firmer methodological foundation than does the English study by Brewer.

We would like to delineate some of the problems found in the English study authored by Brewer as an illustration of our concern over poor methodology. First, Brewer relied upon a questionnaire that was sent to psychiatrists in a given British catchment area. Thus, his data depended upon each psychiatrist's memory and/or ability (willingness?) to retrieve records. We know of no reliability or validity coefficients for this questionnaire and have no reason to believe that any were computed. Additionally, the questionnaire was sent to only 25% of the psychiatric consultants in the area. There is no guarantee that these consultants are representative, and indeed Sim and Neisser in their analysis "Post-Abortive Psychoses: A Report from Two Centers" (1979) claim that "... the psychiatrist with the greatest responsibility and experience in the area of the assessment and treatment of patients with instability associated with pregnancy did not participate." Brewer also reports that some psychiatric consultants had well defined catchment areas while some had catchment areas that overlapped with those of other psychiatrists. In effect, the result of this overlap was that the denominators in the incidence rates were "estimated." All these practices stand in sharp contrast to David, Rasmussen and Holst's use of computer-held data for the entire population of Danish females aged 15 through 49. In addition, the Danish study matches the post-abortion and postpartum conditions on prior incidence of psychiatric admission over the prior 15month period, age, marital status, and parity. No attempt appears to have been made in the English study to equate comparison groups on these or any other factors.

Conclusion

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To summarize, our review of the post-abortion sequelae literature suggests that the majority of studies published in this area are greatly flawed. Rather than rely on the presently published conclusions, it seems prudent to focus attention on the methodological shortcomings in existing studies in order to provide for more reliable studies in the future. We readily agree that no

Abrams, M., Dibiasc, V. and Sturgis, S. (1979). Post-abortion attitudes patterns of birth control. Journal of Family Practice, 9, 593-599.

- Adler, N. E. (1975). Emotional responses of women following therapeutic abortion. American Journal of Orthopsychiatry, 45, 446-454.
- Adler, N. E. (1976). Sample attrition in studies of psychosocial sequelae of abortion: How great a problem. *Journal of Applied Social Psychology*, 6, 240-259.
- Arnerican Psychiatric Association (1968). Diagnostic and Statistical Manual of Mental Disorders. Washington: APA.
- Arnerican Psychiatric Association (1980). Diagnostic and Statistical Manual of Mental disorders. Washington: APA.
- Athanisiou, R., Oppel, W., Michelson, L., Unger, T. and Yager, M. (1973). Psychiatric sequelae to term birth and induced early and late abortion: A longitudinal study. *Family Planning Perspectives*, 5, 227-231.
- Barnes, A. B., Cohen, E., Stoekle, J. D. and McGuire, M. T. (1971). Therapeutic abortion: Medical and social sequelae. Annals of Internal Medicine, 75, 881-886.
- Bracken, M. B., Hachamovitch, M. and Grossman, G. (1974). The decision to abort and psychological sequelae. *Journal of Nervous and Mental Disease*, 158, 154–162.
- Brody, H., Meikle, S. and Gerritse, R. (1971). Therapeutic abortion: A prospective study. I. American Journal of Obstetrics and Gynecology, 109, 347-353.
- Brewer, C. (1977). Incidence of post-abortion psychosis: A prospective study. British Medical Journal, 6059, 476-477.
- Campbell, D. T. and Stanley, J. C. (1963). Experimental and Quasi-Experimental Designs for Research. Chicago: Rand McNally College

research area is free from inevitable methodological flaws, but not all research is dealing with such grave decisions as whether or not a pregnancy should be terminated. Our point is that when research is dealing with such a crucial issue as possible psychological risks for post-abortion women, we need to be as rigorous as possible in designing and conducting credible research.

At minimum, the findings of David, Rasmussen, and Holst, with its differing conclusions from studies evidencing less methodological rigor, should underscore the importance of readdressing the issue of postabortion psychological sequelae with better experimental design. Findings reported in what we consider to be the most reliable study to date are compatible with the assertion that post-abortion psychological sequelae occur more frequently than postpartum sequelae. Obviously, it is of considerable importance that other well planned studies be conducted in an effort to verify the findings reported by David, Rasmussen and Holst. It is crucial that these studies move beyond psychiatric hospitalization as an endpoint measurement to include other forms of emotional sequelae. At minimum, depression should be measured.

Our review of the literature leads us to conclude that the questions of psychological sequelae to abortion is not closed as many researchers have stated, but remains to be determined. Although such a conclusion fails to satisfy the expectations of either those for or against abortion on demand, it seems to reflect the present state of affairs.

REFERENCES

Publishing Company

- Cohen, J. (1977). Statistical Power Analysis for the Behavioral Sciences. New York: Academic Press, Inc.
- Cook, T. D. and Campbell, D. T. (1979). Quasi-Experimentation: Design and Analysis Issues for Field Settings. Chicago: Rand McNally College Publishing Company.
- David, H. P., Rasmussen, N. K. and Holst, E. (1981). Postpartum and postabortion psychotic reactions. *Family Planning Perspectives*, 13, 88-92.
- Derogatis, L. R. (1977). The SCL-90 Manual I: Scoring Administration and Procedures for the SCL-90. Baltimore, Md.: John Hopkins School of Medicine, Clinical Psychometrics Unit.
- Drower, S. J. and Nash, E. S. (1978). Therapeutic abortion on psychiatric grounds. South African Medical Journal, 54, 604-608.
- Evans, D., and Gusdon, J. (1973). Post-abortion attitudes. North Carolina Medical Journal, 34, 271-273.
- Ewing, J. A. and Rouse, B. A. (1973). Therapeutic abortion and a prior psychiatric history. American Journal of Psychiatry, 130, 37-40.
- Ford, C. V., Castelnuovo-Tedesco, T. P. and Long, K. D. (1971). Abortion: Is it a therapeutic procedure in psychiatry. Journal of the American Medical Association, 218, 1173-1178.
- Greenglass, E. R. (1975). Therapeutic abortion and its psychological implicatons: The Canadian experience. *Canadian Medical Association Journal*, 113, 754-757.
- Hamill, E. and Ingram, I. M. (1974). Psychiatric and social factors in the abortion decision. British Medical Journal, 1, 229-232.

Henshaw, S. K., Forrest, J. D. and Blaine, E. (1984). Abortion services in the

United States, 1981-1982. Family Planning Perspectives, 16, 119-127.

- Hopkins, J., Marcus, M. and Campbell, S. B. (1984). Postpartum depression: A critical review. Psychological Bulletin, 95(3), 498-515.
- Jacobs, D., Garcia, C. R., Rickels, K. and Preucel, R. W. (1974). A prospective study on the pscyhological effects of therapeutic abortion. *Comprehensive Psychiatry*, 15, 423-434.
- Jansson, B. (1965). Mental disorders after abortion. Acta Psychiatrica Scandinavica, 41, 87-110.
- Kretzschmar, R. M. and Norris, A. S. (1967). Psychiatric implications of therapeutic abortion. American Journal of Obstetrics and Cynecology, 98, 368-373.
- Lask, B. (1975). Short-term psychiatric sequelae to therapeutic termination of pregnancy. British Journal of Psychiatry, 126, 173-177.
- McCance, C., Olley, P. C. and Edward, V. (1973). Long term psychiatric follow-up. In G. Horobin (ed.), *Experience with Abortion*. Cambridge: Cambridge University Press, pp. 245–300.
- Meyerowitz, S., Satloff, A. and Romano, J. (1971). Induced abortion for psychiatric indication. American Journal of Psychiatry, 127, 1153-1160.
- Mintz, J. (1983). Integrating research evidence: A commentary on metaanalysis. Journal of Consulting and Clinical Psychology, 51, 71-75.
- Mosely, D. T., Follingstad, D. R., Harley, H. and Heckel, R. V. (1981). Psychological factors that predict reaction to abortion. *Journal of Clinical Psychology*, 37, 276–279.
- Niswander, K. and Patterson, R. (1967). Psychological reaction to therapeutic abortion: I. Subjective patient response. Obstetrics and Cynecology, 29, 702-706.
- Osofsky, D. and Osofsky, J. (1972). The psychological reaction of patients to legalized abortion. American Journal of Orthopsuchiatru, 42, 48-60.
- Pare, C. M. and Raven, H. (1970). Follow-up of patients referred for termination of pregnancy. *Lancet*, 1, 653–638.

- Patt, S. L., Rappaport, R. G. and Barglow, P. (1969). Follow-up of therapeutic abortion. Archives of General Psychiatry, 20, 408-414.
 Payne, E. C., Kravitz, A. R., Notman, M. T. and Anderson, J. V. (1976).
- Payne, E. C., Kravitz, A. R., Notman, M. T. and Anderson, J. V. (1976). Outcome following therapeutic abortion. Archives of General Psychiatry, 33, 725-733.
- Peck, A. and Marcus, H. (1966). Psychiatric sequelae of the therapeutic interruption of pregnancy. *Journal of Nervous and Mental Disease*, 143, 417-425.
- Radloff, L. (1977). The CES-D scale: A self-report depression scale for research in the general population. Journal of the Applied Psychological Measurement, I, 385-401.
- Sclare, A. B. and Geraghty, B. P. (1971). Therapeutic abortion: A follow-up study. Scottish Medical Journal, 16, 438-442.
- Sim, M. and R. Neisser (1979). Post-abortive psychoses: A report from two centers. In D. Mall & W. F. Watts (eds.), *The Psychological Aspects of Abortion*. Washington, D. C.: University Publications of America, Inc., pp. 1-13.
- Simon, N. M., Rothman, D., Goff, J. T. and Senturia, A. G. (1969). Psychological factors related to spontaneous and therapeutic abortion. American Journal of Obstetrics and Cynecology, 104, 799-808.
- Smith, M., Glass, C. and Miller, T. (1980). The Benefits of Psychotherapy. Baltimore, Md.: John Hopkins Press.
- Spitzer, R. L., Endicott, J. and Robins, E. (1978). Research diagnostic criteria. Archives of General Psychiatry, 35, 837-844.
- Todd, N. A. (1971). Psychiatric experience of the abortion act (1967). British Journal of Psychiatry, 119, 489-495.
- Wallerstein, S., Kurtz, P. and Bar-Din, M. (1972). Psychological sequelae of therapeutic abortion in young unmarried women. Archives of General Psychiatry, 27, 828–832.

"We are all passengers in a runaway train with neither conductor nor engineer. All we know is that our speed is steadily increasing.

"The tension between the technical apparatus of our existence and the unsolved social, human and spiritual problems, between our mastery of nature and our inadequate solutions of other questions—this tension is growing at a frightening rate. "We have set loose a vast dynamism. How are we to bring it under control again?"

Julius Baer, a Swiss banker. Quoted in U.S. News and World Report, December 12, 1966; p. 46.

Some Implications of the New Reproductive Technologies*

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In this paper I explore a range of implications of the new reproductive technologies, in areas that I consider to be crucial from the standpoint of Christian thinking and practice. In doing this I go beyond specific questions, such as the status of the fetus and the nature of personhood, and concentrate instead on broader issues, such as the value of human life, our approach to procreation and infertility, and the nature of the family. This is an exploration of broad themes which will, I hope, elicit a serious assessment of basic attitudes towards the new (and not-so-new) reproductive technologies.

Value of Human Life

The reproductive revolution has forced me to go back to biblical and theological principles, in an attempt to extract those principles of relevance to the questions raised by contemporary biotechnology. The following provide a hint as to the sort of issues I think we should be considering.

a. Human life, for each one of us, is on loan from God.¹ It is a gift from God, and should never be viewed as primarily being of intrinsic biological value. Its value is derived from God, and is to be seen as coming from God and as being for his use. The value of human life can never, therefore, be isolated from its relation to God. Hence, in assessing how to deal with difficult ethical questions in the realm of bioethics, we must always work within this framework rather than view each human life in abstract absolute terms.

b. The wholeness of human beings implies that their biological-spiritual unity must be treated with serious-

ness. It also means that the biological aspect of human life cannot be subdivided into discrete genetic and environmental components. Consequently, human life cannot be defined solely in terms of its genetic uniqueness, any more than it can be defined only in environmental, social or spiritual terms. If this is true, it follows that the individuality of human beings derives not only from their genetic uniqueness, but also from the myriad environmental and spiritual factors essential for healthy personal development. Individuality is lost when there is no scope for growth and fulfilment as a being in one's own right, and when the opportunity to become oneself is denied or frustrated. What is of critical importance, therefore, is human value rather than the mere existence of human life in its barest essentials.

^{*}The ideas expressed in this paper are discussed in greater detail in my book, Manufacturing Humans, recently published in the United States by Eerdmans.

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c. Human life should always be characterized by the potential to transcend what one is at present. For the individual this entails the potential to become more fully human in all aspects of one's life—in matters of health and culture, in family life, in the nature of one's employment, and in obedience to God's revelation and specific directives. It also implies that we are to assist and encourage others, so that they have the opportunity under God of realizing their potential. Potentiality, in these terms, applies with equal force to prenatal and postnatal life.

d. The quality of an individual's life is important. It is unfortunate that the term "quality of life" in bioethics has, in the eves of some, become confined to the biological or medical quality of life. Equally unfortunate is the backlash this has entailed, so that for others 'quality of life'' is virtually a term of abuse. Nevertheless, the quality of life in a broad sense is seen to be an essential attribute of a Christian perspective on human life. The goal for the lives of individual human beings is an adequate physical existence, and a satisfactory dayto-day experience of family and social obligations, work, recreation, moral responsibility, and a whole range of challenges and expectations. It also incorporates spiritual experience, the service of God and one's fellow human beings, and interaction with other humans in love, forgiveness and hope.

It follows that any available technology may be used if it contributes to the richest possible life for the individual and for the enhancement of family life. Technologies, therefore, should cause us grave concern if they devalue the individual and his or her relationships. Conversely, and in terms of medical priorities, technologies should be positively encouraged if they hold out the possibility of enriching the life (or future life) of that person and of those closely related to him or her.

e. The undervaluing of human life may take many forms. It may certainly stem from the widescale

destruction of fetal life for superficial reasons. But it may also be the result of the irresponsible creation of new life—within marriage or outside of it, in bed or in the laboratory. It may stem from pregnant women smoking or drinking alcohol, from unjust social or commercial practices, from an inequitable distribution of resources within our society or between societies, and from gross inequality of opportunities within a society.

Human life is tragically easily wasted, and all instances—whatever the motives—are an implicit denial that human life is precious to God. All forms of pointless human wastage are destructive of hope and question the value placed upon human life by God.

f. Although all human life has value and worth, choices between one human life and another are sometimes inevitable, or one group of humans is favoured above another group. Many such choices are invidious, and we should aim to ensure that, as far as possible, our social and economic systems do not precipitate these dilemmas with their overtones of injustice, exploitation and consequent despair. In the final analysis though, our world is a sinful one, and it is this that forms the basis of the ethical ambiguity, the moral imperfection and the errors of judgement with which we have to contend. Much as we might wish that all human life was of absolute value, in practice as well as in theory, this does not appear to be the case. Is it possible to argue that the lives of any particular groups of humans should be regarded as inviolate? If this is done on the grounds that the weak are entitled to the strongest protection, we may find that it fails to do justice to the overall challenge presented by the Christian imperative to value and enrich all human life.

g. Choosing between the lives of different human beings is a reflection of our responsibility as human beings under God. Such responsibility has, of course, many more ramifications than just this particular one. Our technological prowess has brought within our control our own potential as human beings. This is an



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extension of the God-given mandate to subdue the earth and bring it within our control. We are responsible therefore, both for ourselves and others as human beings, for nature in general and the human species in particular.

Human life cannot be defined solely in terms of its genetic uniqueness, any more than it can be defined only in environmental, social or spiritual terms.

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Technology has possibilities for the good of human life, and it is appropriate that we, as created beings, should fulfil our God-given directive to utilize it in ways that will further human welfare. Choices are implicit in this, between one application of a technological development and an alternative application; between one individual who could benefit from a particular procedure and another individual who has to lose out because of a lack of resources; between children in one country who benefit from expensive medical care and children in another country for whom even the most basic of medical resources are unavailable. However complex some of these choices, they are nevertheless choices that individuals or societies are making repeatedly-either deliberately or without thinking.2

The perspective which I believe emerges from the biblical teaching on human life is that our technological expertise is one of the riches bestowed upon us by God, and as such is to be employed wisely and responsibly. We are to be thankful for these riches, but we are also to realize the responsibility bestowed upon us to be faithful in our stewardship of such abundant resources. We are never to confuse these riches with faith. If we do, we confuse the creature with the Creator, and the difference between inordinate dependence upon human expertise and worshipful dependence upon God.

Procreation and Infertility

The "Brave New World" of reproductive technology has its roots in one of the most inauspicious of all longings—the desire for a child. It is not the desire for power or glory or even a perfect body, but the much humbler longing for progeny. There are, of course, additional elements and we would be unwise to downgrade these. Nevertheless, the drive behind much of the work in reproductive technology is the problem of infertility. It behooves us therefore, as we seek Christian directions for our bioethical thinking, to pay sufficient attention to both the place and importance of infertility in almost every aspect of this debate.

The desire for children stems from our creation as male and female, in other words, as sexual beings. The biblical concept of personhood is very closely related to sexuality, which fulfils several fundamental needs in human beings, including the need for companionship and intimacy and also the desire to procreate. While individuals may live fulfilled lives in the absence of one or more of these, they remain basic to human life as a whole.

The procreative urge is built into our biological, that is, our created, make-up. The desire on the part of a woman to be pregnant and to give birth to a child is an essentially human desire. The strength of the urge in many women reflects what a woman is in the image of God. A fetus, and subsequently a child, is part of the woman in a profound way, something it is perhaps impossible for a male to understand and which has biological, psychological and even spiritual implications for the woman herself. This underlines the gravity of induced abortion on the one hand, but it also underlines the gravity of giving up a baby for adoption on the other.

We should aim to ensure that, as far as possible, our social and economic systems do not precipitate these dilemmas with their overtones of injustice, exploitation and consequent despair.

By itself, of course, the desire to bear a child does not bypass the need to make ethical decisions. Such decisions still have to be made when confronted by abortion or adoption, both of which have to be decided on other grounds. Neither does it suggest that a single woman or a lesbian couple should bear children. What it does is direct our attention to what for many women is a very powerful and very understandable desire. This, in turn, stresses the gravity of the choices that are repeatedly being made in the reproductive area, and these are accentuated by the ever-increasing choices being held out by modern reproductive technology and also by the influence of social pressures.

In the Old Testament we find certain patterns for circumventing childlessness, such as the patriarchal pattern and levirite marriage.³ Whatever may be made of these particular devices, they certainly appear to illustrate God's concern for the infertile. It may well be legitimate therefore, to search for remedies to overcome it. What does come through in the Old Testament is that the goal of these procedures was to strengthen the family unit, even if some of the attempts were misguided. What we have to decide is whether these Old Testament devices have any relevance for our quite different form of society, and if so, whether they provide us with guidelines for practices of gamete donation and surrogate motherhood.

This [profound human desire] underlines the gravity of induced abortion on the one hand, but it also underlines the gravity of giving up a baby for adoption on the other.

There appears to be no suggestion that we actually employ these Old Testament practices today, especially in view of the involvement of sexual intercourse by a third party and the possible involvement of polygamy. Can we learn anything though, from the importance to one society of providing a family with an heir, when the demand in our society is to provide a husband and wife with a child? This raises the issue of the nature and extent of the family, to which far too little attention has been paid by theologians.

We are still left with the question of how far we should go in attempting to alleviate infertility. Regardless of any specific answers we provide, we need to remember that the availability of a technological procedure is never sufficient reason for using it. Somehow or other we are going to have to put together biblical principles and directives, and the intertwined threads of infertility, technological expertise and the challenges of procedures such as gamete donation and human embryo research.

Another issue I should like to raise is perhaps an unexpected one in this context, and it is that of adoption. I shall not go into the theological dimensions of adoption,⁴ except to say that it appears to have two prominent emphases—the openness of God in accepting into his family those who are undeserving, and the obligation placed on the followers of Christ to assist children and others in need. From here it is but a short step to the establishment of orphanages and acceptance of the practice of adoption. The issue confronting us is whether adoption as we know it today is simply concerned with the welfare of the adopted child.

Most adoptive parents have traditionally been infertile couples, or alternatively, couples who for some medical reason have decided against having children (or further children) of their own. For as long as there was an ample supply of babies awaiting adoption within the community concerned, the desire of couples for a child (or children) and the needs of the babies available for adoption converged. Although the desire to avert childlessness would probably have been uppermost in the motives of the couples concerned, this fitted in very well with the welfare of the adoptive children who were accepted into families rather than left to face a future of institutional life. There were, of course, difficulties since certain children-notably those with mental or physical handicaps, and those with a different cultural or ethnic background—were not readily accepted for adoption. In this regard, the social practice of adoption has generally fallen short of adoption in biblical terms.

These problems with adoption have been markedly accentuated over recent years as the number of "acceptable" babies available for adoption has dropped dramatically in countries with liberal abortion practices and where single parents are accepted. The result has been an increasing emphasis on one particular motive for adoption, namely, the overcoming of childlessness. There is no longer any problem in finding suitable adoptive families for "acceptable" babies; the social problem of meeting the needs of these children has, therefore, all but disappeared. With this trend, the face of adoption has changed: its role in overcoming childlessness has come to the fore, as has the plight of the "unacceptable" babies.⁵

Not infrequently, it is argued that pregnant single women (very often teenagers) seeking an abortion should be counselled to continue with the pregnancy, and make the child available for adoption. In this way the fetus' life will be saved, and a childless couple will be provided with a child. While I accept that there is considerable merit in both these consequences, we need to be aware that this view of adoption is quite different from the traditional one. Instead of the needs of an existing child being met by being made part of a family, a child is now being brought into the world in order to meet the needs of a childless couple.

I am well aware that this is only part of the issue, since a fetus' life is also being saved; nevertheless the way in which the argument is expressed is putting the
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spotlight on the couple longing for a child. In general social terms this may be quite acceptable. We need to realize, however, what it is that we are doing: we are providing a couple with a child which is not genetically theirs, and we are doing this for the sole reason that they desire a child. In moving in this direction we are accepting the notion that the nuclear family need not be a genetically homogeneous unit. This is being done with only limited regard for humanitarian reasons stemming from concern for the welfare of the child.

It is my contention that contemporary adoption enshrines a range of awkward ethical dilemmas, many of which are also encountered (sometimes in more extreme forms) in the new reproductive technologies. For the couple seeking a child for adoption, various choices confront them: between a healthy child and one with some form of handicap; between a child with their own racial characteristics as against one with different racial characteristics; between a child unrelated to them genetically (the adopted child), as opposed to one completely or partially their own in genetic terms but conceived using some artificial means. The couple also needs to consider the motives behind whatever choice they make.

Adoption also involves another party, and this is the woman whose child it is—the biological mother. While it is easy to advocate that a woman (frequently single and frequently a teenager) with an "unwanted" baby should give up the baby to a couple longing for one, the biological and psychological bonds between the biological mother and the child are still broken. We should be aware that the arguments used to justify this will have relevance for arguments used in favour of surrogate motherhood. While there are immense differences between the two situations, there are also areas of overlap that we would be foolish to ignore.

Nature of the Family

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For me, one of the great implications of the new reproductive technologies is to sort out the boundaries of the family as a unit. This issue is raised by the whole area of gamete donations and also by surrogacy in its many forms.

The control which can now be exerted over reproduction means that the production of children can be divorced more and more readily from the context of the "family" and from the marriage relationship. A major difficulty, however, is that discussions rarely get beyond the conjugal or nuclear family, with the result that unrealistic expectations are placed on the nuclear family. This is particularly evident when infertility and childlessness are threatening the stability of this family unit. A general principle to emerge from the biblical teaching is that there is a mutuality of relationships within the "family," whether this be the nuclear family, the extended family or the church family.⁶ To expect a husband and wife to cope *in isolation* with the trauma of infertility, or with bringing up a handicapped child (or incidentally with many other social pressures) is to place upon them a burden totally alien to Hebraic and Christian precepts.

In sociological terms, the concepts of family and marriage crop up repeatedly within society, and so they have to be tackled from this perspective as well as from the Hebraic-Christian one. Unfortunately, there are no ready definitions, especially of the family. It may refer to a married couple alone, a married couple with children, three generations of related people, an unmarried couple with children, a married couple with adopted or foster children, a married (or unmarried) couple whose children have grown up and are living away from home, a solo (divorced, widowed or single) parent with children, and so on. From this range of possibilities it is clear that, while marriage frequently has a great deal to do with the family, this is not always the case.

Contemporary adoption enshrines a range of awkward ethical dilemmas, many of which are also encountered (sometimes in more extreme forms) in the new reproductive technologies.

Robert Snowden and collaborators at the University of Exeter⁷ recognize two essential ingredients in family life. These are: (1) an exclusive sexual relationship, and (2) the birth, nurturing and upbringing of children. For them, family and marriage are concerned primarily with issues surrounding procreation. Taking this further, they argue that familial relationships normally imply a shared genetic background. The genetic link is a direct one in the case of children and their parents, and an indirect one where the birth of children unites previously unrelated sets of kin. In this way, direct and indirect genetic links are important in establishing "family" relationships, although such relationships are possible in the case of childless couples and their respective in-law kin.

Within "normal" family situations, there are a number of assumptions. These include recognition of the mother and father, their respective roles in being the biological (genetic) parents of the children as well as their social parents, and the exclusivity of their sexual relationship. These assumptions are shattered by artificial interventions into the reproductive process, and they are also shattered by adultery and adoption. Doubts arise over recognition of the parents, when the genetic link between the two parents and their children are broken, or when all stages in the reproductive process are not carried out in the same woman.

While genetic continuity within a family may be the simplest situation to deal with, the lack of such continuity can be handled in the context of loving, accepting relationships.

Under normal circumstances the genetic and nurturing functions of parents are difficult to separate. Once a division is created between these functions, difficulties in recognition may well ensue. This is because a division has been created between the child's *past*, in terms of family history, and its *present*, in terms of current family relationships. The crucial role of nurturing the child after its birth (the obvious face of parenting) may be carried out by those who have had no involvement in the child's *past*. This is when doubts are expressed about the child's *real* parentage or about the father's status as the *real* father (as in artificial insemination by donor, AID).

Whatever the child's genetic status, and whatever genetic links there may or may not be with the (social) parents, a successful family environment is one in which the relationships are based on respect and trust. Relationships of this calibre are crucial to the wellbeing and healthy development of children. Without them family life disintegrates and is rapidly undermined. In general, important support is provided by society's recognition of marriage and the family (including non-genetic relationships such as in adoption). If society were to conclude that family relationships were no longer worth supporting, the implications for family life could be far-reaching.

From what I have said a number of points emerge. First, monogamy is the ideal pattern in marriage. If this is so, it follows that the ideal family pattern is one in which there is genetic continuity between the parents and children. Second, the extended family has a great deal to recommend it. In our contemporary societies it may encompass not simply different generations of the one genetic family, but a nuclear (genetic) family together with one or more unrelated individuals such as single people, infertile couples, foster children and young people. Although extended families may take many different forms, a central feature of them should be a welcoming atmosphere with trusting relationships. It is this mutuality of support and care that is important. In this way, the loneliness and isolation of the single person or the childless couple may—to some degree be overcome, while the excessive demands made by children on the parents of a large family or on a solo parent may be alleviated.

The quality of the relationships existing within the nuclear or extended family is the critical element in the nurturing of children. It is this that provides an appropriate context within which a child may begin to realize its potential. Once this is established, it can be seen how lack of genetic continuity can be accommodated. While genetic continuity within a family (in its narrow context) may be the simplest situation to deal with, the lack of such continuity can be handled in the context of loving, accepting relationships. It is within this framework that the adopted or fostered child can flourish, as can the child born out of wedlock, or reared by a step-parent, or conceived and born with the aid of a diverse range of reproductive technologies. The fundamental questions from a Christian perspective can then be seen to center not so much on the technology per se, but on the context in which it is used and the family environment in which the offspring will be reared.

Significance of Fertilization

Some of the most difficult implications of the new reproductive technologies for us to cope with are those revolving around the event of fertilization. For one group of people, those who are desperately longing for a child, fertilization has been elevated to the status of an idol. It is the one thing they want more than anything, and, for some, virtually anything may be sacrificed to attain it. Hence, the willingness to cross previously uncrossable marriage boundaries. Paradoxically this is not the only group who may be in this position. At the other end of the spectrum, those who appear to place more value on embryonic life than on any other form of human life have also made it an idol. For them, once new human life has been conceived, nothing whatsoever should come between that nascent life and its realization in the birth of a child. All the weight of the "sanctity of human life" has to be borne by the event of fertilization, so that idol status has, in effect, been bestowed upon fertilization.

I realize this is a provocative statement. It is made, however, in an effort to make us ask how adequate (or otherwise) is this particular traditional view of fertilization at coping with the challenges of the new reproductive technologies. In saying this, I am not prejudging these technologies; I am not arguing that they have to be accepted and that traditional views of fertilization have to be altered. Rather, I am asking whether the weight many Christians have placed on fertilization is not too much for it to bear.

Perhaps I can illustrate this, and related points, by reference to three groups of issues. The first of these concerns contraception. Let us imagine four couples: A, B, C and D. Not one of them wishes to conceive. Couple A decide not to have intercourse; thereby preventing a possible future child from coming into existence. Couple B have intercourse; since they are using an oral contraceptive, fertilization does not occur, and no child results. Couple C have intercourse, and the wife is using an intra-uterine contraceptive device (IUCD); fertilization does occur, but the embryo is prevented from implanting; no child results. Couple D have intercourse, but no contraceptive is being employed since they think they are infertile and have no reason to expect to conceive. Fertilization, however, occurs on this occasion; a child is not wanted on account of the wife's chronic ill-health; a first trimester abortion is carried out, and no child results.

All the weight of the "sanctity of human life" has to be borne by the event of fertilization, so that idol status has, in effect, been bestowed upon fertilization.

These four couples pose immense challenges to our ethical decision-making, and demonstrate clearly the stress we place on fertilization. The intention of all four couples is the same—none of them wishes to conceive and bring a new human being into existence. The result in all four cases is the same, and yet in two of them fertilization occurs. Are couples C and D acting unethically, or is there no difference between all four couples? In terms of the principles outlined previously, there is a difference ethically between the actions of A and B on the one hand, and those of C and D on the other. The principles dealt with earlier do not rule out the actions of C and D under every circumstance. They do, however, see them in hierarchical terms, with the actions of both C and D being less acceptable than those of A and B—and D being more objectionable than those of C. In both instances, they should only be resorted to in situations where all other contraceptive procedures have failed, and where there is conflict between two courses of action both regarded as evil. If, however, fertilization is used as an absolute landmark, the actions of C and D become unethical.

A second illustration refers to couples E, F, G, H and I. In this case the couples wish to conceive. Couple E are fertile; they have intercourse and fertilization occurs. Each time they want to conceive they know they will be successful within two to three months. Couple F are fertile but there are certain sexual problems requiring counselling. With help, however, they overcome these problems and are able to conceive. With couple G, the male partner has an infertility problem. However, the use of artificial insemination by the husband (AIH) helps to circumvent this problem, and fertilization occurs using AIH. In the case of couple H, there is an infertility problem on the female side. This is solved by microsurgery on her uterine tubes, and fertilization subsequently occurs. A similar problem exists with couple I; surgery is unsuccessful in this instance, although fertilization is brought about using in vitro fertilization (IVF).

In each of these cases the couple wish to have a child of their own, derived from their own genetic materials. They do not want to introduce a third party into their marriage relationship. Each of them is successful, although different avenues are used. Each of them would, ideally, have wanted a child in the simplest, easiest and most natural fashion-just like couple Eand yet they are unable to do so. The question is, Have couples F to I acted less ethically than couple E? Is there any distinction between the actions of couples F and G, both of whom have received therapy and yet only couple G have had artificial assistance in the reproductive process itself? Is there any distinction between couples H and I, both of whom have the same problem (blockage in the female partner's uterine tubes) and resort to the same initial treatment (microsurgery to repair the blocked tubes); and yet couple I had to go further and employ IVF?

Yet again, there is ethical uncertainty. The goal of all five couples is the same—the production of a child from their own bodies, a child who is the outcome of their marital love. In none of these instances has there been any abrogation of the marriage bond or any desire to do so. In each case the desire has been to raise a family of their own, to care for and to bring up any resulting children within the confines of the love and warmth of a couple committed to each other and also to others for whom they have responsibility. Any differences between these couples stem from the extent of

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their fertility, and the intrusion of therapy into the reproductive process. On the basis of the principles outlined previously, there are no ethical differences between the actions of any of these couples. When undue emphasis is placed on fertilization, however, AIH may be regarded as unethical, and IVF almost definitely will be viewed as such.

A third set of illustrations concerns couples J, K, L and M in an IVF program. Couple J conceive using the simplest form of IVF, with the husband's sperm and the wife's ovum; no freezing of embryos is involved. In the case of couple K six embryos are produced. Two are transferred to the wife's uterus on each of three successive months; she becomes pregnant on the third attempt. Although four embryos were initially frozen, none remain at the end of the treatment period. With couple L six embryos are again produced; in this case, however, the wife becomes pregnant on the first treatment, leaving four spare embryos. All these are used a couple of years later to provide the couple with a second child, so that no spare embryos remain. In the case of couple M, six embryos are produced and pregnancy occurs after four have been used. The two spare embryos are not required by this couple, and are discarded. Once again, there are ethical uncertainties which have nothing to do with transgressing the bounds of the marital relationship. They do, however, raise once more the question of the artificial assistance of reproduction, and the production of an excess number of embryos, their freezing, and their fate. When stress is laid on fertilization, none of these procedures will be ethically acceptable. However, the principles I have discussed open the way to the actions of couple J. The actions of couples K through M are, however, more problematic since the freezing of embryos is undertaken knowing that there may be surplus ones to the couples' requirements. There is no way of knowing whether this will or will not be the case in any individual instance. The matter can only be resolved in terms of the status ascribed to the embryos under these circumstances.

These illustrations highlight some of the uncertainties surrounding the event of fertilization. These include a reassessment of the acceptability of contraception (both natural and artificial), they introduce conflict between giving "life" to the preimplantation embryo and the legitimacy of embryo donation, and they bring to the fore the competing claims of the preimplantation embryo, the later fetus, and postnatal human life.

Undue emphasis on fertilization does not eliminate conflict and uncertainty. In fact, it increases both conflict and uncertainty. The nature of the uncertainties has, however, been changed, and the repercussions are enormous for almost every facet of reproductive bioethics, and even for our views of marriage and the family.

Concluding Remarks

The implications of the new reproductive technologies are diverse. Some are specific, and bring us faceto-face with specific decisions—approval or disapproval of AID, IVF, the freezing of human embryos, *et cetera*. Others, however, are of a much more general nature, touching as they do on our attitudes towards infertility, adoption, and the family. Above all, these technologies should be forcing us to question the way in which we make ethical decisions in many "non-technological" (as well as "technological") areas of our lives. Perhaps some of our widely accepted attitudes are not as firmly based in theological realities as we might like to think.

NOTES

- For a fuller discussion of some of these points see J. Robert Nelson, Human Life: A Biblical Perspective for Bioethics, Fortress Press, Philadelphia, 1984.
- 2. The making of choices such as these is a salutary reminder that there can be no escape from such decision-making, which frequently has to be undertaken on financial grounds. This occurs not only in the medical area, but also in, for instance, the planning of road systems where costs and safety factors are integral facets of planning. These general considerations are relevant to the IVF debate, since one of the reasons sometimes given for rejecting IVF on moral grounds is that choices have to be made between one embryo and another. This is considered by some to be unethical, entailing as it does the choice of one "human life" at the expense of another. Quite apart from the observation that this is a constant occurrence in natural fertilization, it is also placing demands on our ethical system that we do not make in other areas.
- For biblical references to these patterns, see Genesis 16:1-15, 30:1-13; Deuteronomy 25:5-10; Genesis 38. For a New Testament reference to one of these illustrations, see Galatians 4:22-27.
- 4. For an outline of the theological dimensions of adoption see, for example, J. I. Packer, *Knowing God*, Hodder and Stoughton, London, 1973.
- 5. The human side of infertility and adoption, as well as the plight of unacceptable babies, is brought out in Joy Cooke's book, Why Us, Lord?, Pickering Paperbacks, Basingstoke, 1985. Perhaps the most controversial and unsatisfactory aspect of this personal account of the trauma of infertility comes with the Cooke's rejection of a mentally retarded baby, suffering from galactosaemia, who was offered to them for adoption. While the pathos of this choice is self-evident, the rejection of the child is interpreted as Cod's will for them. Since the author was strongly opposed to abortion, one is left wondering what is Cod's will for those who have no choice about caring for a mentally retarded child. This incident also throws a great deal of light on contemporary attitudes (even on the part of some Christians who would resolutely deny such attitudes) implicit in the emphasis upon adoption as a means of overcoming childlessness rather than of caring for a child in desperate need of a loving family, the importance attached to an adequate "quality of life" (defined in strictly biological terms), and the assumption that children are an essential part of marriage.
- 6. For an analysis of the "family" in the Old Testament see, for example, a paper by Michael Schluter and Roy Clements entitled "Family Policy in Old Testament Israel: Some Lessons for British Social Policy in the 1980's," published by the Universities and Colleges Christian Fellowship (UCCF), Leicester, 1984. Further aspects of the concept of the family are to be found in F. J. Kline, "Family," in Baker's Dictionary of Christian Ethics, Baker Book House, Grand Rapids, 1973, pp. 237-242; in T. C. Mitchell and D. W. B. Robinson, "Family," "Household," in J. D. Douglas (ed.), The Illustrated Bible Dictionary, Part 1, Inter-Varsity Press, Leicester, 1980, pp. 500-502; in J. I. Packer, M. C. Tenney and W. White (eds.), articles on "Family Relationships" and "Birth and Death," The Bible Almanac, Nelson, Nashville, 1980, pp. 411-419 and pp. 440-449.
- R. Snowden, G. D. Mitchell and E. M. Snowden. Artificial Reproduction: A Social Investigation, Allen and Unwin, London, 1983.

Communications

THE THERMODYNAMICAL TRIPLE POINT: Implications for the Trinity

There has been little progress in the doctrine of the trinity since the Athanasian Creed and the Westminster Confession of Faith. A large number of parallel concepts have been suggested, but the use of the thermodynamical triple point as an analogy to the trinity has not been previously discussed. In this study we show that the thermodynamical triple point possesses a number of elements in common with the trinity. The triple point contains (1) a singular nature shared by three coequal but distinct subsistences, (2) economical, and (3) ontological properties. It also preserves the distinction between the classical trinity and the (4) tritheistic and (5) trimodal formulations. These rigorous requirements have been difficult to satisfy in previous analogies. The triple point provides an epistemic counterpart for our thinking about the trinity and allows for development of new perspectives.

The triple point is defined as the point where the solid, liquid, and gaseous forms of a substance coexist in equilibrium. The concept is anticipated by the Gibbs phase rule, according to which the largest number of phases \mathbf{P} which can coexist in a thermodynamical system plus the number of degrees of freedom F equals the sum of the components C of the system, plus 2. In algebraic terms:

$\mathbf{P} + \mathbf{F} = \mathbf{C} + \mathbf{2}$

The phases **P** are the states of matter that make up the system, usually solid, liquid, and gas. Each phase is homogeneous and contains bounding surfaces which allow for mechanical separation (at least in principle). The degrees of freedom **F** refer to the number of independently variable parameters that completely specify the thermodynamic state of the system. Such parameters are normally temperature, pressure, and composition. The components **C** are the lowest number of substances of independently variable composition which compose the system. In a solution such as salt water, possessing stable compounds, the number of components is two (NaCl and H₂O). In a metallic alloy, it is usually sufficient to count the elements involved. Most pure substances possess a three-phase equilibrium point.

Application of the phase rule to a substance results in a phase diagram showing the possible phases available to the substance at varying pressures, temperatures, and compositions. The simplest phase diagram is that for a onecomponent system whose composition is fixed at 100% of the material under consideration. The remaining degrees of freedom (temperature and pressure) are customarily plotted on a two-dimensional graph with appropriate regions representing solid, liquid, and gas. A common example is water, whose phase diagram is reproduced in Figure 1. Equilibrium between two phases occurs along the mutual boundary of the phase regions, and equilibrium among all three phases occurs at the intersection of the regions. This intersection is the triple point.

For the case of water, which as a fixed composition, C = 1, and the maximum number of phases **P** of water that can coexist in equilibrium is three: ice, water, and steam. By Gibbs' phase rule:

$$P + F = C + 2$$

3 + 0 = 1 + 2

No degrees of freedom exist under these conditions. This means that coexistence of ice, steam, and water can occur only at one specific temperature and one specific pressure. Such a condition, indicated by a single point on the phase diagram, is called the triple point.

The phase rule governs a system in equilibrium, meaning that the thermodynamic system possesses properties that are independent of time. At the triple point, equilibrium requires that rigorous control of pressure, temperature, and composition results in maintenance of the triple point indefinitely. The equilibrium is dynamic, with transitions occurring continuously between the coexisting phases, but in a way such that no apparent change is evident with the naked eye. This means that, at the triple point, boiling and condensing, melting and freezing, and subliming and freezing of gas are all going on simultaneously. For the case of water, the necessary pressure (0.006 atm.) is below 1 atmosphere and must be prepared in a special experimental setup.

Finally, it is noteworthy that the triple point is *not* equivalent to the mere existence of three forms of matter, but rather defines a unique relationship between the solid, liquid, and gaseous phases. Mere existence of three phases of matter is trimodal and therefore unsuitable for analogy to the trinity.

By analogy we mean the extension of patterns of relationship drawn from one area of experience to coordinate other types of experience. This requires the establishment of a number of characteristics held in common by the objects of comparison. It is possible to identify at least seven important areas of comparison between the triple point and the trinity.

1. Both the triple point and the trinity possess a singular nature with three coequal but distinct subsistences.

The triple point and the trinity both have a singular essence and possess three subsistences which have real distinctions among them. For example, the three states of water at the triple point are conjoined by a common molecular structure, yet ice, steam, and water are quite different from one another macroscopically. The difference is manifested by the distinctive physical properties held by the states of matter, such as density, compressibility, electrical conductivity, *et cetera*. Because the coexisting phases at the triple point possess a distinctive set of physical properties, the



Figure 1. The phase diagram of water, showing the possible phases available to H_2O at varying temperatures and pressures. Coexistence of two phases occurs along the lines marked S-L, L-G, and S-G, while coexistence of three phases exists at the intersection of the regions, defined as the triple point. Since the triple point of water occurs below atmospheric pressure, it must be put under vacuum to observe.

union of one into three occurs without loss of identity of the phases. By comparison, the trinity is also a single essence containing three subsistences which are able to merge without loss of identity. There is an infusion of three-into-one in both models, the satisfaction of which constitutes a minimum requirement for establishment of an effective analogy to the trinity.

2. Both the triple point and the trinity are equilibrium states.

Equilibrium is that condition in a thermodynamic reaction beyond which no net change occurs in the concentration of any substance. It defines a state in which the properties of the system are independent of time. Dynamic equilibrium occurs when equilibrium is maintained by equal rates of forward and reverse reactions, as opposed to equilibrium maintained by the absence of reaction. In the case of the triple point, the equilibrium is dynamic. Transitions are continually occurring among the phases, and no net change in the relative amounts of liquid, solid, and gas are measurable. The existence of an equilibrium state is analogous to the immutability of the Godhead, meaning that the nature and attributes of the Godhead are invariant with respect to essence. The triple point is also invariant, since a given substance is composed of a distinct elemental composition and, by definition, an equilibrium state is independent of time.

3. The triple point is not a tritheism.

The triple point preserves the distinction between tritheistic and trinitarian viewpoints of the trinity. Tritheism holds that there are three Gods rather than three personal distinctions in one God. The persons of the triad refer to three deified beings and deny the unity of the essence of God. The triple point is incompatible with tritheism because, at the triple point, there are not three phases in the sense of taking steam, ice, and water from separate locations and combining them mechanically. There is unity of essence at the triple point, with the phases tied to each other at a particular set of thermodynamic conditions. Reversible transitions are occurring between the phases, while bounding surfaces separating the phases are maintained. The triple point of water does not represent the existence of three "waters" united merely by purpose. There is something more in the union of the three phases at the triple point than merely the sum of the phases. The same is true of the conjoined persons of the trinity.

4. The triple point is not a trimodality.

Trimodalism holds that the Godhead is a trinity of revelation rather than a trinity of persons and denies the reality of the trinitarian persons. The postulate is that there are three aspects or manifestations of one God, with no internal distinctions within the divine substance. It may be argued that the triple point is not modal because the thermodynamic phases possess distinct and unique properties and are not merely different manifestations of the same thing. For example, although composed of identical molecules, ice is manifestly different from steam and water and exhibits different physical properties. Further, the phases of the triple point are locked together in a state of dynamic equilibrium, which prohibits individual manifestation of the states of matter except by destruction of the triple point. This means that once the triple point is established, simultaneous exercise of the three coincident phases is guaranteed. No grounds exist for the action of one phase apart from another. In contrast, the trimodal God can manifest only a single mode at a given time.

5. The phase relationships at the triple point are similar to relationships in the trinity.

The interdependence of phases at the triple point is analogous to the sense of relationship found between members of the trinity. Thermodynamically, each phase at the triple point derives and sustains its character by mutual collaboration with the other two phases. In other words, the thermodynamic phases at the triple point cannot exist independently of one another, but are interlocked in a state of thermodynamic equilibrium. This symphonic blending is similar to the relations between the persons of the Godhead. The Godhead is sustained by a self-contained mutuality of relations, and no one person of the trinity is or can be without the others. There is a coequal sharing of the singular divine essence without intrinsic subordination of any person. The undivided essence belongs equally to each of the persons and each possesses all the substance and all the attributes of deity. The same could be said for the triple point phases, as no state of matter is more fundamental than another, nor is water any less itself because it exists in three coincident forms.

6. Both the trinity and the triple point have ontological properties.

There is a resemblance between the relationship of the phases at the triple point and the distinctions rendered by the ontological ("in essence") trinity. Ontologically, the persons of the trinity have an internal number system whereby the Father as the first person neither proceeds nor is begotten; the Son as the second person is begotten by the Father; and the Spirit as the third person proceeds from both the Father and Son. There is similarly a natural ordering of phase relations. It is a general law that reactions in nature tend to proceed in the direction of lowest energy and greatest disorder. The appropriate thermodynamic function which quantifies this tendency is the Gibbs free energy function. In order to minimize the free energy during a reaction, phase changes can occur and one phase may be considered to "beget" another or "proceed" from another. The language is strained, however, and the true situation is more complicated. There is, however, a fundamental quantity which allows for phase ordering in a way that is suggestive of the trinitarian ordering.

7. Both the trinity and the triple point have economical properties.

The economical ("in works") trinity expresses the view that the entire Godhead is involved in external divine acts, but usually one member of the triad is featured. This preeminence is ground for describing one person as distinct from another. Similar behavior is displayed by the states of matter of most substances. Take water as one example: steam is used to drive locomotives and heat buildings, ice is an effective coolant and friction reducer, and water provides power and sustains the human body. While such applications are normally carried out far from equilibrium and no necessity exists for maintaining three coexistent phases at the triple point, use of a substance at its triple point is not ruled out in principle for systems which operate at equilibrium. For example, in a "triple-point" skating rink, the joint operation of all three phases contributes to the maintenance of lubrication while the solid (ice) phase is featured. Under idealized conditions, then, it is possible for the triple point to simulate a reaction which depends on the conjoined effort of all three phases but where only one phase is featured.

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SCIENCE, RELIGION, AND IDEOLOGY: THE CASE OF EVANGELICALS AND EVOLUTION

In recent years the status and image of science have undergone something of a revolution as historians, philosophers and sociologists have plied the tools of their trade. Scientific claims to objective knowledge have been challenged from various philosophical quarters, and these have been more than matched by the ethical dilemmas arising from apocalyptic visions of nuclear holocaust, the chilly winds of environmental decay, and the human face of technology in assembly-line alienation. Besides these reassessments is the even more radical critique of those who see the scientific enterprise as a cultural product and a political resource, and therefore as nothing less than a tool of ideological imperialism. It is on this latter rereading of the science story that I wish to focus by taking another look at that old chestnut, "evangelicals and evolution." Old it may certainly be, but the "Darwin industry," as it has been styled, continues to be one of scholarship's most productive multinational enterprises, packaging its product, to continue the metaphor, in many new wrappings. Via the examination of some of these major trends in historical interpretation, it will be possible to evaluate the strengths and weaknesses of the more radical critics.1

Traditional histories of science, Whiggish in spirit and triumphalist in character, conventionally resorted to the language of warfare and struggle in their reconstruction of faith's encounter with science. This *conflict* model, with its military metaphors and campaign veterans, was enshrined in the celebrated best-seller, *History of the Conflict between Religion and Science*, published in 1875 by John W. Draper. Clever metaphor that it was, the book provoked a whole spate of similar crusade reveries most notable in the works of Andrew Dixon White and James Y. Simpson.²

As the documents of the scientific past have been ransacked, however, the whole apparatus of this "conflict" arsenal has been dismantled with forensic precision by a squad of historical revisionists. In the period before 1850, for example, it has long been recognized that the vocabulary of controversy is just simply inappropriate. The new science of geology, to take just one case, happily counted among its advocates such English clergymen as Sedgwick, Buckland and Coneybeare, and sombre Scottish Calvinists like Playfair, Hugh Miller and John Fleming.³ Again, the pervasive influence of the natural theology ethos throughout the entire nineteenth century, not to speak of earlier, has had to be taken more fully into account,⁴ while, as we will presently see, many evangelicals found the conceptual resources necessary to absorb any shock-waves emanating from the Darwinian revolution. Even the Wilberforce-Huxley melodrama, so colourfully portrayed by popularists like Irvine,⁵ now appears more the product of historical predisposition than a description of what really happened. J. R. Lucas and Sheridan

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Gilley, recently raking over the ashes of this supposed fracas, have succeeded in finally dispelling the disarming simplicity of the so-called "Victorian crisis of faith."⁶

These revisionists have certainly made their case. But it would be foolish at the same time to deny the secularizing role that science has played since the late Victorian period. Although, as a source of religious scepticism, science probably did less harm than the ethical revolt against Christian convention, the explosion of radical biblical criticism popularized in Essays and Reviews, working class defection from institutional religion and inter-denominational feuding.⁷ Nor should it be taken to mean that no one felt a tension between the call of faith and the findings of science. Many examples could be cited, and among them Charles Hodge's dismissal of Darwinism as atheism must figure prominently. For him, as for many others, there was a direct clash between the claims of natural theology and those of natural law.⁸ Among evangelicals of a different tradition, to take another random case, Alexander Winchell, a prominent American geologist and Wesleyan Methodist, devoted some 400 pages to the subject in his tome Reconciliation of Science and Religion in 1877-a task evidently assuming mutual antagonism⁹. And certainly the accommodationist strategies of classical liberalism only make sense against the background of a perceived need to reconstruct Christian theology along lines dictated by scientific overlords. The scientific dogmatics of a Tielhard de Chardin or a Don Cupitt only represent the latest in a long line stretching back to John Fiske, Henry Ward Beecher and Frederic Myers.¹⁰ Again, the fact that the vocabulary of hostility is not far from the lips of latter-day creationists and their evolutionary opponents should caution against a too facile expulsion of the warfare analogy to the mists of historical fantasy.

Still, the warfare model has, by and large, done little to advance our understanding of the interface between science and Christianity in history, and it is because of its ambiquities and crudities that some historians of science have recast it in a more restricted vein. Here, the conflict is transmuted into a *competition*, and is applied not so much to science and faith per se, but to the "struggle" for cultural ascendancy in society contingent upon the appearance of the new scientific professional. Frank Miller Turner is the leading architect of this interpretative realignment, and he has made out the case for a Victorian battle for social preeminence between the ecclesiastical hierarchy and the new, thrusting scientific elite. The "conflict," then, is to be seen in terms of a shift in intellectual authority from the preprofessional clerical sage to the middle class professional intelligentsia. The amateur parson-naturalist who had hitherto played a noble role in the advance of science's discoveries was somehow by late Victorian days a quaint anachronism in the laboratorial world of the emerging disciplinary specialist.¹¹. So when men and women fell on hard times, whether because of the threat to harvest, cattle plague, or typhoid in the Royal household, it was questionable whether they should obey the clergy's call to prayer or turn to the agricultural, veterinary, and medical experts. If the choice was initially hazy, it was rapidly resolved in a predictable direction. The manifest success of sanitary engineering, preventive medicine, and the surgeon's knife heralded an increasing privatization of religious observance, and an accompanying transfer of societal kudos into the hands of a willing scientific fraternity. As Turner concludes: "If the movement from religion to science in western culture represented, as some would contend, the exchange of one form of faith for another, it also meant the transfer of cultural and intellectual leadership and prestige from the exponents of one faith to those of another.... It was a clash between established and emerging intellectual and social elites for popular cultural preeminence in a modern industrial society."¹² All this, moreover, has been reinforced in the writings of another student of Victorian intellectual life, T. W. Heyck, who finds at least one locus of the "conflict between science and theology" in "the effort by scientists to improve the position of science. They wanted nothing less than to move science from the periphery to the centre of English life."¹³

This analysis certainly does throw light on some infernally stubborn problems in the history of the science-religion saga. It helps explain, for example, the rise of the Wilberforce versus Huxley legend. The later passion to purge the British Association of the stain of clerical dilettantism would evidently favour a reconstruction of that debate in the baldest mediaeval versus modern terms. On the other side of the Atlantic, some of the early Princeton opposition to evolution clearly needs to be seen in the context of the attempts to dissolve links between the College and the Seminary, and therefore disengage science from theology.¹⁴ Although in that same institution the very substantial willingness of evangelicals to negotiate a modus vivendi with the new evolutionary doctrine and the shared religious world-picture of the scientific professionals and their theological colleagues doubtless played an important role.¹⁵ Besides this, the competitive reading, I think, clarifies much of the otherwise ambiguous rhetoric on the lips of certain scientific publicists. Huxley's craving for an evolutionary teleology, Galton's hankering after a "scientific priesthood," and Geddes's substitution of Darwin for Paley, certainly invite such exegesis.¹⁶ Indeed, if intellectual authority in modern society has not passed to the professional scientist why is it that cries of 'pseudo-science" are so often on the lips of both creationists and evolutionists? And why is it that unbelievers and believers alike continually resort to science for ideological selfjustification? As Eileen Barker, in her sociological wanderings through a variety of scientific gatherings, concludes: "The Biblical literalist, the Evangelical revivalist, the political visionary and even the slightly perturbed old priesthood of the established theologies turn to the new priesthood [of science] for reassurances that their beliefs have not been left behind in the wake of the revolutionary revelations of science. The new priesthood has not been found wanting. Sometimes with formulae, sometimes with rhetoric, but always with science, the reassurance is dispensed."¹⁷

Plainly this approach has much to commend it; but it surely is worth emphasizing that by itself it cannot accommodate all aspects of the science-religion question. Indeed it is in connection with some of the model's greatest strengths that most care must be taken. Religious knowledge, to be sure, cannot be cut loose from religious knowers, nor scientific theory from scientific practice. Both *are* rooted in society, and it is well to remember that they can be manipulated to serve particular group interests. But this in and of itself tells us really very little about the *nature* of religious

and scientific understanding, nor about the adequacy of the grounds for resorting, say, to surgical operations rather than to spiritual observance. Such theoretical questions would clearly have to be resolved by other criteria whatever the legacy of historical judgment may have been. Then too, by focussing on the social struggles of theologians and scientists, the "competition approach" solidly ties both enterprises to the moorings of popular culture. Clearly this has advantages in explaining the flowering of Victorian naturalism. But since the average Jesus-freak knows as much about theology as the average hip-ecologist knows about environmental science, we may well be justified in asking what relation Victorian folk religion bears to biblical Christianity. The substitution of popular confidence in hygiene for the faith of vernacular supernaturalism leaves quite untouched the relationship between Christian theism and scientific naturalism. Let us remember too that there were evangelical spokesmen prepared to relinquish their theological hold on some things. Here I am thinking of Warfield who told his readers that "teleology is in no way inconsistent with ... a complete system of natural causation. Every teleological system implies a complete 'causo-mechanical' explanation as its instrument."18

Predating this rereading of the record is an alternative historical interpretation characterized by its emphasis on the cooperation science has received from Christianity. In this context its advocates are well known. Briefly, the sociological work of Merton correlating the rise of English science with the advent of Puritanism was later supplemented by the theological reflections of Hooykaas, whose seminal work, found in the doctrinal thought-forms of the Reformation, specific principles foundational to the very possibility of experimental science.¹⁹ Support for, and opposition to, this general narrative need not detain us here. Suffice it to say that so far as the nineteenth century is concerned, James Moore's monumental survey of Protestant responses to Darwin suggests, as a broad generalization, that it was among orthodox believers who retained a firm hold on Calvin's doctrine of Providence that the least religious nervousness was experienced.²⁰ Indeed I have discovered a vibrant tradition of evangelical evolutionism, particularly in the United States, which has been ignored or suppressed by certain propagandists.²¹ It was, for example, through the efforts of three evangelicals-James Dana, Asa Gray and George F. Wright-that Darwin got a fair hearing in the New World; in the denominational journals George Macloskie, a Presbyterian, and Alexander Winchell, a Methodist, disseminated their evangelical brand of theistic evolution; among the theologians such revered names in the evangelical tradition as Warfield, Orr, A. A. Hodge, Iverach, Strong, Pope, and McCosh, not to mention a host of lesser known individuals, all embraced the new biology in one form or another.

This general scheme of interpretation is plainly attractive. It accommodates both theoretical and social dimensions of our subject, for example, by engaging both the theological ideas and the human networks in which scientific practice was ultimately rooted. Even for controversial periods like Darwin's century, it redraws our attention to aspects of that drama that have lain hidden beneath a veneer of positivist rhetoric. At the same time, the cooperative agenda is not complete. If Christianity was so central to the growth of science, how may we explain its secularizing ethos, its reductionist and materialist inclinations, and the sense of cosmic loneliness which came with the breakup of the natural theology canopy? Besides, to leave the nineteenth century for a moment, there is the ethical challenge forthcoming from those frankly critical of scientific rationality itself and therefore of its Judaeo-Christian underpinnings. The advanced state of environmental pollution, the unprecedented threat of nuclear holocaust, the exhaustion of the soil by agricultural mismanagement and forest clearance, and the undreamt of horrors of biological warfare are just some of science's nasty gifts that have to be weighed in the balances against the evident benefits of engineering, agriculture and medicine.

Perhaps the most coherent effort to transcend the emphases on conflict and cooperation is the argument for ideological continuity, most forcefully articulated by the Marxist historian of science, Robert M. Young. In a number of influential articles, Young advanced the proposal that "conflict" readings of the great Victorian debate on "Man's Place in Nature" have only obscured the fact that both religion and science are socially sanctioned ideologies.²² And, in developing his critique, he has made use of the old idea of theodicy, a doctrinal move originally designed to diffuse the problem of evil. What Young suggests is simply this: the theodicy grounded in theology (justifying the ways of God to humanity) has been replaced by a scientific theodicy (justifying the ways of nature to society). In both cases the existing social order is ratified and therefore science, no less than religion, continues to support the principles of adjustment and conformity. Darwin is nothing but a secular Paley.

Whatever the inadequacies of Young's ultimately Marxian programme, he has nonetheless compiled an imaginative travelogue to guide us through the maze of the Victorian intellectual landscape. The much vaunted talk of a "Church Scientific," lay sermons, a Scientific Priesthood, and what not, begin to make sense in the context of a transition to a new theodicy. Then the ultimate imprimatur of establishment acclaim, burial in Westminster Abbey, which was accorded to Darwin, thanks to the frenetic string-pulling of John Lubbock, can now be read in a new light. Moore, following the broad sweep of Young's portrait, finds much symbolic significance in the solemn bearing of Darwin's body "up the nave by Huxley, Wallace and other dignitaries ... to its resting place a few feet from the monument to Sir Isaac Newton." It was, he suggests, "the trojan horse of naturalism entering the fortress of the Church."23 Besides, Young's arguments do full justice to the pre-Darwinian roots of secularization and to the resort to the scientific creed by the intellectuals of the new status quo casting about for some new consensus. That religious believers shared much of this value-system only seems to strengthen the case.

Let me mention one particularly dramatic instance of this kind of conceptual maneouvre where the pressing of evolution into the service of ideology is all too clearly paraded. Throughout the last century, numerous individuals were intoxicated with the hope of isolating some scientific measure of racial differences. A whole subfield of anthropologyanthropometry or somatometry-emerged to satisfy their needs. This sub-disciplinary specialism had no necessary ideological undertones, but many practitioners believed that the inferiority and superiority of particular races could thereby be unambigously established. Scientific racism, drawing from disciplines as diverse as evolutionary biology, physical anthropology, the new human geography, and certain schools of history, rapidly contributed ammunition for a battery of social policies ranging from eugenics to immigration restriction.²⁴ Here the "constitutive role of evaluative concepts" in science, to use Young's own terminology,²⁵ is all too clear. Nor were evangelicals immune from such machinations. Consider, for example, the judgments of two prominent evangelical scientists in the America of last century. In the case of Arnold Guyot (Princeton's Professor of Physical Geography and Geology and guest lecturer to the Seminary's students), it was the Creator who had "placed the cradle of mankind in the midst of the continents of the North ... and not at the centre of the tropical regions, whose balmy, but enervating and treacherous, atmosphere would perhaps have lulled him to sleep the sleep of death in his very cradle."²⁶ For Winchell, by contrast, it was "Nature," conscious of the "irremediable estrangement" of the black races, that had condemned them to inhospitable and inaccessible regions of the globe.²⁷ A more dramatic shift from a theological to a scientific theodicy within a religious frame of reference can scarcely be envisioned.

Still, for all that, Young's treatment is open to objections both historical and philosophical. If we momentarily pursue the question of scientific racism it has to be pointed out that both Asa Gray and B. B. Warfield used evolution to challenge these racist assumptions and to support the biblical doctrine of the unity of the human race.²⁸ Then the relative incoherence of the natural theologians' strategies in the pre-Darwin period has been highlighted by some historians, and Young's "common context" begins to look in disarray.²⁹ There is too, I think, some sense of the over-determination of Young's theoretical framework. To say that science and society are closely related, indeed that scientific theory is often socially determined, is one thing; but to claim that values and politics are necessarily constitutive of scientific explanation is quite another. Philosophy of science, surely, can not be so easily transmuted into the sociology of knowledge, nor science into ideology. Various strategies are open to those who see science as finding out something about the way the world is, rather than merely being the expression of social relatings. Ernan McMullin's policy of tracing the longterm resilience of particular theories in different contexts as an indicator of their truthfulness is one that I have found attractive.30 And yet, at the same time, Young's trenchant questioning of scientism, scientific idolatry if you will, is certainly timely. Surely it is right to demand, as he does, that the philosophical, ethical, religious, and political factors that are invariably assumed or promoted in the practice of science be brought out into the open and discussed for what they are, rather than being concealed behind the facade of scientific jargon. For, as Colin Russell has recently reminded us, it is "the sacralisation of science (or the secularisation of society by putting science in the place of cultural leadership once occupied by institutional religion) [that] has meant a burgeoning of the uses of science as an argument for justifying, or delaying, changes in society."³¹

By now it is, I hope, clear that the Christian engagement with science cannot rest content with resolving purely epistemological questions. If history teaches us anything it surely is that that pursuit cannot be severed from the social, ideological and ethical contexts in which science as a cultural enterprise is embedded. Even if we sustain the argument that science is not all ideology, that it can in principle make substantive claims to objective knowledge, the fact that it can be and often is ideologically biased is surely sufficient grounds for it to feature high on any Christian agenda for science. The Christian call to self-awareness and selfjudgement is particularly cutting at this point, as is the biblical teaching that the image of God in men and women is defaced, scarred and distorted. The ideological captivity of science to particular interests should therefore come as no surprise. Evangelical scientists too, it goes without saying, are no less inclined to partisanship than their secular colleagues. But the implication of biblical anthropology is surely that they should be in the vanguard of scientific self-criticism. And at the same time, aware as they are of humanity's constitutional disfigurement, Christian scientists should best understand the irrepressible idolatry of humankind that has resulted in the transfer of the sacral from the spiritual to the scientific realm.

NOTES

1. What follows is largely drawn from my forthcoming paper, "Farewell to Arms: Reflections on the Encounter between Science and Faith."

2. A useful review and critique of the conflict interpretation may be found in Colin A. Russell, "Some Approaches to the History of Science," in *The* "Conflict Thesis" and Cosmology, Open University, Science and Belief: from Copernicus to Darwin, Block 1, Unit 1, (Milton Keynes: The Open University Press, 1974).

3. See Charles Coulston Gillispie, Genesis and Geology: A Study in the Relations of Scientific Thought, Natural Theology, and Social Opinion in Great Britain, 1790-1850 (New York: Harper & Row, 1959); Davis A. Young, "Nineteenth Century Christian Geologists and the Doctrine of Scripture," Christian Scholar's Review 3 (1982): 212-28.

4. Many studies have appeared on this subject, but one useful survey is John Hedley Brooke, "The Natural Theology of the Geologists: Some Theological Strata," in L. J. Jordanova and Roy Porter (eds.), *Images of the Earth: Essays in the History of the Environmental Sciences* (Chalfont St Giles: British Society for the History of Science, 1979), pp. 39-64.

5. William Irvine, Apes, Angels and Victorians. A Joint Biography of Darwin and Huxley (London: Weidenfeld and Nicholson, 1956).

6. Sheridan Gilley and Ann Loades, "Thomas Henry Huxley: The War Between Science and Religion," *Journal of Religion* 61 (1981): 285–308; J. R. Lucas, "Wilberforce and Huxley: A Legendary Encounter," *Historical Journal* 22 (1979): 313–30.

7. See H. R. Murphy, "The Ethical Revolt against Christian Orthodoxy in Early Victorian England," American Historical Review 60 (1955): 800-817; James R. Moore, "1859 and All That: Remaking the Story of Evolutionand-Religion," in Roger G. Chapman and Cleveland T. Duval (eds.), Charles Darwin, 1809-1882: A Centennial Commemorative (Wellington, N.Z.: Nova Pacifica, 1982), pp. 167-94.

8. See David N. Livingstone, "The Idea of Design: The Vicissitudes of a Key

Concept in the Princeton Response to Darwin," Scottish Journal of Theology 37 (1984): 329-57.

9. Alexander Winchell, Reconciliation of Science and Religion (New York: Harper and Brothers, 1877).

10. For similar strategies see Frank Miller Turner, Between Science and Religion: The Reaction to Scientific Naturalism in Late Victorian England (New Haven: Yale University Press, 1974).

11. Frank Miller Turner, "The Victorian Conflict between Science and Religion: A Professional Dimension," Ists 69 (1978): 356-76.

12. Frank Miller Turner, "Rainfall, Plagues, and the Prince of Wales: A Chapter in the Conflict of Science and Religion," *Journal of British Studies* 13 (1974): 65.

13. T. W. Heyck, The Transformation of Intellectual Life in Victorian England (London: Croom Helm, 1982), pp. 87-89.

14. See J. David Hoeveler, Jr, James McCosh and the Scottish Intellectual Tradition (Princeton, N.J.: Princeton University Press, 1979), p. 274.

15. See Livingstone, "Idea of Design."

16. Gilley and Loades, "Huxley," p. 290; Francis Galton, English Men of Science: Their Nature and Nurture (London: Macmillan, 1874), p. 193; Patrick Geddes, "Biology," Chambers's Encyclopaedia (London and Edinburgh: W. and R. Chambers, 1925, orig. 1882), Vol. 2, pp. 157-64.

17. Eileen Barker, "Thus Spake the Scientist: A Comparative Account of the New Priesthood and Its Organizational Bases," Annual Review of the Social Sciences of Religion 3 (1979): 99.

18. B. B. Warfield, Review of Darwinism Today by Vernon L. Kellogg, Princeton Theological Review 6 (1908): 649.

19. See R. Hooykaas, "Puritanism and Science," in Open University, Science and Belief: from Copernicus to Darwin. Block 3. Scientific Progress and Religious Dissent (Milton Keynes: The Open University Press, 1974), 7-32.

20. 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: Cambridge University Press, 1979).

21. I discuss this in my forthcoming book, Darwin's Forgotten Disciples: Rediscovering an Evangelical Tradition.

22. Robert M. Young, "Natural Theology, Victorian Periodicals and the Fragmentation of a Common Context," in Colin Chant and John Fauvel (eds.), Darwin to Einstein: Historical Studies on Science and Belief (Harlow: Longman, 1980), pp. 69-107; idem, "The Impact of Darwin on Conventional Thought," in John Symondson (ed.), The Victorian Crisis of Faith (London: SPCK, 1970), pp. 13-35: idem, "The Historiographic and Ideological Contexts of the Nineteenth-Century Debate on Man's Place in Nature," in Mikulas Teich and Robert Young (eds.), Changing Perspectives in the History of Science: Essays in Honour of Joseph Needham (London: Heinemann, 1973), pp. 344-438; idem, "The Naturalization of Value Systems in Human Sciences," in Open University, Science and Belief: from Darwin to Einstein. Block V1. Problems in the Biological and Human Sciences (Milton Keynes: The Open University Press, 1981), pp. 63-110.

23. Moore, "1859 and All That," p. 194.

24. See John S. Haller Jr., Outcasts from Evolution. Scientific Attitudes of Racial Inferiority, 1859-1900 (Chicago and London: University of Illinois Press, 1971); David N. Livingstone, "Science and Society: Nathaniel S. Shaler and Racial Ideology," Transactions of the Institute of British Geographers N.S. 9 (1984): 181-210.

25. Robert M. Young, "Evolutionary Biology and Ideology: Then and Now," Science and Studies 1 (1971): 177.

26. Arnold Guyot, The Earth and Man. Lectures on Comparative Physical Geography in its Relation to the History of Mankind (New York: Scribner's 1879, orig. 1849), p. 251.

27. Alexander Winchell, Preadamites; Or a Demonstration of the Existence of Man before Adam; Together with a Study of Their Condition, Antiquity, Racial Affinities, and Progressive Dispersion over the Earth (Chicago: S. C. Griggs and Company, 1880). p, 157.

28. See A. Hunter Dupree, Asa Gray (Cambridge, Mass.: Belknap Press of Harvard University Press, 1959); Benjamin B. Warfield, "On the Antiquity and the Unity of the Human Race," Princeton Theological Review 9 (1911): 1-25.

29. See John Hedley Brooke, "Natural Theology and the Plurality of Worlds: Observations on the Brewster-Whewell Debate," Annals of Science 34 (1977): 221-86. Robert J. Richards, "Instinct and Intelligence in British Natural Theology: Some Contributions to Darwin's Theory of the Evolution of Behavior," Journal of the History of Biology 14 (1981): 193-230; Peter J. Bowler, "Darwinism and the Argument from Design: Suggestions for a Re-evaluation," Journal of the History of Biology 10 (1977): 29-43.

30. Ernan McMullin, "History and Philosophy of Science: A Marriage of Convenience?" in R. S. Cohen et al (eds.), Boston Studies in the Philosophy of Science (Dordrecht: D. Reidel Publishing Company, 1976), pp. 585-600; idem, "A Case for Scientific Realism," in Jarrett Leplin (ed.), Scientific Realism (Berkeley, Los Angeles, London: University of California Press, 1984), pp. 8-40.

31. Colin Russell, Science and Social Change 1700-1900, (London: Macmillan, 1983), p. 259.

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SCIENCE UNDER FIRE?

Introduction

It is frequently uncomfortable to experience a re-evaluation of what has always been taken as "given," to find that a world we have hitherto supposed to be closed is in fact open, and to realise that most of our cherished assumptions may be actually vulnerable to question. Such a situation has no novelty for Christians who have always understood something of the transience of this world and its allegedly unchanging values. However, for professional scientists it can be unnerving when the whole nature of the scientific enterprise is called into question. After all, it is on the power, precision and objectivity of that enterprise that many of us have based our careers.

Of course, we are all used to challenges in matters of specific detail:

Were our observations sufficiently accurate? Can the empirical data bear any other interpretation? Have earlier results been taken properly into account? Has some relevant piece of data been overlooked?

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and so on. But this is different. Over the last 20 or 30 years a new critique of science has begun to raise far more fundamental questions than these. The purpose of this paper is to identify a few of these questions in a very general way and to suggest the kinds of response that might properly be given by scientists who are also Christian believers.

One consequence of these new approaches is a concentration on the nature of scientific knowledge itself. Once given a privileged status in the hierarchy of human understanding, scientific knowledge is now so often reduced to a level of social dependence that its authority and mystique are unrecognisably diminished. It becomes simply one other kind of socially constituted knowledge, no more (or less) "true" than the insights of poet, mystic, politician or prophet. It shares the doubtful privilege with religion of being the object of the most vigorous efforts of sociological reductionism so far attempted.

It is obvious that much of this radical critique emanates from the sociology of science and the sociology of knowledge. As such, it is likely to be preemptorally dismissed by many working scientists, particularly those active in the physical sciences. However, it is not in the least degree necessary to subscribe to this or that school of sociology in order to recognise insights of great value and power, even though these may sometimes be concealed beneath layers of jargon and tendentious argument, and on occasion be embodied in what turns out to be a thinly veiled political manifesto. Furthermore, one has to be a very naive backwoodsman indeed to identify, and dismiss, all the critique as Marxist or even neo-Marxist in origin, inspiration and intention. Historians and philosophers of science of all shades of political opinion are agreed that it is high time to reappraise the status and uses of science in the light of the considerable amount of historical analysis since the War. Just as scientific analysis (properly understood) is the correct mode of enquiry into problems internal to science itself, so historical analysis can be of great value in elucidating the course and nature of scientific development-as it is for any other changes in historical time.

It is not the purpose of this paper to attempt any magisterial synthesis, or to offer a critique of the critique. The issues are far too large for that. One major question underlies all the others: given that there may be substance in some (or much) of what has been written by way of a radical critique of science, what is an appropriate Christian response? Three areas of enquiry suggest themselves. In each case a few provocative quotations may prompt further discussion.

1. Critiques of the Nature of Science

The internalists always seem to me essentially Manichaean; they do not like to admit that scientists have bodies, eat and drink, and live social lives among their fellow-men, whose practical problems cannot remain unknown to them; nor are the internalists willing to credit their scientific subjects with subconscious minds.¹ (J. Needham, 1964)

As a mission cannot be neutral, the science done in achieving it cannot either.² (S. and H. Rose, 1971)

Science is social relations.³ (R. M. Young, 1977)

These citations represent the view that science is essentially a social construct, a product of the societies in which it grew and developed. That statement can, of course, mean a great many different things to different people. At one extreme it can imply merely that the *rate* of scientific advance is affected by the degree to which society gives (or withholds) its favours to science by funding, education and general encouragement. At the other extreme there may be the suggestion that the very fabric of scientific knowledge itself may be socially conditioned. And, of course, there are all kinds of intermediate positions.

The first, and weakest, form of the proposition that science is a social construct is so obviously true as to be a mere platitude and not worth further discussion. The last, and strongest, form is extremely contentious, and calls for more comment. If it is true, a good number of sacred cows have to be led to the altar. For example, we shall no longer be able to claim total objectivity for scientific knowledge, the "myth of value-free science" will be exposed for what it is, and at last science will be toppled from its long cherished position at the pinnacle of human understanding. Understandably, this view has not met with rapturous enthusiasm amongst the scientific community itself (particularly as it is often articulated by those with the most minimal direct experience of science). That, however, is not the point. Nor is it to our present purpose to engage in philosophical debate, observing en route that the proposition "science is value-laden" is itself a socially conditioned, value-laden statement. That way madness lies! Rather we should ask whether any empirical evidence can be brought to bear on the question. If such exists anywhere it must surely lie within the history of science.

In 1977 the New Scientist carried an article by Professor M. Hammerton⁴ which designated as "a fashionable fallacy" the notion that scientific advances are ever determined by "social and economic factors." Pointing out that a literal interpretation of this view "is not only false but absurd," he cited the imaginary possibility of a society in which the second law of thermodynamics was denied and in which it did not even apply. He concluded that the best that could be claimed was that society may condition scientific thinking, but that even for this modified form of the original proposition there was insufficient hard evidence. In the subsequent furore it was pointed out that evidence did exist in plenty if only one looked in the right places. One could go further and assert that the historical data point overwhelmingly to a science that has been profoundly influenced by the culture in which it has grown. It is not necessary to suppose, with some Soviet writers of the 1930's, that Newton's mighty edifice of universal gravitation reflected his interests in mercantile and military matters.⁵ But it is as near certain as can be that his whole scientific philosophy was intimately connected with the world view of late 17th century England, including its theology. Darwinism is another classic case; so are electrochemistry, theories of the ether, uniformitarian geology, thermodynamics and many other areas of science, down to such oddities as astrology, alchemy, phrenology, mesmerism and sociobiology. In all these instances the actual content of theories embodied the values and world views of their proponents.

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When the results of studies on the cognitive structure of science are added to those on the scientific community and on individual men and women within it, the case for a social dimension to science becomes unanswerable. The reason is perfectly simple. When we do our science we do not cease to be human beings with motivations. That is the point of the Needham quotation above. Each of us has only one brain and we cannot close off part of it when we shut the laboratory door behind us. When we are also part of a project (or "mission") even more values are imported into our science hence the Rose quotation above. The old-fashioned "internalist" history of science that ignored such considerations did so at its peril. It may have been flattering to scientists to read triumphalist histories of their subjects, but the explanatory power of such anecdotal accounts was negligible.

Despite the success of studies of science in its cultural setting, it is quite unnecessary to go "over the top" and allege a social dependence that is total and absolute. To imagine that in *any* society thermodynamic laws did not hold and that kettles boiled on icebergs is just silly. To that extent—and only that—Hammerton was right. The faith of the scientist, that there are regularities in nature and that he can begin to discover them, is entirely unscathed by a recognition that how he works and how he formulates his generalities is a function also of the society in which he lives. A recent writer (Loren Graham) put it thus:

We now must live in the middle range of the science-value spectrum, recognizing the erroneousness of the value-free conception of science so prevalent in the previous generation, and the equal erroneousness of the countering view that "all of science is value-laden."⁶

How may the Christian respond to all this? I suggest several reactions are appropriate. The first is caution. A familiarity with the history of science will already have given a healthy scepticism to any claims for *scientific* finality. A comparable restraint is desirable in the face of *historical* claims of an absolutist kind (e.g., that science is always value-laden). We of all people ought to be willing to face all the available evidence without fear or favour. Much more remains to be done, and until then there is plenty of room for an open mind.

A second reaction could well be to welcome the new insights insofar as they find corroboration in the historical data. For what has gone has been an attitude to science that was profoundly anti-Christian. This was the positivist approach that negated Biblical claims that ultimate truth was only to be found in Jesus, and exalted science as the one way to truly objective knowledge. What has toppled is not science but "scientism," science falsely so-called, something akin to an object of worship for its own sake. At the same time we can bid an unlamented farewell to the whole elaborate artifice of a "conflict" view of science history in which science and religion are portrayed as forever interlocked in mortal combat. That was exactly how the Victorian positivists and "scientific naturalists" wanted us to see things, and indeed was what might have been expected if science alone were immune from social contamination.

Finally, liberation from this dogma enables us to see with a new clarity the historic links between emerging science and

Biblical Christianity. Christians may find themselves making common cause with Marxists in uncovering the cultural roots of the scientific enterprise, but they should not be disconcerted. In the search for truth, historical as well as scientific, no holds should be barred. Let's stop being defensive.

2. Critiques of the Motivation of Science

Newton's natural philosophy served as an underpinning for the social ideology developed by the church after the [English] Revolution.⁷ (M. Jacob, 1976)

The founders of British Mechanics' Institutes thought a scientific education would aid in the social control of those artisans who were their designated target.⁸ (S. Shapin and B. Barnes, 1977)

Science as the mode of cultural self-expression by a new social class.⁹ (A. Thackray, 1974)

Why does anyone do science? Traditionally the reasons might have been any of the following:

To achieve self-fulfillment To bring glory to God To benefit humanity by "useful" discoveries To earn a living

and so on. The first of these is the timeless reaction of a dedicated minority who enjoy nothing more than laboratory success. The second is hard to locate alone from the others; Kepler was probably an example as he "thought God's thoughts after him." The third has been much more common over the last two centuries; it is, of course, the traditional Marxist explanation as well. The fourth justification is quite modern, coinciding with the professionalization of science in the last hundred years. What the radical critique of science has done is to add to these a number of others in which science is pursued for reasons that see it as a means to an end which is often political and rarely to do with science alone. The quotations above are typical.

This extension of sociological thinking may seem of little moment for any except those actively involved in the controversies. But that is an illusion. The first citation above represents a well known attempt to explain away in political terms a sustained exercise in Christian apologetics in the early 18th century, the famous Boyle Lectures. Newtonianism was proclaimed from City pulpits, not because it helped to highlight the absurdity of atheism (the ostensible purpose), but so that it could "underpin the social order." This it was supposed to do because the peddlers of atheistic philosophies were seen as subversive not only of church but also of state. Moreover Newtonian science had built into it the concept of Providential intervention. This was politically attractive to those who had abrogated the "divine right" of kings, deposing James II and welcoming William III (whose landing at Torbay owed much to a Providential east wind!). This alleged use of science for political ends is the author's reason for denying in the first place the status of the Boyle Lectures as a straightforward exercise in Christian apologetics. She simply cannot believe that the debate was "centred essentially on intellectual issues" or that it was "only simple Christian piety that was at stake." Here is a classic case of a

radical critique ending up by arguing in a circle: sociopolitical considerations are parmount *because they must be paramount*! At least the author has been refreshingly candid on what she can and cannot assume.

Similar considerations apply to the second citation (above) that science in the Mechanics' Institutes had the primarily political aim of social control. It is not hard to marshall empirical data that make the proposition look extremely implausible, at least as a widely held objective.¹⁰

Which brings us to the third citation, from Thackray. Writing of the famous Manchester Literary and Philosophical Society in the late 18th century, he sees its early members as "marginal men" in the city's community, not hereditary aristocrats or even landed gentry. These were the new industrialists and others who saw in science a way up the social ladder. It was a new and potent status symbol, and could lead to a respected place in society. Whether they were right or wrong they now had another reason for cultivating science, quite apart from its obvious utility to the new industry. Again Thackray's thesis has not escaped criticism, but he is on far stronger ground than either of the other authors cited. By stressing the cultural uses of science he has reminded us again of the complexity of motives in human beings and perhaps hinted at something akin to the Biblical warnings to sit lightly to worldly acclaim and to use the gifts of God for the benefit of others. Those gifts include science.

3. Critiques of the Uses for Science

Science is nothing more than a body of information and techniques accumulated mainly in the last 150 years or so from work on problems relevant to the concerns of the capitalist class.¹¹ (D. Albury and J. Schwartz, 1980)

Modern Western science was cast in a matrix of Christian theology \dots If so, Christianity bears a huge burden of guilt.¹² (Lynn White, 1966)

From the ideological "uses" of science we turn, finally, to some modern critiques of the more obviously technological applications with which it has been credited. Science has been attacked on at least two fronts.

First, science is sometimes seen as a lackey of capitalism, being merely a tool in the hands of the industrial establishment. The first citation is from an article on the work of Davy on safety in coal-mines. Apart from numerous inaccuracies, it ignores Davy's refusal to gain profit from his invention of the safety-lamp and unsurprisingly reveals that his interests were those of the mine-owners. It was, after all, they who commissioned him. What is truly remarkable is the breathtaking generalisation expressed in terms of naive "nothingbuttery." Yet for all its flaws the article does usefully remind us of vet another dimension of our science-its possible use for narrow class-directed ends. It is all too easy to see this in history, too hard to perceive it in our own environment. Once again a truly Christian insight will critically sift the evidence and recall the universality of original sin, recognising a need to use all our gifts responsibly, including that of scientific knowledge.

The challenge of responsible stewardship emerges more clearly in the famous (or notorious) paper of Lynn White in which he addresses the problem of pollution and environmental damage owing to science and/or technology. Unlike the previous two authors he has a realistic understanding of the roots of modern science and locates them firmly in the "matrix of Christian devotion." This insight he shares with many modern historians of science, radical or otherwise.¹³ Furthermore, technology "is at least partly to be explained as an Occidental, voluntarist realisation of the Christian dogma of man's transcendence of, and rightful mastery over, nature." That being the case, the marriage of science and technology a century or two ago produced an offspring of fearful aspect: a determination to use all modern resources to subdue nature for the benefit of man and (at least in theory) to the glory of God. Thus for our modern ecologic crisis and the rape of the environment "Christianity bears a huge burden of guilt."

The remedy proposed is a return to the peculiar blend of romantic pantheism and Christian devotion attributed to St. Francis of Assisi. However, it may be doubted if White is correct in either his diagnosis or the prescribed cure.14 Many individuals have been able to demonstrate a passionate reverence for nature and yet have sought actively to manipulate it-Humphry Davy for one. Again, despoliation of nature and massive pollution have often occurred quite apart from any Christian ideology. One need only recall the foetid rivers of India near Madras or the suffocating air of Tokyo. The pre-Christian world had some prime examples, as in the deliberate deforestation of the Mediterranean seaboard by fire. Indeed, it has been plausibly suggested that much human arrogance towards nature may be attributed to Greek and Roman sources rather than Judaeo-Christian ones. Chiefly, though, the White thesis is comprehensively undermined by many cases of environmental concern that have been specifically Christian in inspiration; one thinks of John Ray, William Derham and Michael Faraday in the past and of insitutions in our own day like Tear Fund or Faith and Farm.

Perhaps some words from Derham (1713) will make a fitting conclusion to this paper. Of the "uses" of nature he wrote:

That these things are the gifts of God, they are so many talents entrusted with us by the infinite Lord of the world, a stewardship, a trust reposed in us; for which we must give an account at the day when our Lord shall call.¹⁵

One can hardly be more radical than that.

REFERENCES

- J. Needham, in M. Goldsmith and A. Mackay (eds.), The Science of Science, Scientific Book Club, London, 1964, p. 129n.
- ²S. and H. Rose, in W. Fuller (ed.), *The Social Impact of Modern Biology*, Routledge & Kegan Paul, London, 1971, p. 220.
- ³R. M. Young, Radical Science Journal, 1977, no. 5, 65.
- ⁴M. Hammerton, New Scientist, 1977, 76, 274.
- ⁵Especially B. Hessen, "The social and economic roots of Newton's Principia," in N. I. Bukharin et al., Science at the Cross Roads (1931), reprinted by Cass, London, 1971, p. 147.
- ⁶L. Graham, Between Science and Values, Columbia University Press, New York, 1981, p. 378.

⁷M. C. Jacob, The Newtonians and the English Revolution, 1689-1720, Harvester Press, Hassocks, 1976, p. 177.

- ⁸S. Shapin and B. Barnes, Social Studies of Science, 1977, 7, 32.
- ⁹A. Thackray, American Historical Review, 1974, 79, 678.
- ¹⁰C. A. Russell, Science and Social Change, 1700-1900, MacMillan, London, 1983, p. 165.
- ¹¹D. Albury and J. Schwartz, Science for People, 1980, 47, 26.
- ¹²L. White, Science, 1967, 155, 1203.
- ¹³E.g., R. Hooykaas, Religion and the Rise of Modern Science, Scottish Academic Press, Edinburgh & London, 1973.
- ¹⁴C. A. Russell, Cross-Currents: Interactions between Science and Faith, Inter-Varsity Press, Leicester, 1985, p. 231.

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¹⁵W. Derham, Physico-Theology: Or a Demonstration of the Being and Attributes of God, from His Works of Creation, London, 1713.

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ALGENY by Jeremy Rifkin. Penguin Books (1983). 298 pages. \$6.95.

Jeremy Rifkin is perhaps best known for his opposition to the testing of biologically engineered bacteria. But what are the motives for his apparent anti-science attitudes? His recent book, *Algeny*, provides some insights into his position.

The industrial revolution relied on pyrotechnology to transform matter. The new age of biotechnology, which we are just entering, involves transforming the essence of a living organism through genetic manipulation—this is called "algeny." Until now, man has been able to manipulate only the environment, but with the age of biotechnology, living organisms will be redesigned and new forms of life will be engineered—some of this is already being done on a limited scale. The transition from one age to the next also requires a new cosmology for, according to Rifkin, cosmologies "serve as a distant mirror of the day-to-day activity of a civilization.... People create cosmologies to sanction their behavior" (p. 40).

Our present cosmology, based on Darwin's theory of evolution, has been largely shaped by the industrial age. "Darwin dressed up nature with an English personality, ascribed to nature English motivations and drives, and even provided nature with an English personality and the English form of government" (p. 72). Darwin's cosmology was used to legitimize social structures, political struggles, increased efficiency and empire building in the English world. His theory, in providing a mechanical theory of the origin and development of species, tied in well with the mechanical world view developed in physics.

The theory of evolution has been firmly entrenched in our society. Yet the charge that evolution theory is "pseudo-science" is being heard with increasing frequency (p. 117). "The evolutionist today" says Rifkin, "is every bit the true

believer. Baptized in the theory of natural selection, he is prepared to spread the good news and bring his fellow human beings to accept Darwin's teachings." He then questions some of the basic assumptions of and evidences for the theory of evolution.

But if you reject this theory, what do you replace it with? Rifkin points to the facts that (1) the development of an organism depends on more than its genes, (2) an organism is made up of individual parts working together as an integrated whole, and (3) the presence of biological clocks appears to provide an essential mechanism for survival. The new theory of evolution is based on a temporal conception of nature, rather than Darwin's spatial cosmology in which objects existed independent of time. Advances in the fields of physics, ecology and philosophy have helped to lay the groundwork for a new temporal theory of evolution in which organisms adjust themselves to a scarcity of time rather than a scarcity of resources. Rifkin summarizes this view on page 194, as follows:

The Darwinian views an organism as a concrete structure that performs a specific function. The newer theory views an organism as a unique complex of behavior patterns. In this newer way of thinking, the behavioral complex that we call an organism is really a bundle of temporal programs that copy some combination of rhythms and periodicities in the larger environment. These temporal programs are predictive devices. They are the organism's way of anticipating the future in order to manage its own survival. Temporal programs are just another way of describing mind-which is to say that the mind is what the organism is all about. When we get to the species level, it is argued that each differs from the other in its ability to economize on time or respond faster to a greater range of external periodicities, which is just another way of saying that species differ in intelligence. All species, then, are bundles of knowledge, and each species is distinguished by its intelligence; that is, the speed with which it is able to utilize knowledge to control its own future.

The fusion of two of the most recent technologies, computer and bioengineering, will lead to organisms more adept in processing increasing amounts of information in shorter periods of time, allowing man to not only change his environment but also to control it. This new algeny will change the essence of life, transforming the world into a perfectly engineered state.

In the concluding section of his book, Rifkin provides us with two approaches to the future. The first is an engineered approach in which a totally man-controlled environment is created. This approach gives man complete control over his future, but he would give up companionship with other living things and live a life devoid of meaning. The second approach is an ecological one in which man lives in harmony with the rest of nature.

It is within the context of this consideration of a future cosmology that Rifkin's opposition to the testing of bioengineered organisms makes sense. Even though genetic engineering promises many benefits, where is this research leading us? What kind of world are we creating? Although Rifkin does not provide a biblical alternative to the Darwinian view, he does present a challenging sketch of a possible new cosmology.

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THE TRADEMARK OF GOD: A Christian Course in Creation, Evolution, and Salvation by George L. Murphy. Morehouse-Barlow Co., Wilton, CT (1986). 138 pages. Paperback; n.p.g.

This little, well written book is packed with provocative and enlightening relationships between creation, evolution, and salvation. Designed as a 12-lesson course, a leader's guide, an annotated bibliography on the topics covered, and an index are included. The useful guide includes sections entitled "Notes" on purposes and goals, "Matters Arising" to alert the leader to problem areas, "Openers" (questions for discussion starters), and "Resources." It has all the markings of a potentially useful teaching tool; but I would also highly recommend it for anyone interested in the relationships between creation, evolution, and salvation. It is one of the clearest and most understandable of any that I have read.

God's "trademark" is creation out of nothing, which always brings forth newness. God raises the dead, gives hope to the hopeless, and justifies by grace. The Incarnation shows God's trademark. The clearest example of his trademark and masterpiece of all of God's work is the Cross and Resurrection.

Murphy draws out of biological evolutionary theory insights and interesting parallels to theology. In many ways he emphasizes the strong link between creation and redemption. He uses current illustrations from ecology, nuclear weaponry, modern political ideologies, and cosmology. His clear explanations are infused with Lutheran theology of the Word, the Sacraments, the nature of Christ and the Church.

Murphy succeeds in meeting all his "learning goals" listed on page 101:

to think about ways in which Christian faith and science can inform one another, to become acquainted with the organic and evolutionary character of God's universe, and to connect our evolutionary understanding of creation with current concerns such as the environment, abortion, and men-women issues.

Of special interest to this reviewer is one of Murphy's notes in his leader's guide section: "The 'theological proof of evolution'—combining the basic principle that 'what has not been assumed has not been redeemed', and the biblical witness that the whole creation is to be redeemed allowing us to show *theologically* that evolution is superior to 'special creation.'"

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CREATIONISM ON TRIAL: Evolution and God at Little Rock by Langdon Gilkey. Winston Press, Minneapolis, Minnesota. 234 + 67 pages notes and appendices. Paperback; \$12.95.

Langdon Gilkey, author of the classic Maker of Heaven and Earth and Professor of Theology at the University of Chicago Divinity School, served as a "theological witness" for the American Civil Liberties Union at the "creationist" trial in Little Rock, Arkansas, December 7–9, 1981. In this marvelous book Gilkey gives us, in about two-thirds of the text, his personal experiences related to the trial, and then reflects for the remainder on the significance of the issues. It is a book that anyone even remotely concerned about the interaction between "scientific religion" and "religious science" should read carefully.

In the first three chapters Gilkey gives us his experiences as he prepared for the trial and was deposed by the opposition lawyers. Believing that the enactment of the proposed law posed a major threat to religion, the teaching of science, and academic freedom, Gilkey was ready to serve as a witness. He shares with the reader his reactions to the material representing the background of the trial and his conclusion that "creation science represents a quite contemporary, even (alas) 'up-to-date' synthesis of both modern science and contemporary religion, a synthesis to which each one had substantially contributed" (p. 40). He also sees another synthesis that goes beyond the trial and threatens our future:

Our present political life illustrates another unfortunate but also very modern form of union: that of contemporary right-wing economic and imperialist politics on the one hand, combined with old-time fundamentalist religion on the other, both seemingly intent on forming a "Christian, capitalist America." As fundamentalism has joined with science to form creation science, so the politics of the Moral Majority is dominated by a union of fundamentalism with modern conservative social theory—and regrettably, neither one seems about to go away. (p.41)

The dramatic experience of the deposition is laid out in fascinating detail, in which a witness faces the opposition lawyer's questions before the trial with the knowledge that any small error or misjudgement may become the basis for a major assault during the actual trial.

The next three chapters cover the details of the trial itself, up to the moment when Gilkey had to leave to return to Chicago. His own testimony is given to us in detail, and is a model of clear statement and delineation both in respect to the nature of science and to the relationship between science and religion. Anyone who has faced public interview can empathize with the problems in speaking clearly and fairly under stress to avoid misunderstanding; in fact, anyone facing public questioning about these issues could hardly do better than to review Gilkey's testimony. Especially telling in the trial itself are those moments when advocates of "creation science" are charged with heresy because they seek to discuss creation without talking about God as Creator, and when they are charged with following in the footsteps of Stalinist Russia where ideology attempted to rule scientific activities.

Part II of the book is entitled, "Analysis and Reflection: The Implications of Creation Science for Modern Society and Modern Religion." It consists of two chapters, the first of which analyzes the interactions between "Science and Religion in an Advanced Scientific Culture," and the second of which deals with the religious significance of creation. I would like to share many of the cogent arguments set forth. I will, however, content myself with sharing a couple of remarks which indicate the nature of the approach:

Creation science embodies a common error of our cultural life, that all relevant truth is of the same sort: factual, empirical truth, truth referent to secondary causes—in a word, "scientific truth." (p. 171)

Despite this almost universal agreement among religious leaders, *the wider public*, both those who attend church and those who do not, remains apparently quite unaware that there is no longer any such conflict between science and religion... The century-old rapprochement between science and theology is the best-kept secret in our cultural life. (p. 187)

In a "Time of Troubles" such as we are entering, the religious dimension tends to expand and, unfortunately, to grow in fanaticism, intolerance, and violence; science and technology tend accordingly to concentrate more and more on developing greater means of destructive and repressive power. This combination represents, as we can all agree, a most dependable recipe for self-destruction. (p. 206)

Gilkey gives us no one-sided attack on fundamentalism in the name of science; rather, he provides us with a careful analysis of both science and religion and the problems one encounters when one forgets the religious dimension of all human endeavor.

The book concludes with 25 pages of notes and two appendices, giving the text of Arkansas Act 590 and the Judgment by the Federal Court at the conclusion of the trial. Beyond its immediate relevance, this book can be strongly recommended as a clear presentation of the proper and improper uses of scientific approaches to life and its problems.

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EVOLUTION AND CREATION by Ernan McMullin (ed.). Notre Dame Press, Notre Dame, Indiana (1985). 304 pages. \$24.96.

This book is based on a conference held in March, 1983, at the University of Notre Dame under the joint sponsorship of the Program in History and Philosophy of Science and the Center for Philosophy of Religion. Eight chapters correspond to papers read at the conference, which are published here together with three additional papers. Twelve authors are involved, all of whom are academics except one. Six of the authors are in the field of philosophy, three in theology, two in Old Testament, and one in genetics. The book is divided into four sections: a historical introduction by the editor, three chapters on evolution, three chapters on creation, and four chapters on evolution and creation.

This is not an easy book to read; it has in general a scholarly tone and depth that is often difficult to penetrate, and which seems sometimes to obscure rather than to clarify the issues. On the other hand, many of the chapters are quite perceptive and careful attention to their message is a fruitful endeavor. I found myself becoming more enthusiastic about insights gained the longer I read the book.

It is stated in the Introduction that the book does not deal with the "creation-science" approach at all. This is mostly true, but there are scattered brief discussions of "creationscience," all directed toward indicating the inadequacies of this approach.

In the Introduction, McMullin traces the early history of evolutionary ideas, the thoughts of Augustine and Aquinas, the rise of scientific understanding, the development of "physico-theology" (or, the attempt to found a basis for religious belief in the findings of science); for example, the argument from design, and the interaction between evolution and philosophy, physics, and politics.

The first chapter in the section on evolution is the only really scientific chapter of the book; a discussion of the recent successes and challenges of the theory of evolution by geneticist Francisco J. Ayala. He takes the position that the evolutionary origin of organisms is corroborated beyond reasonable doubt, supported by a weight of cumulative evidence so great that is has ceased to be a concern to the majority of scientists today. He then describes some of this evidence available from modern molecular biochemistry and genetics, and the use of these techniques to attempt to trace evolutionary histories. He concludes with the statement that "macroevolutionary theories are not reducible (at least at the present state of knowledge) to microevolution... macroevolution is an autonomous field of study that must develop and test its own theories." (I must confess, as one who is prepared to accept some version of the evolutionary development of organisms, that I seldom feel as uneasy about this choice as when I listen to evolutionists who are dead sure that evolution is a "fact.")

In the second chapter of this section, John Leslie, philosopher from the University of Guelph, deals with the effects of modern scientific understanding and arguments from design for the existence of God. He suggests that arguments from design may not be dismissed as summarily as they have been in recent years. In view of our increasing knowledge of the "fine-tuned" nature of our universe in qualities and quantities essential for the development and existence of life, we are faced with two alternatives: (1) there have existed an effectively infinite number of different universes with a random variation of all the critical parameters, and it just so happens that the one universe suitable for human life was one of these "trial" universes, or (2) the special fine-tuning of our universe for life is indeed the result of the activity of creative power. Having made this point, however, Leslie then continues to propose that the creator, God, need not be a person at all but can be replaced by a "creative ethical requirement." It is not clear to me exactly what is meant by this phrase in spite of Leslie's attempt to clarify it.

The final chapter in the first section on evolution is a discussion of natural purpose by historian and philosopher Phillip R. Sloan. He deals with the issue of whether we can continue to argue that purpose exists in the natural world if it has come into being by an evolutionary process. Considering the various arguments advanced to deny this possibility, he concludes that none is ultimately damaging once we realise that the doctrine of creation does not demand a creation event "at some datable moment in time, nor ... the establishment of intelligible order in a preexistent chaos," but rather that "creation is an existence-giving act, an act establishing an ontological dependence of the world on a free act of the Jahweh of Exodus 2:14." Such arguments against purpose have power "only if it is assumed that Christian theology implies a natural order without evident defect or deficiency, able to reveal God's purposes and benevolence in some direct way without need at some point of a faith-response.'

In the section on creation, Dianne Bergant and Carroll Stuhlmueller, professors of Old Testament, consider the implications of the Old Testament texts with respect to the creation versus evolution debate. They conclude that these texts direct us primarily to the Person of the Creator, rather than to information about the details of the created world. Study of prophecy and psalms confirms this interpretation of Genesis, and shows that "creation is *not* presented as a cosmological account of the origins of the universe, nor is creation treated for its own sake, independent of faith or religious confession."

The doctrine of "creation from nothing" is explored next by theologian David Kelsey. The initial advancement of this formula was designed to express both the continuing dependence of the created universe upon God for existence, and the origin of the world in a singular event—in later discourse the latter implication came to receive more attention. The author considers various possible developments that might make the formula no longer useful or relevant.

"God's Action in the World," by philosopher William P. Alston, is the final chapter in the second section of the book. He explores the meaning of the affirmation that "God's creative or sustaining activity is continually required to keep the creature in being," and in what sense we might then also speak of God's activity in a small subset of events in some special sense. Problems in causal determination and human voluntary actions are considered, as well as reflections on the possibility or necessity of the "intervention" of God into natural phenomena. The author's use of the term "law" tends often to sound as if he were treating a natural law as if it were prescriptive, rather than descriptive; some of the problems might be resolved just by that realization.

The third section, "Evolution and Creation," starts with a consideration of the question, "Could humans have evolved, yet be capable of life forever with God?" by philosopher James F. Ross. This is perhaps the most difficult chapter of the entire book, principally because of the somewhat obtuse style of the author. On two pages, for example, there are fifteen parenthetical remarks. He supports a view called "nonreductive evolutionary naturalism," which he distinguishes from other views he considers inconsistent with the biblical promise of resurrection, including those of Descartes, Bonaventure, Plato, Kant, and Berkeley. The chapter is entitled, "Christians Get the Best of Evolution," and concludes with the statement,

To get the best of evolution, Christians need to live forever with God. That is what is *promised* in Scripture, *advanced* by the emergence of human life in the biotic system, and *achieved* by the cooperation of the Spirit over millennia: the Kingdom to come, a world without end.

Philosopher William H. Austin considers whether evolutionary explanations of religion and morality can properly be construed as "explaining religion away." He focuses particularly on the writings of Edward O. Wilson and his exposition of sociobiology. He argues that Wilson's attempted explanation of religion is at best rather weak, unlikely to discredit anything; that Wilson's arguments taken at face value seem to point to that adaptive character of religion, which is not a viable way to discredit it; and that Wilson's own "scientific materialism" is hardly a creditable alternate source of moral guidance and strength.

Nicholas Lash, Professor of Divinity at Cambridge, reflects on the nature of Christian hope and original sin. This is perhaps the most moving chapter of the book, in my opinion. Lash deals with the relationship between evolutionary views of human origins and Christian doctrines of redemption. He avoids three common approaches to obtaining a coherent world view: (a) denying the cognitive character of theology, (b) recourse to metaphysical dualism, or (c) collapsing the languages of science and religion into a single pattern of description. Complete coherence may come at too high a price, given our own ignorance of the ultimate nature of things. "The mystery of evil is *far darker* than appears in our moralizing self-dramatization." His brief comment on the role of Genesis 2 and 3 is insightful: The story in the second and third chapters of Genesis does not contrast the way things are with the way they once were. It contrasts they way they are and have ever been with how they should, in principle, be... being God's garden is the *destiny* of the world.

Or again, "The context of the confession of God's good creation, the context of our celebration of God's good garden, remains (for the Christian) the garden of Gethsemane and the hill of Golgotha on which the tree of life was planted."

The final chapter by Christopher F. Mooney, S. J., Academic Vice-President of Fairfield University, presents a sympathic but realistic summary and assessment of the contributions of Teilhard de Chardin to the issues raised in this book.

In summary, there is a lot of meat in this book that can prove profitable for reflection by Christians prepared to deal with the philosophical difficulties. At the very least, it provides many warnings against simplistic attempts to resolve the creation versus evolution debate, and points the way to more responsible evaluations.

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

WHAT ARE THEY SAYING ABOUT GENETIC ENGINEERING? by Thomas A. Shannon. Paulist Press, Mahwah, New Jersey (1985). 103 pages. Paperback; \$4.95.

In this little book, Dr. Shannon, Professor of Social Ethics at Worcester Polytechnic Institute, summarizes many of the main ethical issues dealing with genetic engineering. Ninetyfour pages of text are divided into eleven chapters; all of the chapters except three are only about six pages in length. The three longer chapters, which account for almost one-half of the book, are concerned with recombinant DNA research, birth technologies, and a summary of various positions on genetic engineering.

The book is accurate in its title: it is a summary of what people have said and are saying about this group of ethical issues. In the words of the author, the first six chapters discuss "the variety of ways in which different commentators have defined these contexts of perception and have identified various methods of interpretation." The style is relatively colorless and the impact is rather bland. Since the author provides only minimal analysis of his own, the book is almost limited to its use as the background for discussion in a group led by one experienced in this field.

Some of the more challenging issues raised include: In thinking about improving the species, why do we always tend to think of increasing intelligence rather than increasing compassion? How will we handle the approach to the fetus, that to date has not ascribed personal status, but now must consider the rights of the fetus as a patient? Will technology lead us to view conception under the category of manufacturing? If people think of human/non-human hybrids, they frequently do so in terms of developing a "slave-labor" class—does this imply a fundamental weakness of human beings? (And a question not asked in this book: at what point would we find the cross-over between hybrid mammals and organic machines?)

In the summary chapter, the author describes the recommendations of five different committees dealing with these issues. "Events and technologies continue to overtake us and problems continue to mount," he writes. He then goes on to question the status of frozen embryos whose "parents" are killed in an airplane crash: should the embryos be implanted in surrogate mothers and allowed to develop, or should they be destroyed?

The book reminds us throughout of the relationships between values and science. It could serve as a useful study guide.

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

GOD AND SCIENCE: The Death and Rebirth of Theism by Charles P. Henderson, Jr. John Knox Press, Atlanta (1986). 186 pages. Paperback; \$10.95.

Charles P. Henderson, Jr., pastor of Central Presbyterian in New York and Assistant Dean of the Chapel at Princeton University, deals in this book with some of the major arguments advanced against belief in God, is generally effective in turning them inside out, and considers possible new evidence for theism. Although he spends considerable space on indicating why classical "proofs" for the existence of God do not fulfil that role, the author still insists throughout the book on speaking of a "new proof for the existence of God," and attempts to formulate such a new "proof," rather than simply recognizing that to speak of such "proofs" is to misuse language. He concludes the entire book by saying that,

When it is shown that faith is internally consistent, coherent, and responsive to new insights which arise at the forward frontier of knowledge, then one has in fact established a new proof for God.

But this is to use language in a misleading way. When we speak about establishing "proofs," and what we have really done is to supply further evidence, or, as the author states a few lines further, "to state the case for God in the strongest possible terms," we misrepresent our own arguments and lead others to misunderstand us as well.

The book starts with a chapter dealing with the thought of Einstein (unfortunately entitled, "New Proof for the Existence of God"), and then completes its first half with analyses of the thought of Freud, Darwin and Marx. In the next two chapters, the author turns to two prominent modern contributors to theological thought: Teilhard de Chardin and Paul Tillich. There follows a chapter on Fritjof Capra's and Gary Zukav's attempt to interpret modern science in terms of Eastern religion, and finally a chapter of the author's own conclusions.

Henderson's purpose in this undertaking is wholly commendable, namely to resolve the stance of conflict between science and religion. Many of his conclusions are closely related to those of informed evangelical Christians, but sometimes he arrives at them in a roundabout and ambiguous way, attributing weak positions to Christian writers and thinkers, which those committed to integrating authentic science and authentic theology have not held for some time. The reader often gets the feeling that the author is completely out of touch with informed evangelical thought on these issues.

Some of the surprising assertions of the book include: two references to Bonhoeffer as one who has surrendered completely to scientific atheism; the claim that Paul Tillich was the first major theologian to see the threatening implications of perceiving God as a finite being alongside other finite beings; the claim that "erotic love ... plays a central role in the religious life itself," and that "all forms of sexual expression are merely repressed spirituality"; the mistaken, or at least too broad, indictment of traditional (by which what is meant?) theology by saying that "The high and all-powerful God of traditional theology can influence the world only by intervening in its natural processes and contradicting its natural laws"; the implication that Colossians 1:15–17 does not intend to declare "the supremacy of Jesus over all the other creatures"; the claim that the parables of Jesus "are often nonsensical and paradoxical in relation to our common-sense view of the world," and that "the parables clearly transcend all conventional distinctions between good and bad, beautiful and ugly, birth and death"; and the conclusion that "a nuclear war which rendered this planet uninhabitable would be a precise refutation of the Judeo-Christian faith.' We should no doubt grant to the author the possibility that in some of these cases, of which I have quoted a few here, he is speaking dramatically for emphasis or in exaggeration, rather than anticipating a careful interpretation of each statement.

The book has value for those who would like to see a different perspective on the thoughts of Freud, Darwin and Marx—through the eyes of a Christian theologian. If it can lead a wide spectrum of Christians to a more healthy integration of authentic science and theology, it will make a useful contribution. Christians already committed to such an integration may be puzzled, however, at why the author regards his major conclusions as new.

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

THE TRAVAIL OF NATURE: The Ambiguous Ecological Promise of Christian Theology by Paul H. Santmire. Fortress Press, Philadelphia. 274 pages. Paperback; n.p.g. I recommend this book to anyone in the ASA readership who is interested in what Christian theology traditionally has said about the creatures with which humans share this planet.

Santmire is motivated by his concern that too often Christianity has been blamed for the exploitation of nature that has led to our ecological crisis. He investigates the approaches of Christian writers and theologians to the natural world, and finds them ambiguous—sometimes affirming that nature is filled with God's immanence and goodness, and sometimes treating nature as a temporary disposable platform for the human drama. Santmire concludes that Christian theology has contributed in part to the ecological crisis, though it need not do so. The travail results from the mixture of distress and hope with which the church traditionally has approached nature.

The author begins with a set of metaphors by which nature, and human interaction with nature, can be described. The first is the metaphor of *ascent*, in which humans, the sole vessels of spirit, leave the world behind and ascend toward Heaven, progressively less encumbered by terrestrial things. Another is the metaphor of *fecundity*, in which the immanence of God radiates out and blesses the natural world. These two metaphors are related, he says, because both may be symbolized by images found during the ascent of a mountain. The first metaphor pertains to the view of the climber when he looks only upwards; the second is encountered when he looks down at the earth below him and sees that it is fed by streams flowing from the mountain he is climbing. The two metaphors conflict with each other, however, because the climber can only entertain one view at a time. The third metaphor concerns the migration to a good land. Santmire then defines two motifs: the spiritual motif, from the overwhelming emphasis on the metaphor of ascent; and the *ecological* motif, from the conjoining of the metaphors of fecundity and migration. The two motifs are fundamentally in conflict.

Certainly these metaphors are not the only possible Christian interpretations of nature. Instead of saying that the metaphors of ascent and fecundity are two aspects of climbing a mountain, he could just as easily have considered migration to heaven (ascent) and migration to the promised land to be opposites. The validity of Santmire's analysis, however, by no means depends upon his having identified the uniquely correct choice of metaphors.

Santmire then reviews the whole history of post-biblical Christian theology in the light of these metaphors. Specifically, he distinguishes between theological systems that are "asymmetrical" (the goodness of God created both humans and nature but grants eternal life only to the former) and those that are "symmetrical" (the goodness of God will redeem both humans and nature). Irenaeus and Augustine's visions of the renewal of the whole creation are contrasted with Origen's view of creation as a temporary stage. Thomas Aquinas, Bonaventure, and Dante appreciated nature, but thought nature valuable primarily for its usefulness to man and so emphasized man's progress toward pure spirit; in contrast to Francis of Assisi, who called on his fellow creatures, his brothers and sisters of the natural world, to

praise God along with him. The Reformers saw God's goodness in the natural world, but their emphasis on the human drama allowed the secularization of nature, even among theologians such as Barth. Even Teilhard de Chardin, who paid more attention to the natural world than most others, saw the physical world as dying while humans advanced toward a spiritual omega-point.

Thus, the spiritual and ecological motifs have alternated throughout church history, with the ecological motif practically vanishing from modern theology. The Augustinian and Franciscan influences demonstrated that the ecological motif need not have been lost, however. Presumably Santmire intends to construct an ecologically sound theology in a later book; indeed, he has provided a brief outline of his approach in the final chapter, which presents an ecological understanding drawn from the Bible.

Starting with the Old Testament, Santmire points out the centrality of the migration metaphor. The Israelites' creation beliefs, and so their view of nature, far from having been derived from foreign sources, were the natural devolopment of their redemption experiences. The goodness of nature is, of course, seen in Psalm 104, and, even apart from its service to man, in Psalm 148. Turning to the New Testament, Santmire points out that the epistles describe the present cosmic lordship of Christ and the eschatological renewal of the earth. Santmire finds the fecundity metaphor in Ephesians 1:10 and Colossians 1:17, and the migration metaphor in the church's missionary commission. He shows that the creation beliefs of the church cannot be studied in isolation from its evangelistic outreach: "No biblically legitimate creation theology... will prompt its adherents to forsake the life and mission of the people of God under the cross" (p. 209). However, even in the New Testament the Bible is ambiguous toward nature, says Santmire. The Gospel of John treats nature as essentially hostile, and Hebrews depicts God's City as totally spiritual.

Santmire's book cannot be described as evangelical. Indeed, he hesitates to say whether or not Jesus was God or spoke with God's authority at the very point (chapter 10) at which that authority was important to establish. Santmire does not communicate the belief that the Bible as a whole is the word of God. Two consequences of this are, first, that while he claims that the Bible must be the basis of any Christian theology of nature (p. 175), he relies as heavily on theologians' opinions (especially those of Schillebeeck) as on the Bible; and second, that he sees the Bible as fragmented into viewpoints that are not completely reconcilable. For instance, he describes the contradiction between the ecological viewpoint of Ephesians and Colossians and the antiphysical viewpoint of John and Hebrews as if these books can be legitimately interpreted in isolation. Nevertheless, we can transfer most of Santmire's work into an evangelical framework and find it serviceable.

Santmire distinguishes between theologians like St. Francis, who have loved nature enough to mention its particulars—the plants and animals and climate that constitute nature—and those like Barth, who treat it as an abstract concept. Because of this, I had expected Santmire to review the many Biblical passages in which their writers exulted in the beauty and diversity of nature. Santmire cites only a few of these, however, and was himself somewhat abstract about nature. Many of us too have the problem of being abstract about the natural world. In article after article, we generalize about nature, as if it can be symbolized by boxes and arrows, rather than by examining the real world of colorful diversity.

Even if Christian theology were as anti-ecological as Lynn White claimed in his famous article, "The Historical Roots of our Ecologic Crisis," it is difficult to prove whether or not Christian theology has had any influence on the economic developments of modern times. The exploiters of nature may not have cared one way or the other about what the Bible or theologians have had to say. Furthermore, if the dominance of the metaphor of ascent towards noncorporeality is a measure of ecological insensitivity, then the various Eastern religions are worse offenders. Nevertheless, Santmire's exposition has proven convincing enough to draw an endorsement from Lynn White, who was so critical of the anti-ecological effect of Christianity.

Thus, while we cannot agree with Santmire in every detail, let us join with him in his vision of:

a transfigured cosmos where peace is universally established between all creatures at last, in the midst of which is situated a glorious city of resurrected saints who dwell in justice, blessed with all the resplendent fullness of the earth, and who continually call upon all creatures to join with them in their joyful praise of the one who is all in all... (pp. 217–218)

Reviewed by Stanley Rice, Plant Biology, University of Illinois, Urbana, Illinois.

THE WESTMINISTER DICTIONARY OF CHRIS-TIAN ETHICS by James F. Childress and John Macquarrie, (eds.). Westminster Press, Philadelphia (1986). xix + 678 pages, index. Hardcover; \$34.95 (US), \$50.00 (CAN).

The first edition of this work, prepared in 1967 by the philosophical theologian John Macquarrie, quickly became the standard Protestant dictionary in its field. Two decades later, the world is a vastly different place, and so are the institutional settings, social and intellectual concerns of Christian ethics. These changes are reflected in this useful and comprehensive reference tool edited by the biomedical ethicist James Childress. Approximately six-tenths of the material is new; those articles that have been retained have all been revised. There are 620 up-to-date entries by 167 contributors (but only nine of them women!)—more than double the number of authors in the previous edition.

The list of contributors reads like a who's who in Christian ethics and moral philosophy. Apart from the well-known editors, the authors include Charles Curran, Arthur Dyck, Tristram Engelhardt, James Gustafson, William Frankena, Beverly Wildung Harrison, Stanley Hauerwas, Carl Henry, James Nelson, John Noonan, Richard McCormick, Joseph Fletcher, Oliver O'Donovan, Gene Outka, Warren Reich, Roger Shinn and Robert Veatch. This group of scholars,

wide-ranging in every sense, has been drawn not only from the United States and the United Kingdom, but from Canada and Australia as well. They represent mainline and evangelical Protestant, Anglican, Roman Catholic, Eastern Orthodox, and Jewish backgrounds. A sign of the tremendous interest in questions of applied ethics is that moral theologians and philosophers have here been joined by social ethicists, psychologists, educators, sociologists, biblical critics, bioethicists, systematic and pastoral theologians, lawyers, physicians, historians, anthropologists, and political theorists.

The resulting articles are lucid, authoritative, uncluttered and undogniatic. Each entry usually offers an outline of the development of, and current perspectives on, the issues. Articles, necessarily condensed, come equipped with ample bibliographies and cross-references, which ought to satisfy seekers of more information.

Entries fall into seven rough categories:

- 1. Basic moral concepts, such as duty, rights, goodness, conscience, benevolence, justice, free will.
- 2. Biblical ethics, with overviews of Old and New Testament ethics, and specific themes such as koinonia, prophetic ethics, eschatology, Jesus' teachings, and the Kingdom of God.
- 3. Theological ethics, as represented not only by entries on theodicy, love, faith, grace, sin, and orders of creation, but also by survey articles on such traditions as patristic, Augustinian, Thomistic, Lutheran, Mennonite, Calvinist, Orthodox, Puritan, Quaker, Roman Catholic, Wesleyan, Kierkegaardian, feminist, and liberation ethics.
- 4. Philosophical traditions, including Aristotelian, Stoic, Platonic, Kantian, utilitarian, natural law, and existentialist.
- 5. Non-Christian and ancient ethical systems, such as Buddhist, Jewish, Islamic, Hindu, Humanist, Marxist, Zoroastrian, Manichean, Taoist, Egyptian and Babylonian are discussed.
- 6. Political, social, psychological and other concepts relevant to Christian ethics are also addressed, including laissezfaire, industrial relations, media, civil disobedience, mental health and illness, marriage, communism, socialism, refugees, homosexuality, and torture.
- 7. Specific and substantial ethical problems, such as unemployment, war, peace, and world hunger.

It is in this last category that the *Dictionary* excels as a guide for those interested in religious-ethical perspectives on the issues of technology, science, medicine and health care in the 1980s and beyond. Thus, there are entries covering computers, robots, nuclear warfare, psychoanalysis, population policy, environmental ethics, sexual ethics, science and ethics, care of the aged and the handicapped, energy, evolutionary ethics, and more. Turn to the entry on bioethics, for instance, and you will be led through a series of cross-referenced articles on fetal research, abortion, euthanasia, organ transplantation, genetics, reproductive technologies, experimentation with human subjects, hospices, and eugenics.

The Westminster Dictionary of Christian Ethics is a fine addition to an outstanding series of "Westminster Dictionaries". Other one-volume reference works in the series deal with Christian Theology, Christian Spirituality, the Bible, Worship, and Church History. A copy of this book belongs in every pastor's library. Its value for members of the ASA/ CSCA should also be obvious.

Reviewed by Paul Fayter, Institute for the History and Philosophy of Science of Technology, University of Toronto, Canada.

PEACE IN OUR TIME? Some Biblical Groundwork by David Atkinson. Eerdmans, Grand Rapids (1985). 219 pages. Paperback; n.p.g.

This book by the chaplain of Corpus Christi College, Oxford, provides a biblically oriented background for Christian students confused by the resurrection of an old Roman precept: "If you desire peace, prepare for war!"

"Clearing the Ground" reviews historically the just war tradition (Augustine, Aquinas, Luther, Calvin) and the pacifist point of view (Mennonites, Quakers). The author sketches the Old Testament concept of a holy war as God's use of war as a judgement against His people, as well as the later development of militarism by the state. In New Testament times, however, warfare was commonplace under the political and social conditions. Christian pacifism was envisaged between individuals. The manifesto, based on the principle of good overcoming evil, was "Love your enemies." The author, believing that the Bible is a guide for knowing God, raises a question as to its value today as a moral textbook, considering such new problems as global nuclear war. Is the extrapolation of personal ethics justifiable for current social ethics? Atkinson also reviews the historical development of the concept of a just war. Was World War II just? Is a just nuclear war possible?

Part III, "Putting Down Markers-Towards a Theological Foundation," considers the human predicament in light of the existence of an evil power. Is it possible to live the Christian life in a modern state with its powerful control? Can one maintain one's allegiance to God? to His demand of the sanctity of human life and the stewardship of His world? For the maintenance of both the rights and obligations of peace there must be justice embedded in order, all leading to "the peace of God, which passes human understanding"-peace in Christ. The individual is required to "render unto Caesar . . . " what actually belongs to God. What about the state's self-escalating armaments, its so-called defense strategy, its vaunted control of space? How can the individual respond to the divine imperative: "Be perfect!"? Is there a limit to the state's use of force? What does the Christian peacemaker do when there is a call to arms? As the author emphasizes, each one must answer for him or herself. I would add: you do not know what you will do until you have to do it.

The author gives his own personal conclusions in the last section: "Starting to Build—Right, Wrong, War and Nuclear Deterrence." He views war as "a last resort defensive action against unjust aggression"—limited by noncombatant immunity with respect to both discrimination and size. He notes that the NATO Cruise and Pershing II missiles are "not unambiguously weapons of defence and deterrence." Is the neutron bomb, preferring property to people, a deterrent? Noting that deterrence is always based on distrust and irrational escalation is potentially hazardous, Atkinson concludes that all strategic nuclear weapons and, indeed, all battlefield weapons, must eventually be abandoned. One must say no to all indiscriminate weapons. Their very possession is morally wrong. "Atomic peace can never be a settled and reassuring peace."

As a thoughtful analysis of everyman's awful problem, this book is worth studying and discussing.

Reviewed by Raymond Seeger, RSF Ret., Bethesda, Maryland.

WHOSE VALUES? THE BATTLE FOR MORALITY IN PLURALISTIC AMERICA by Carl Horn, ed. Servant Books, Ann Arbor, MI (1985). 205 pages. Cloth; n.p.g.

Recognizing that American society is characterized by conflicting fundamental values or world views, and at the same time aware that decisions are being made by appropriate authorities of Government (United States) on legal and other public policy matters which tend to affect the quality of societal life, the eleven authors of this collection collectively address the question: "Whose values should inform and form the bases of such decisions?" Their answers tend to favor traditional moral and family-centered values, reflecting a belief that these values will hold a pluralistic society together and ensure its moral strength. They do not directly and explicitly argue that these values must necessarily be rooted in one traditional religion.

Chapter one, "The Politics of Morality and Religion," by Terry Eastland, traces the relationship of politics and religion from the founding of America to contemporary times. The changes noted are said to be due to the extension of Federal Judiciary powers to decide over substantive moral and religious matters which previously were left to the decision of the states and localities. For example, the Federal Court's decision in *Roe v. Wade*, which was based on a right to privacy, led to the invalidation of the abortion laws of fifty states (p. 19). The promulgation of this decision has led to the usurpation by the Judiciary of the creation of policy, previously thought to be the prerogative of Legislature. The questions this chapter raises are how to restrain the Judiciary and return it to its proper role and how to enhance the capacities of self-government.

Chapter two, "Disentangling the Secular Humanism," by James Hitchcock, and chapter three, "Secular Humanism" or "The American Way," by Joseph Sobran, deal with secular humanism and its pervasive influence in society by means of the media, public schools, and the Courts. Of the latter, Sobran says: "The judiciary, custodian of the secular

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humanist ground rules, has served as a theocratic priesthood which, in the name of the American Constitution, has successfully circumvented popular politics to realize much of the liberal agenda" (p. 48). So, the authors urge Christians to disentangle influences of secular humanism from their lives and not to be misled by the posturing of secular humanists as upholders of the American Way, evidenced by the causes they champion which are often settled by appealing to the First Amendment of the Constitution.

However, disentangling such influences necessitates a correct understanding of what constitutes secular humanism. Unfortunately, discussion on this is meager, and what there is is not always instructive, perhaps even inaccurate. An example would be: "The secular humanists deplore any talk of a 'Communist menace,' because they look on Communism as an essentially rational (though no doubt occasionally brutal) social principle, akin somewhat to their own, and therefore eligible for 'dialogue' and 'negotiation.' After all, Communism never adverts to the supernatural. It is only a variant of secular humanism, which is why secular humanists remain far more scandalized by religious wars and persecutions than by the continuing oppressions . . . of the Communist regimes" (pp. 50–51).

Both chapters are correct in associating secular humanism with secularization, described by sociologists as the process of differentiating categories of human action, identifying that which is public and that which is private. Religion has been identified as a private affair. On examination, however, the problems that have caught the attention of the public, are being discussed by politicians, and decided upon by the Courts of the land, are decidedly religious in nature; for example, abortion, mercy killing, and so on. Religion does not seem to be an altogether private affair! Both chapters remind Christians not to remain passive and naive in their understanding of the political process but to act when their religious beliefs are taken for granted and violated.

The factors that are said to be responsible for the breakdown of religious faith, strong family bonds, and moral probity in post-World War II America are discussed in chapter four, "On Parents, Children, and the Nation-State" by Allan C. Carlson. These factors are divided into two categories: that of 'internal weakness' and 'the cultural war.' The former includes (1) the failure of mainline churches, (2) the race question, and (3) the image of the American woman. These weaknesses rendered American society an easy target for a whole range of ideological opponents, creating a culture war. Among the opponents enumerated are the Marxist Left, the Sexual Libertarians, the Neo-Malthusians, and the Radical Feminists. American culture, says the author, became a "cockpit in conflict" (p. 68).

Despite the enormity and complexity of recreating moral communities, the author goes on to suggest steps that could help create a new vision of moral community (pp. 69–72), one designed to reinstate the centrality of family authority and the right of families to preside over the education of their children. In turn, these steps suggest changes regarding schooling practices.

Continuing the theme that American society is deeply divided over its core of values, the discussion moves on to such matters as abortion and infanticide. These are the topics of chapter five, "Abortion: The Judeo-Christian Imperative," by W. Douglas Badger, and of chapter six, "Rationalizing Infan-ticide: Medical Ethics in the Eighties," by James Manney. At once, Badger puts to rest the questions of whether or not a fetus is a human being or of when life begins by citing statements of different scientists affirming the humanity of a fetus. Indeed, he says that this is not the question at issue. Rather, underlying all moral and value problems in America is an irreconcilable conflict between two views of human life, namely, the sanctity-of-life ethic which is the Judeo-Christian moral tradition-one which emphasizes the intrinsic worth and equal value of every human life regardless of its stage or condition (p. 98)-and the quality-of-life ethic which allows relative rather than absolute value to be assigned to human lives (p. 99). Increasing acceptance of the quality-of-life ethic may have been encouraged by the Supreme Court's decision in Roe v. Wade-that the right of privacy was broad enough to encompass a woman's decision whether or not to terminate her pregnancy (p. 79). The chapter includes some descriptions of actual performance of abortion in order to focus ... on the undeniable reality of precisely what an abortion is" (p. 87). It concludes with an affirmation of the Christian stand on the sanctity of life; hence, its opposition to abortion. The question of whether there are cases where abortion may be morally justified on Christian grounds is not raised. What is emphasized is that in principle Christians are opposed to abortion.

The conflict of the two world views is evident in the discussion on intentional killing of innocent newborn life, 'beneficient' euthanasia, killing of disabled newborns, and so on. An attempt which is supposed to be informed by Christian beliefs and which provides ground for deciding when to sustain or to terminate life is presented for analysis. It is the so-called "relational principle" authored by Fr. McCormick and also used by the American Medical Association in 1981 in a paper entitled "Quality of Life." The principle is based on I John 4:20-21: "If any man says I love God and hates his brother, he is a liar. For he who loves not his brother, whom he sees, how can he love God whom he does not see?" From these verses Fr. McCormick concludes that the substance, meaning, and consumation of life is found in human relationship, along with supporting qualities of justice, respect, concern, and so forth (p. 104). The question then becomes, on what basis may mentally retarded or handicapped children be judged capable of sustaining human relationships? And how should their *quality* of sustaining such relationships be judged? By whose standards? The guideline is too broad and vague to enable someone to decide whether human relationship is sustained or not. It may be applicable to difficult and extreme cases, but not to a wide range of cases of varying degrees of abnormality, or mental retardation. The author concludes the chapter with a brief discussion on the employment of medical technology and on vitalism. Suggesting that discussion on these matters are sometimes misdirected, the author once more directs himself to the issue of whether handicapped infants should receive the same treatment as non-handicapped infants. If not, why not? Too often social rather than medical reasons justify the answer. The child's projected I.Q., the parents' aspirations, a doctor's view of a meaningful life, *et cetera*, make him a target for infanticide. But the disabled child is, says the author, "one of us, a creature of God, a pearl of great price" (p. 112).

If public schools are said to promote the values of secular humanism, then inquiry into the bases for teaching moral education should be made. Accordingly, chapter seven, "Ideological Biases in Today's Theories of Moral Education," by Paul Vitz, discusses two popular theories of moral education; namely, values clarification and Kohlberg's theories of moral development. At once it should be said that values clarification has lost much of its attraction and popularity. It has received numerous critical commentaries, the foremost of which question its understanding of what constitutes 'values." Most of its game-like strategies tended to render complex moral problems into mere likes, dislikes, wants, or wishes. It tended to concentrate on "getting in touch with one's self" to the exclusion of others. The primary moral question of "How ought I to behave considering that there are others like me" tended to be obscured or rejected. Most of the criticisms in this chapter to the theory may no longer be necessary. Values clarification is now out of fashion!

Kohlberg's theory of moral education, on the other hand, continues to enjoy some popularity and to draw attention. But it is no longer viewed as the primary source for understanding the complex field of moral education. Questions have been raised regarding the reliability and validity of his empirical data. And even if they were all acceptable, on examination, his theory is an evaluative one, mixed with some of his own beliefs about what one's overriding principle ought to be. His overriding principle of justice competes with other principles, e.g., respect for persons, love, God, *et cetera*. And the absence of such concerns as care or compassion reduces Kohlberg's understanding of moral problems to nothing more than rational, cognitive commitments. Consequently, the central problem of uniting one's moral decisions with moral actions is not or cannot be solved.

Given the pluralism of the times, how then should Government decide on public policy matters? If neutrality is taken to mean respect for every individual's view, the reducing of moral problems to radically individualistic problems, then there is no need for a public morality. This could mean societal chaos. Chapter eight, "Pluralism and the Limits of Neutrality," by Francis Canavan, S. J., gives suggestions on how to respect the individual and at the same time cultivate the view that we are "... a community of communities" (p. 160).

"World Views and Public Policy," by Carl Horn, concludes the collection of essays. He reiterates a basic theme of these essays that Christians must be alert to the rhetoric of plural-

ism and alleged neutrality of values. Behind them, he warns, "... lurks an alternate religious vision for man and society" (p. 168). So, to every decision by the Courts over certain cases, to every TV programme that invades one's home, and to every teaching that public schools provide the children, Christians must ask, "Whose values are being reflected and affirmed to be desirable in all these?"

This collection of essays answers the question, "How ought we to live and how ought we to conceive of what the good life is?" The authors state their views boldly and unequivocally on such matters as mercy killing, abortion, handicapped newborn children, and so on, *many times without argumentation*; at times they appear to address complex moral problems in beguilingly simple terms. There is, however, an urgency in their concerns over an American society so deeply divided over a core of values. Their motivation is right, and for the wide range of people who label themselves either Christian, orthodox, or traditional, it is certainly acceptable.

Reviewed by Evelina Orteza y Miranda, Professor, Department of Educational Policy and Administrative Studies, The University of Calgary, Calgary, Alberta, Canada.

NEED—THE NEW RELIGION by Tony Walter. IVP, Downers Grove, IL (1985). 173 pages. \$6.95.

"A new morality is all about us, and virtually nobody has noticed. Its centerpiece is 'need.' Needs are good things, and meeting them is the ultimate good" (p. 1). Thus opens this useful but sometimes puzzling book.

Tony Walter (Ph.D., Sociology, Aberdeen), a writer living in England, has set about the task of arguing that "need" has taken the place of all previous legitimate and illegitimate justifications for our, and by extension, our societies' behaviors. (He is writing for both English and American readers.)

Essentially his argument traces the Western understanding of acceptable authority for backing up what we do relative to our selves, our work and leisure, our spouses, our children, and all others in our societies. Then he discusses the nature of "need" and "want" and the problems involved in attempting to spell out exactly what constitutes true or basic human needs. Finally he concludes with a discussion of some biblical ideas for how we might get out of the trap of being respondents to need and finding liberation in being respondents to Christ.

This book presented some real difficulties for this reviewer. While the main point is clear and there is much good information, the act of reading the book is rather like riding a horse that is prone to bucking for no predictable reason. Just when the reader gets used to a style of presentation there is an abrupt change of course! This makes it very hard to determine the intended readership. As a scholarly work, it betrays four major weaknesses, the first being the making of many assertions with no reference to supporting evidence. There is also some questionable use of the Bible. For example, he asserts that the New Testament portrays no conflict between needs of the flesh and the needs of the spirit, but that the church has been aware of just such a conflict. Even though the church does not view human needs as "sacrosanct," it has been involved in addressing "human want and misery." This leads directly to his conclusion: "Christian thinking therefore has, at best, appreciated the ambiguity and complexity of human needs; at worst, been confused by them" (p. 13). I'll say!

The third problem is a seeming inconsistency in the use of "need" and "want," as illustrated above, and throughout the text.

The fourth difficulty is probably a matter of debate, but I have trouble with some of the assertions—unsupported—of what Karl Marx believed about society and history. Sadly, this is all too common for disciples, and critics, of Marx and even of Christ.

It is also not possible to characterize the intended reader as the academic "layman." Walter regularly uses names of notable scholars as if the reader already knew the implications of their work relative to his current subject. Could it be that the "average" Briton is so much better schooled in philosophy and psychology that this is really only a problem for American readers?

In any case there is a real problem for us Yanks. In American politics the term "liberal" generally refers to Democratic politicians in recent history and/or anyone outside the New Right today. For Walter, "liberal" refers to pre-Depression capitalism and current Reaganomics. Students of American political economy understand this use because the term refers to the liberation of the market place from irrational (royal or big government) influences.

There is a similar confusion in the use of "ideology." Throughout the text it refers to the world view we all accept from our culture as Reality and not as a socio-linguistic construction. This is the way Marx used the term, but the common use in this country is in reference to communism, and, by extension, to false beliefs.

Although I found the actual reading an irritating experience due to the above "curiosities," Walter's main argument—that we are caught in an ideology of need which reifies perceived wants and desires as objective facts of need and thus imparts an oughtness to their fulfillment—actually does appear to hold water. Probably the clearest example is the current popular understanding of marriage as a contractual agreement to get our ego needs met until poor performance do us part!

Walter's alternative to struggling to create our selves out of nothing but man-made ideas, e.g., "I think therefore I am," "I desire therefore I am," and "I need therefore I am" is to adopt "I respond therefore I am." The response is to the love and grace which predates us in God and in the community in which we find ourselves. This implies, of course, that society should model the behaviors it wants from us—rather like a loving family—instead of assuming the worst and then organizing around coercive philosophies to keep us in line.

This sounds rather utopian but Walter is not so naive as to assume the perfectability of people through social change. His contention is that we would do better to at least try to model acceptable behaviors and risk being "taken" sometimes than to err on the side of a worst-case scenario of human nature. Although he does not use the term, it seems he is applying the theory of self-fulfilling prophecy to entire societies.

Someone has accused sociologists of explaining the obvious, and there is something to that. On the other hand the "obvious" seldom becomes obvious until someone points it out to us. Sociologists are interested in understanding how, and how much, society influences us, but this is the first time I have encountered this popular theory applied in this way. Justice-as-fairness is not uncommon among social theorists, but pointing out the modelling aspect of governmental behavior is new... at least to me.

Even with its shortcomings I recommend this book. If nothing else the reader will sense a "red flag" every time s/he hears or utters the word "need." I am finding it somewhat disconcerting to notice how few "needs" actually fit the term. If this sounds "merely obvious" recall the first words of this review and Jesus' words about becoming as little children (who see what "mature adults" have learned not to see?)

Reviewed by Larry Riedinger, MRE, Southern Baptist Theological Seminary, Louisville, KY, and graduate teaching assistant (sociology), University of Louisville.

VITAL SIGNS by George Barna and William McKay. Crossway Books, Westchester, Illinois (1984). 155 pages. \$6.95.

In recent years, a number of Christians in the field of sociology have begun writing books relating their faith to this discipline; several deficient approaches have surfaced. Some write extended opinion pieces that propound favorite ideological or political positions, with a few verses of Scripture tacked on here and there. Others dialogue with major thinkers and researchers in the field, but the Christian perspective again seems superficial and incomplete. A few exceptions to this dismal trend exist (for example, Tony Campolo), but overall, these attempts come off as weak and boring.

In contrast to this trend, Barna and McKay have compiled a considerable amount of recent research and have written a very readable and interesting work. The authors are associated with the American Research Bureau, which has conducted a great deal of research for religious organizations. They make use of not only their own research but also that of Gallup and other polling agencies (an endorsement by Gallup can be found on the back cover).

The book opens with a short overview, followed by an initial chapter on the family. The authors document how attitudes about divorce have changed in the church, such as the fact that two out of three Christians see divorce as a reasonable solution to a problem marriage. Attitudes about abortion among Christians (40% are relatively uncommitted) and the recent shift in values among college students are detailed.

Education is considered in the next chapter. The historical shift in the context of education is considered, as well as alternatives to public schools—home schooling and Christian schools. Evidence of threat to the Christian college is carefully considered. The chapter concludes that decisions by Christians regarding education are very personal matters, with no clear cut answer.

The media are considered, including the topics of cable television, Christian television, satellites, movies, and reading. The increase in sex, violence, and profanity is welldocumented, although it may be noted that some of the statistics are already dated.

The political involvement of Christians is dealt with in chapter four. The authors consider the religious beliefs of political leaders as well as the inactivity of evangelicals in the political process, concluding that evangelicals are not a "moral majority" but rather a "mild minority." Throughout these early chapters of the book a conservative orientation is sometimes found, yet there are also statistical data cited that are contrary to conservative assumptions.

The last three chapters of the book specifically deal with indications of spirituality and the institutional church context. In my opinion, these chapters alone are worth the price of the book. A number of the findings contrast with common assumptions held by church people.

For example, the authors state that there is no real evidence of revival or decline in the church, although there are indications of a *preparation* for revival. The authors forecast a shift to smaller churches because of indications of a "willingness to sacrifice first-rate preaching and Sunday school teaching for the opportunity to develop deep and lasting bonds with other Christians." The amount of prayer and attitudes about women ministering in the church are also considered, as well as the evidence of secularization among evangelicals.

I tested this book as a supplement in my introductory sociology classes, and found that students were at times shocked, at other times excited, and almost always interested in what the book stated. The topics correspond with half or more of the chapters in a standard sociology text, so it works very well as a secondary textbook. In addition, I have found myself returning to these chapters to quote a statistic or conclusion to students and colleagues. This is an outstanding contribution from Crossway Books, perhaps the best they have released to date. Perhaps this fine quality can be attributed to their editor, Lane Dennis, who has a doctorate in sociology. We need more of this kind of sociology research by Christians!

Reviewed by Donald Ratcliff, Assistant Professor of Psychology and Sociology, Toccoa Falls College.

LOGIC by Gordon H. Clark. The Trinity Foundation, Jefferson City, Maryland (1985). 124 pages. Paperback; \$8.95.

Readings in Ethics, Gordon Clark's first book, was published in 1931. *Logic* is his thirty-third. *Logic* has eleven chapters and a glossary, but no index or bibliography. It is intended for use as a logic textbook by Christian schools and colleges.

The jacket blurb calls Clark "America's foremost theologian and philosopher." Indeed, Clark has held a prominent place in Christendom for nearly 60 years. Trained at the University of Pennsylvania and the Sorbonne, Clark has taught at several colleges and universities during his distinguished career.

John Robbins, the president of Trinity Foundation and publisher of the book, has written an introduction entitled "Why Study Logic?" He translates John 1:1 thusly: "In the beginning was the Logic, and the Logic was with God, and the Logic was God." The introduction is something of a paradox, since it contains several non sequiturs. One example: "The results of this rejection of logic—mass murder, war, government-caused famine, abortion, child abuse, destruction of families, crime of all sorts—are all around us" (p. ix). It is not the rejection of logic which leads to these evils, but rather the rejection of certain premises.

Some of the topics Clark discusses are: why study logic, definition of logic, inference, syllogism, sorites, dilemma, and truth tables. There are both verbal and pictorial illustrations. Nevertheless, a good deal of concentration is required to follow the book's progression. It is not light reading.

It can be useful reading for anyone who has never given much thought to logic and the importance it plays in arriving at valid conclusions. Clark is very good at offering contemporary illustrations and then dissecting them. He shows that many false conclusions could be avoided if the laws of logic were applied.

This book might serve as a textbook in a course supplemented by lectures or other materials. Although the book is somewhat skimpy, it has the virtue of not overwhelming the reader. It is occasionally opaque, but this could provide the teacher an opportunity to wax eloquent. Why the book is intended especially for Christian colleges is not clear. The religious references and illustrations it includes do not seem intrinsic to Christianity.

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

HOMOSEXUALITY AND HOPE: A Psychologist Talks about Treatment and Change by Gerard van den Aardweg. Servant Books, Ann Arbor, MI (1985). 134 pages. Paperback. ISBN O-89283-265-7.

Dr. van den Aardweg is a Dutch psychologist who uses his experiences over the past twenty years of treating more than 225 homosexual men and about 30 lesbian women as the basis for much that is in his book. He believes that "homosexuality is a form of self-pitying neurosis" (p. 45). By understanding homosexuality in this way, one has an appreciation for its nature that provides insight about ways of treatment which allow realistic hope for change, in contrast to the widespread belief that homosexuals are trapped by the purported inherent and unchangeable character of homosexuality.

I had difficulty with this book. It took me many months and about a dozen attempts, to write this review. Dr. van den Aardweg "does not use any explicitly Christian concepts or theory in his interpretation of homosexuality or in his clinical response to it" (p. 11). He even suggests that it is better to remain skeptical of those who claim a profound change from their homosexual orientation because of a religious conversion until critical investigation has removed any doubts about the change because of "possible self-deception within the neurotic's personality" (p. 95), although he briefly describes a few case histories of homosexuals who did change because of religious conversions.

The position that homosexuality is a neurosis and can be overcome in ways similar to the manner in which other neuroses can be overcome is a wholesome contrast to much of what is found in contemporary literature about homosexuality. Dr. van den Aardweg does not claim that the change is easy, but presents a convincing case that change is possible. The approach that he proposes is "anticomplaining theory." His experience is that about two-thirds of his homosexual patients who continued the treatment program achieved long-term change from their homosexuality.

The description of factors causing or promoting homosexuality and its relation to "self-pity addiction" are helpful. Unfortunately, the portion of the book devoted to "the road to change" is very short (12 pages) and does not provide as much help as one would desire. The book does not treat the important and complex issue of how to help homosexuals find the motivation to put forth the effort required to change. And the two-page chapter on ways to prevent homosexual orientation is too brief to be useful.

My overall reactions to this book are negative, but I have been hard pressed to really understand why. Obviously, I

think Dr. van den Aardweg is right on target in describing homosexuality as a treatable problem and appreciate his data about changed homosexuals. However, I found his discussion of the factors leading to homosexuality somewhat simplistic and lacking in new or additional insight to the materials already prevalent within the evangelical community. I was disappointed at the lack of depth in the discussion of his treatment for homosexuals. And I was sorry that the book had little of substance about the power of God or His Word in helping homosexuals to change. Consequently, this is not a book that I can strongly recommend.

Reviewed by D. K. Pace, The Johns Hopkins University Applied Physics Laboratory, Laurel, Maryland.

THE FREEDOM WE CRAVE by William Lenters. Eerdmans Publishing Company, Grand Rapids, Michigan (1985). 177 Pages. Cloth; \$9.95.

The Freedom We Crave has already received high praise from reviewers: Lewis B. Smedes calls it "a splendid gift," J. Harold Evans labels it "a great book," and Wayne E. Oates says it is "technically informed and clearly Christian." What can I add to the comments of such notables? Perhaps a little information about the author, a synopsis of the content and a few random observations.

William Lenters is a certified addictions counselor and an ordained minister, who presently serves as campus minister at Purdue University. From 1973–1981 he served as director of Calvary Rehabilitation Center, a drug and alcohol treatment agency in Phoenix. The author has counseled over 500 people addicted to beverage alcohol.

The book has no index, although it does have endnotes. The six chapters present addiction as the response of people to the stresses of life ("The problem of addiction in our culture is... a people problem"). Addictions discussed include alcoholism, love, religion, workaholism, food and fitness. Finally, Lenters concludes with a chapter on recovery from addiction. An appendix on steps to healthy living contains a self-test.

Addiction is endemic to the human condition and everyone is addicted to something: "A major contention of this book is that addiction describes something that happens to everyone at the deepest level... The addiction experience is the human experience" (p. 4). What is addictive behavior? It is any activity that provides a temporary relief from emotional or physical discomfort but is not a permanent solution to the discomfort. While some addictions are more harmful than others, all addictions are harmful. Chronic addiction is detrimental to addicts' mental, physical, spiritual, and social well-being. Addicts' disorders have a detrimental effect on those around them, also.

The author concentrates mainly on the addictions of love, alcohol, and religion. The chapter on the addiction of love opens with an observation from Plato: losing the sex drive in old age is like being allowed to dismount from a wild horse. On the other hand, learning to love is the key which unlocks our potential and the most important process which continues throughout life. Love has many illusory aspects which the author debunks.

Lenters thinks that we are living in an age of pharmeceutical buffoonery, as indicated by the 13 million alcoholics in the United States. Alcohol abuse is a learned behavior which results from a person's inability to deal successfully with stress. For every obvious addict, there are many less obvious ones who use alcohol or take drugs because of their inadequacy, inferiority, and impotency. However, even people not addicted to chemicals are addicted to some other form of "patterned existence."

Lenters sees many similarities between addiction to alcohol and addiction to religion. They both provide relief from weariness, boredom, drudgery, rejection, loneliness, fear, meaninglessness and anomie. "Bellying up to the bar for another glass of firebrewed magic and shuffling up to the altar for the mystical host are not altogether unrelated motions... Chemical intoxication and spiritual euphoria are akin" (p. 80). Lenters reminds us that the disciples at Pentecost were mistaken for drunks.

Some of Lenters' statements will perhaps arouse the reader to debate. He believes that "people do not change their ways... via the costly route of psychotherapy" (p. 6). Lenters thinks that "abstinence as a norm is simply not biblical" (p. 63). Furthermore, some hymn singing can be pathological: "but 'I Surrender All,' despite its noble sound, is sentimental trash, symptomatic of pathological religion, unless it is followed up and counterbalanced by the readiness for engagement in life: 'Am I a Soldier of the Cross?' " (p. 88). And on an errorless Bible: "Pathological fixations on 'biblical inerrancy' suck the life out of a lively theological debate" (p. 90).

This book may disturb the reader occasionally when controversial topics are dispatched in a cursory fashion. On the other hand, the book contains many useful insights which make for informative and stimulating reading. All addicts should find it beneficial. That means everybody.

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

THE INTELLECT AND BEYOND Oliver R. Barclay. Zondervan Publishing House, Grand Rapids, Michigan (1985). 157 pages. Paperback; \$6.95.

Barclay's plea in this book is for Christians to think Christianly. He stimulates the reader to do just that. The author has obviously given a good deal of thought to Christian thought, and the result is a provocative, interesting, wellwritten, insightful book. It is highly recommended for Christians who are eager to bring every thought captive to Christ. While Barclay believes that all Christians have a Christian

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mind, it is possible for believers "to be more deeply Christian" and to develop a Christian outlook that controls life and thought.

Trenchant insights and opinions abound. Barclay is uncomfortable with so-called Christian philosophy. Christianity, argues Barclay, will not fit into a philosophical mold. This is because Christians do not have a complete world-and-life philosophy given to them in the Bible. Therefore, a complete Christian philosophy is very difficult to justify since the Bible does not provide a complete intellectual system.

Barclay takes a swipe at the exclusivity of Christian education. While "God's psychology and sociology are better than ours," they are not complete and therefore do not provide the basis for Christian isolationism. "The idea that the children of Christian parents should be withdrawn into Christian schools, universities or trade associations is . . . not of the teaching of the Bible, which does not even hint at such a thing."

The author also is wary of Christian politics. Since Christian ethics depend upon Christian doctrine, Barclay continues, Christians must systematize their faith if they are to think as Christians. However, "the lust for intellectual tidiness must be resisted when it leads us to dogmatize about what is not clear in Scripture." This dogmatizing can lead to a "Christian political position" which is sometimes a real embarassment to other Christians. This anecdote, told by Barclay, perhaps summarizes the gist of this book. A German evangelical theologian was complimented for taking his stand firmly on the Bible. He responded, "On the contrary! I sit under the Bible." Barclay argues that such a subservient attitude is the place to begin in developing a Christian mind. The book tries to steer the reader clear of the excesses of extreme intellectualism or emotionalism. The solution to combatting these excesses is Spirit-led understanding and application of the Word.

The book's nine chapters fall into three categories. The first five define the Christian mind; the next three deal with a Christian view of man, work, job, unemployment, and culture; and the final chapter gives advice on developing a Christian mind. Bibliography. index, and endnotes are omitted. Included are a brief introduction and an appendix entitled "The Dooyeweerdian Christian Philosophy."

Oliver R. Barclay, now retired, was general secretary of the Universities and Colleges Christian Fellowship (formerly Inter-Varsity Fellowship) in the United Kingdom. This book is a revision of *Developing a Christian Mind* which was published in 1960 by Inter-Varsity Press in the United Kingdom. I am glad it has been revised and reissued. May it be widely read!

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

Letters

A Problem of Presuppositional Certitude

When Greek thinkers broke away from the religious mythologies of their day, seeking a more earthly (natural) explanation for reality, they obviously believed they could come up with a definite answer. Yet, some 2,500 years later we are still vigorously debating the nature of the "real."

There have always been proponents who staunchly proclaimed their belief system the "only definitive" answer to questions of reality. Certitude (a feeling of absolute sureness, as Webster defines it) is an interesting concept, but if history teaches us anything it is that absolute sureness fits better with dogmatists than with seekers after the truth. This is not to say that we throw our hands up in despair of ever knowing truth; it is to say that certitude is an elusive category and causes many problems when we hang our cosmologies upon it. Any statement of certitude needs much collaborative evidence before we place our hats of trust upon it. I can trust that tonight at 7:57 p.m. the sun will set (or more correctly, the earth will rotate in such a way that darkness will replace the light), and that at 5:57 a.m. tomorrow the light will return. And, that this pattern of light and dark will happen routinely without fail, at least until God ends time as we know it or the universe collapses upon itself, whichever comes first. How can I state this with assurance? For forty-one years I've been a witness to it and since the dawn of human history others have been witnesses.

On the other hand, when there is no wealth of collaborative evidence, when the evidence for a belief is at best circumstantial and can be rationally interpreted in different and contrary ways, to claim certitude for any such position is an illusion of its claimant.

In my reading of the literature of macroevolution and special creation in exploring the genesis of life, certitude for either position is presumptuous. Both systems offer reasonable answers, though neither can prove beyond a faith assumption the basic tenets of their belief.

To wed theology, as Mr. Murphy has done in his article "Theological Arguments for Evolution" (JASA, March 1986), to a fallible and questionable belief system is both disastrous to theology and to science. Charles Hummel's book *The Galileo Connection* is a good primer for those who would enter the dangerous grounds of such a merger. George Murphy's article is a good example of the problems of such a merger. It is also a good example of the problem of seeking to establish certitude for a belief system that has epistemological problems and of then trying to cover those problems with the blessings of theology. When Murphy uses Scripture to validate macroevolution, he misconstrues it by forcing it to say something it does not.

Murphy exposes his problem area when he says "we must realize that arguments and proofs are always contingent upon certain presuppositions"... for it is his presuppositions that get him into trouble. His conclusion that "evolution appears to provide the theologically superior understanding of creation" and that "only evolution fulfills the joint requirements that Christ be the Redeemer of the world... and that salvation come via the Incarnation" is based upon his presuppositional error on redemption. In his argument of II (3), he confuses the redemption of humanity with the redemption of the cosmos. Man and nature did not sin together (unless, like Murphy, you believe they are one and the same), but man's sin brought turmoil to nature around him so that what God had created perfect became imperfect only because of man's action of sin. Nature was not given a free choice, only humanity; but nature did directly suffer the consequences of Adam and Eve's sin. It was not to the tree, or the birds, or the rapidly moving stream that God said, "Let us make . . . in our image." It was only humanity He so identified, and it was only with humanity that he took the further step in creation of breathing into it His breath of life. Nature will be redeemed (made whole), but only because, again, of what happens to humanity-his redemption through the incarnation, death and resurrection of the new Adam. The Word did not become flesh so that nature could be so restored in fellowship with the Father, but so man could be so restored. And, having restored man, God will restore what he created for man, namely, nature around him. That is the theology of redemption, and to make it anything else is to force it to take leaps of logic to say what you want it to say, rather than what Scripture says.

Another presuppositional problem arises when he links these two statements: "For the biblical picture is precisely that God brings life out of death, being out of chaos, and hope in hopeless situations," and "The idea that life arises and develops through competition and extinction is part of the same picture." Now I can say that a lemon is sweet like a peach because both grow on trees, but that is as much a construction of my mind as the above statements. There is no necessary nor compelling nor attractive reason to link the statements as Murphy has. He simply wants theology to support his position on evolution and so he will build his house upon any foundation, but that foundation does not support the design of his house.

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I certify that the statements ma and complete.	ade by me above a	are correct

Robert L. Herrmann, Executive Director

Correction:

JASA, Vol. 38, No. 2, June 1986, "Theological Clues from the Scientific World," page 123, column one:

"... love and justice in Barth's exploration of time as belonging to finite creation ..." should be changed to read: "... love and justice in Barth's doctrine of God and, secondly, Barth's exploration of time as belonging to finite creation ..." Our apologies to the author and our readership for the error.

What is the **American** Scientific Affiliation?

We are a world-wide organization of scientists who share a common commitment to the Christian faith (as expressed in our statement of faith, found on the application form inside the back cover). Since 1941, we've been exploring any area relating Christian faith and science, and making the results known to the Christian and scientific communities.



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An ASA Membership Application can be found inside the back cover of this issue.

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The Canadian Scientific and Christian Affiliation was incorporated in 1973 as a direct affiliate of the American Scientific Affiliation with a distinctively Canadian orientation. For more information contact:

Canadian Scientific and Christian Affiliation P.O. Box 386, Fergus, Ontario, NIM 3E2

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

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Associate Membership is open to anyone with an active interest in the purposes of the Affiliation. Members hold a degree from a university or college in one of the natural or social sciences, and are currently engaged in scientific work. Fellows have a doctoral degree in one of the natural or social sciences, are currently engaged in scientific work, and are elected by the membership. Membership includes receiving the Journal ASA, the bimonthly Newsletter covering events in ASA, and full Members and Fellows have voting privileges in elections for the Executive Council of ASA. Dues (per vear):

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

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Hebrews 1:3 **MARCH 1987** }

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