

IMPACT OF SCIENCE AND TECHNOLOGY ON SOCIETY: NEW DIRECTIONS IN ECUMENICAL SOCIAL ETHICS

by Paul Abrecht

Over the last fifty years, that is, since the first world conference on Christian social thought (Stockholm, 1925), the ecumenical movement has given much attention to the issues of social, racial, and international justice and more recently to a consideration of the increasingly complex and alienating technological system characteristic of our times. However, the first organized and substantial effort to draw physical and natural scientists and technologists into the ecumenical discussion of social ethics started only in 1969, following a recommendation of the Uppsala Assembly of the World Council of Churches. This action reflected an uneasy feeling, expressed first in the 1966 World Conference on Church and Society, that the ecumenical movement, while affirming its concern for both the social and the technical revolutions, had failed singularly to involve scientists and technologists who might help to interpret the nature of the technical change.

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No one has yet analyzed why it has taken so long for the scientists and the churches to get together. It may be that the former were so confident that scientific development was in the interest of humanity that they felt no need for ecumenical exchange or theological dialogue on its social implications. Moreover, until recently scientists and engineers have argued that they were dealing with the "hard" or exact disciplines while the churches were overly enamored of the "soft," imprecise disciplines of economics and sociology.

The churches, too, may have assumed that the scientific and technological achievements would be made readily to serve the interests of social welfare and progress. The virtues of science and technology were accepted by the majority of Christians and did not seem to call for any special discussion. (I accept here the general validity of Lynn White, jr.'s, thesis that beginning sometime during the Middle Ages there developed in Christian thought an affirmative attitude to technological innovation which remained practically unquestioned down to our own times: "Technological progress was part of God's will for man" and "integral to the ethos of the West."¹ The major problem for the churches and especially for those concerned with social justice was to ensure that the material progress and economic growth which science and technology made possible would be encouraged and that at the same time its fruits would be distributed in the most just manner possible.)

But by 1969 there was a new awareness that continued technological advance would not necessarily serve the cause of welfare and social justice, that "whilst science-based technology and the ability to predict on the basis of it grow rapidly, the ability to use it for agreed social purposes grows much more slowly and the necessary change in social institutions and structures comes more slowly still."² What lies behind the dynamism of science and technology and what ethical criteria are needed to make responsible choices in view of the options which technology makes possible? These were the kind of questions which provoked the World Council of Churches in 1969 to undertake a five-year inquiry into "The Future of Man and Society in a World of Science-based Technology."

The churches entered the study in a very tentative way, not knowing exactly where it would lead. Almost to their surprise it has raised very new and fundamental questions of ethics in areas like genetics, ecology, population policy, and appropriate technology. These have called attention to more ultimate questions: Can the world provide enough food to feed a population in the process of doubling? Can the ravages of environmental pollution and deterioration be controlled without practically halting economic and industrial growth? Can new

energy sources be found without having recourse to means which threaten us and future generations?

OLD AND NEW CRITIQUES OF SCIENCE AND TECHNOLOGY

I think it can be argued without denying White's thesis that there was always a minority in the Western Christian world who had an aversion to the social consequences of rapid technological development, who believed it was inevitably dehumanizing. This view was part of the romantic, naturalist, Utopian protest against the "dark satanic mills." It was part of the antitechnological spirit of all those radicals who throughout the nineteenth century resisted not only the power of the capitalist class but also the whole conception of regimented, disciplined, technologically organized, growth-oriented economic activity. It has been well represented in our times by the writings of the Anglo-Catholic School of sociology (V. A. Demant's *Religion and the Decline of Capitalism*, Jacques Ellul's *The Technological Society*, and more recently those of such mystics and crypto-Christians as Theodore Roszak and of such Christian and Jewish economists as E. F. Schumacher [*Small is Beautiful*] and E. Mishan [*The Costs of Economic Growth*]). They have rested their case on the dehumanizing character of modern science and technology, on the threats to the quality of life, on the failure of society to understand and distribute justly the full social costs of rapid technological growth.

In preparation for the First Assembly of the World Council of Churches in Amsterdam in 1948 J. H. Oldham succeeded in getting this concern on the agenda of the section dealing with the church and the disorder of society. Yet this issue remained marginal to the central interests of the churches. They were concerned primarily with the right use and just distribution of the fruits of economic growth which science and technology have made possible. They suspected that the critique of technology very often disguised an aristocratic, rural, romantic, and perhaps reactionary view of the human situation and obscured and obstructed the search for social justice for the already existing classes of workers. They saw their hope in increased use of technology with a more just distribution of its product.

(Some of these same concerns for the dehumanizing consequences of technological change also appeared in the missionary discussions of social change in Africa, Asia, and Latin America. But such was the power of the scientific-technological approach and the irresistible nature of its appeal that there, too, the issue was decided against those who were calling for caution. The demand for liberation from the various forms of colonialism came to include the demand for more

access to technology. Thus the virtues of technological advance became increasingly part of a new worldwide ethos.)

In contrast to those Christian thinkers who attacked the dehumanizing aspects of science and technology there were others who extolled its virtues and its secularizing world view, glorifying its achievements as an expression of Christian victory over the "sacral" structures of the traditional cultures and societies (e.g., Harvey Cox, in *The Secular City* and A. van Leeuwen in *Christianity and World History*). While most theological and ethical opinion did not go so far, there has continued until recently to be a powerful theological sanction for the predominant, positivistic, scientific-technological world view which seemed almost to promise life without limits.

Today it is no longer a minority of theologians and Christian laymen who are raising questions about the goals and limits of a technologically organized society. Growing numbers of scientists and technologists themselves are acknowledging that the ability of science to deliver new knowledge and new power over nature is limited, and they are agreed that "the old picture of science as a continually progressive and accumulating sequence of discoveries about the inner nature of things is false."³

Some of them are repelled by the image of an oppressive, exploitative model which they have helped to foster, of science and technology seeking power over nature until they become rapacious and self-defeating in terms of human survival. Others, while not sympathetic with the "limits" approach, nevertheless agree that we have entered a new stage where there must be more recognition of the questions which science and technology cannot answer, where society at large, working with scientists and technologists, must express in one way or another its convictions about the direction of further technological innovation and the risk it is willing, or unwilling, to take.

The views of the first group are already familiar, and little can be added here to what has been said on the continuing debate about limits. This thesis seems to be reinforced by the evolution of the world economy, despite the efforts of some economists to show otherwise.⁴

Of greater interest are the statements, some very recent, of scientists and engineers who, while in favor of continued technical development, emphasize the large uncertainties and risks involved. In their view these seem to call for new ways of approaching decisions about technological policy in the future, with more emphasis on public participation and less expectation of salvation by clear-cut, unequivocal technological breakthroughs. Two examples may be cited:

1. The writings of the American nuclear scientist Alvin Weinberg stress the increasing importance of "transscientific" issues. In his essay

“Science and Trans-Science” he points to the growing range of problems which formerly would have been answerable by science but which are now seen to be transscientific: “. . . though they are, epistemologically speaking, questions of fact and can be stated in the language of science, . . . they transcend science.”⁵ The number of such questions is increasing either because the amount of time and money required to find scientific answers is too large or because “there are inherent elements of scientific uncertainty which as a matter of principle can never be totally resolved.”⁶ Transscientific issues have to be decided either by the “political process” or by “adversary procedures.” The adversary procedure works best where the disagreement is about technical problems between scientists. It involves the use of strict rules of evidence and is more disciplined than the political process, which is best used where the disagreements are about moral or social values.

2. The writings of the German nuclear scientist Wolf Häfele also draw upon his experience in the debate about the risks of nuclear power. Häfele acknowledges the limited capacity of scientific knowledge to overcome the uncertainties relating to the use of high technologies such as are involved in nuclear engineering. In “Hypotheticality and the New Challenges: The Pathfinder Role of Nuclear Energy” he says:

The process of iteration between theory and experiment which leads to truth in its traditional sense is no longer possible. Such truth can no longer be fully experienced. This means that arguments in the hypothetical domain necessarily and ultimately remain inconclusive. . . . this ultimate inconclusiveness which is inherent in our task explains, to some extent, the peculiarities of the public debate on nuclear reactor safety. The strange and often unreal features of that debate, . . . are connected with the “hypotheticality” of the domain below the level of the residual risk. . . . [It is] impossible to apply the method of trial and error to ultimate reactor safety . . . because the consequences of so doing would be too far-reaching. Every country is too small for that—eventually even the globe itself is too small. The magnitude of the technological implications thus becomes comparable with the magnitude of the constraints which determine our normal life.⁷

Häfele believes that these circumstances are not peculiar to the issue of nuclear power: “It is, rather, the general condition of civilisation towards which we are moving; it is a condition where the magnitude of human enterprises becomes comparable with the magnitude of the widest determinants of our normal existence. Nuclear power turns out to be a forerunner, a pathfinder, of that.”⁸ As a result, “‘hypotheticality’ will characterise the next stages of human enterprise. The magnitude of technological enterprises will be so great that it will not be possible to proceed with the absolute certainty that there will be no negative consequences.”⁹

THE CRISIS OF PERCEPTION

It is impossible to set forth here the many interesting theological, philosophical, and ideological implications of such developments. Again, I can take only a few examples, somewhat arbitrarily, to illustrate the fundamental conceptual problems with which we must struggle.

The Theological Critique of the Traditional Western Scientific World View. What is particularly striking is the seeming helplessness (or confusion?) of theological thought faced by this challenge, a challenge which paradoxically would seem to offer faith a new and vital opportunity to witness to the meaning and the mystery of human existence. This may be due to the lack of experience in working with scientists and technologists. It may be due also to the inability of the church as a community to pull together some of the interesting efforts at analysis being made and to encourage those which seem particularly promising.¹⁰ In any case, what we see today is the tentative character of all theological constructs and a new recognition of the fundamental work of rethinking theology that has to be done in view of the questions posed by scientists, technologists, and others.

One tendency, clearly, is to reinforce the previously cited Christian aversion to technology, resulting in new powerful pleas for restraint in the use of science and of our technological possibilities. But, quite reasonably, the counterargument is that at this stage in world history we do not have the option of withdrawing from a society which is so fundamentally dependent upon science-based technology. Yet this seems not to get at the heart of the problem, which is our understanding as Christians of the place of technology in human affairs and the possible distortion which a scientific culture has introduced into the relation among God, Nature, and Man. There is a debate here which seems to be vital to all further discussion of technological policy. I cite two examples of quite divergent views:

1. It is argued by Jean Ladrière, a Roman Catholic philosopher of Science (Louvain), that we must acknowledge, accept, and live with the independent dynamism inherent in modern technological development. According to his view, the primary characteristic of science-based technology is that "it constitutes a new milieu, intermediary between man and nature. . . . as an intermediary position, the technological milieu cannot be put in the same category as either the actions of nature or human activity. It possesses a kind of autonomy, but in addition, there is a dynamism in it which is perpetually expanding." It is an "inherent dynamism which imposes its tasks upon man." The goals of technological development "are more and more set by

technology itself." Despite the obvious interactions between the technological milieu and other milieus, "it is the technological milieu itself which is decisive and which in fact imposes its conditions on other *milieux*."¹¹ Scientific rationality has thus its own ends (*finalité*) in contrast to the separate ends (*finalités*) of man and nature. It has its own dynamic, its own contribution, its own rules and conceptions of life.

This view is, I think, not very different from that of some other Western philosophers and theologians working in this field. Langdon Gilkey has stressed the character of technology as "historical fate, as something irreversible and unstoppable." Even the requirements for controlling technology add to, rather than diminish, its potential threat to the freedom of man in history. "It leads to the apparently unresolvable paradox of a technological culture: to be liberated by becoming more rational (employing more technology) or by becoming more irrational, that is by accepting dependence on the irrational vitalities of individual autonomy."¹²

2. A quite different approach is set forth by metropolitan Paulos Gregorius, the Syrian Orthodox theologian of India. He sees the fundamental spiritual problem in the objectifying, secularizing, and materializing assumptions of the Western scientific, technological world view imbibed by both Christians and non-Christians. While from one aspect the emphasis on objective knowledge has increased human potentialities, from another aspect it "has also reduced the capacity of man for other ways of knowing and thus reduced his humanity."¹³ Socially, it has led to the patterns of consumption and ownership which have tended to accentuate the objectifying and manipulative attitudes to man and nature. This whole Western construct is founded on a separation of man, nature, and God into neat spheres of reality, "each with precise physical boundaries." The objective-analysis technique must be countered by a new appreciation of the biblical understanding of the cosmic view of salvation and the mysterious interpenetration of all aspects of existence. In his paper, "Mystery and Mastery," for the 1974 World Council of Churches (WCC) Bucharest conference, he writes: "[In the Bible] the praise of God arises alike from nature and man to blend together in a cosmic symphony. The Hebrew did not separate himself so completely from all nature-symbolism as to concentrate solely on something called 'history' for which they had no word. They made no such distinctions as nature and history, nature and grace, nature and super nature. . . . It is we who have made these false distinctions which still remain part and parcel of our disastrous theological equipment, which if it were effective, would be more harmful than the polluted air of our cities."¹⁴

ZYGON

Technology and Ideology. Another difficult part of the present reexamination of the link between technology and society is the effort to unravel its ideological components. Much accepted social thinking has supposed that technology was ideologically neutral and that the crisis of technology was in fact only, or primarily, a crisis of the social, economic, or political institutions which used or exploited it. Change the political-economic system and the "crisis" of technology would be solved.

Some Marxists, like Herbert Marcuse, go even further, claiming that modern science and technology, based on the concern to dominate nature, have helped to create the present system of social domination. For example, in *One-Dimensional Man*, Marcuse writes:

The principles of modern science were *a priori* structured in such a way that they could serve as conceptual instruments for a universe of self-propelling, productive control; theoretical operationalism came to correspond to practical operationalism. The scientific method which led to the ever-more-effective domination of nature thus came to provide the pure concepts as well as the instrumentalities for the ever-more-effective domination of man by man *through* the domination of nature. . . . Today, domination perpetuates and extends itself not only through technology but *as* technology, and the latter provides the great legitimation of the expanding political power, which absorbs all spheres of culture.¹⁵

In another passage he says, "The point which I am trying to make is that science, *by virtue of its own method* and concepts, has projected and promoted a universe in which the domination of nature has remained linked to the domination of man—a link which tends to be fatal to this universe as a whole."¹⁶ However, Marcuse himself later speaks about the "extension of the conquest of nature" which would become part of the liberating process. So it is not clear whether he believes that science and technology are the corrupting element or whether it is the modern capitalist-imperialist system of production which has used them for its historical project.

If the human drive to dominate nature is the heart of the problem, can we escape our dilemma by "inventing" a new, nondominating kind of technology? Jürgen Habermas, a Marxist philosopher of science and associate director of the Max-Planck-Institut, Munich, criticizes Marcuse for thinking that

social emancipation could not be conceived without a complementary revolutionary transformation of science and technology themselves. . . . it is impossible to envisage how, as long as the organization of human nature does not change and as long therefore as we have to achieve self-preservation through social labor and with the aid of means that substitute for work, we could renounce technology, more particularly *our* technology, in favor of a qualita-

tively different one. . . . The idea of a New Science will not stand up to logical scrutiny any more than that of a New Technology, if indeed science is to retain the meaning of modern science inherently oriented to possible technical control. For this function, as for scientific-technical progress in general, there is no more "humane" substitute.¹⁷

Many ecologists, even those inclined to put the primary responsibility for the world's ecological problems on the capitalist exploitation of technology, believe that none of the prevailing systems, capitalist or socialist, has grasped its ecological responsibilities.¹⁸ Ecumenical discussion of alternative social systems tends to the view that none of the contemporary social ideologies provides an image of the future which, without fundamental rethinking, could resolve the dilemmas of modern technological society.¹⁹ Is it the case that, as Robert L. Heilbroner suggests in *An Inquiry into the Human Prospect*, "these socio-economic systems [capitalism and socialism] are committed to a civilization whose most striking aspect is its productive virtuosity"?²⁰ In other words, is it the case that science-based technology has its own distinctive world view, its own "ideological" system? In any case, it is not neutral and cannot be readily controlled or managed by other ideological systems (which anyway tend to express in varied ways the dominant scientific-technological world view).

Thus we may assume that not only the theological but also the ideological foundations are being shaken by the present questioning of the connection between technology and society. The churches, like other groups, are only at the beginning of their examination of these questions.

The Dilemmas of "Nontechnological" Cultures. The crisis of perception is perhaps greatest in those countries that are just beginning their technological development, particularly those in Asia, Africa, and the Middle East. At first they were hostile to the current emphasis on the adverse impact of science and technology. It seemed a device to deprive them of their opportunity to enjoy its benefits. They have argued, with a certain truth, that what really has poisoned the technological development of the developed world is not science and technology but the rapacity of the white races in exploiting for themselves the raw materials and resources of the world. They feel that they have in their cultures and traditions the wisdom to avoid the oppressive characteristics of Western technology and therefore the ability to concentrate on its liberating effects. If their experience with science and technology has been warped, it is because a Western pattern has been imposed upon them, one unsuited to their needs and their possibilities. The Chinese model seems to them more attractive.

Yet the suspicion is growing that their cultures might not have the spiritual or moral strength to resist or counter the dehumanizing tendencies of modern dynamic technological development. At one of the WCC regional ecumenical consultations, S. A. Aluko, a Christian layman and economist from Nigeria, pointed to the temptations: "The majority of Africans believe that Western technology can be imported lock, stock and barrel for the rapid modernization of their economies, that total cultural imitation of the West or the East is the fastest, surest way to achieve national greatness. . . . This cultural, political, and ideological subservience to the West or the East creates a barrier to the adoption of distinctive methods and techniques which would lead Africa out of its backwardness, give it a vision of greatness, validate native talents and achievements, and provide the strength of a nationalist ideology for continued modernization."²¹

The WCC Ecumenical Consultation on Science and Technology in East Asia similarly recognized that a major effort would be required to analyze the scientific and technological world view as it has been received from the West and "its tendency toward a triumphalist view of the future":

We feel the urgent necessity to search for an Asian theology of man and society, nature and technology as the basis for a new Christian approach to economic and social goals. This is required by the debate about environment, resources, population and the qualitative approach to development. It is also required by the continuing search for clarity about ideology. This study should have at least three dimensions: (a) a critical examination of the technological mind and its tendency toward a triumphalist view of the future; (b) formulation of the criteria which would help define the quality of life, seen in relation to the harmony of man and nature, and its practical expression in new patterns of human living; (c) the movement towards socialist patterns of society and the still unresolved problem of how to relate this to the religious and cultural ethos of a people."²²

The point is that the uninhibited transfer of resources and technology from industrially developed to developing nations has not only imposed heavy burdens on the recipients in the form of debt obligations, wasteful patterns of production and consumption, and the like but also undermined social justice and self-reliance and created an identity crisis. Underlying the economic and social confusion, therefore, is a deeper spiritual confusion about the human uses of science and technology.

TECHNOLOGY AND SOCIAL POLICY

I turn now to some practical questions of social policy in view of the impact of science and technology. The perceptual problems in any

case will not be solved in isolation from the ongoing urgent issues of practical policy.

A preliminary remark first about the alleged tension between the concern for social justice and the concern for technological and ecological "limits." In part there is a conflict of time perspectives: The short-run implications of social justice seem to some more urgent than the long-run implications of the insult to the environment and the eventual shortage of natural resources (recalling the remark of J. M. Keynes that after all we are all dead in the long run).

Clearly, the churches must resist "any temptation to use the quality of life issue and the search for personal meaning as a way of escaping from the insistence on the imperative of liberation and social justice."²³ Moreover, if a shortage of resources is in prospect, then it is all the more important from a Christian perspective that they be distributed justly among the world's peoples. And it is in the interest of social justice that the employment, control, and ownership of technological processes should come under new scrutiny to see whether it serves human welfare in a world perspective. At the same time our understanding of the parameters of social justice is influenced in a new way by the environment-growth debate and by the discussion of the merits and demerits of various technological options. Our ecumenical discussion has revealed this in relation to particular issues.

Facing the Social Consequences of the Natural Limits to Growth. There is an urgent need for an ethics of resource use, involving the wider problem of how the world can sustain the necessary material basis of life for its inhabitants for the indefinite future. The ethical implications of this are radical and at present quite unacceptable to much of the developed world. The Bucharest conference on science and technology for human development sketched out a new, long-term vision of "a sustainable and just society" which would commit the churches to quite new lines of thought and action. The "sustainable society" is characterized as follows:

First, social stability cannot be obtained without an equitable distribution of what is in scarce supply or without common opportunity to participate in social decisions. Second, a robust global society will not be sustainable unless the need for food is at any time well below the global capacity to supply it, and unless the emissions of pollutants are well below the capacity of the ecosystem to absorb them. Third, the new social organization will be sustainable only as long as the rate of use of non-renewable resources does not outrun the increase in resources made available through technological innovation. Finally, a sustainable society requires a level of human activity which is not adversely influenced by the never ending, large and frequent natural variation in global climate.²⁴

The report goes on to say: "More concretely, we foresee a world where (1) the security of the individual, (2) the redistribution of material wealth, and (3) the implementation of a maximum consumption level, are all effected by a transnational social security system dividing the responsibility for the fate of the individual among all people. . . . The tremendous changes in attitudes towards the national welfare state experienced during the last generation, make us hopeful that a similar acceptance of a sustainable global welfare society can be effected over the next generation, particularly since the need is so much stronger."²⁵

This statement has been challenged because it accepts much of the natural-limits-to-growth argument. There are still many inside and outside the churches, radicals and conservatives, who pin their hopes on new technological breakthroughs, combined with new social measures for justice, to solve our problem. The ecumenical discussion clearly questions that line. The next stage in this debate no doubt will come with the further consideration of food and energy questions. There are plans for an ecumenical hearing on the risks and potentialities of the further extension of nuclear power programs to weigh the arguments for and against the wider use of nuclear energy. But many more people than before are arguing that we cannot expect miraculous new sources of energy which would promise escape from the dilemma indicated above. The public debate on the nuclear question is precisely one in which the relation between the ethical and the technical issues takes on new dimensions of complexity and intensity.

Appropriate Technology. As the disadvantages of certain types of high technology have become apparent, there is more interest in the idea of "appropriate technology" and the social and human criteria for measuring technological change and development. The discussion of this point is still in a very early stage. But the experience in Japan, in China, and in other countries indicates how important it will become. In other words, the issue is not antitechnology but more discriminatory and socially acceptable uses of technology.

The Future of Democracy in a World of "High Technology." There is clearly a close connection between the choice of technological systems and the problem of freedom. It is highlighted by Heilbroner in a very pessimistic way when he poses the question whether "only an authoritarian regime will be capable of mounting the immense task of social reorganization needed to escape catastrophe."²⁶ It is apparent

in the well-known statement by Alvin M. Weinberg concerning the Faustian bargain on nuclear energy: "We nuclear people have made a Faustian bargain with society. On the one hand we offer . . . an inexhaustible source of energy. Even in the short range, when we use ordinary reactors, we offer energy that is cheaper than energy from fossil fuel. Moreover, this source of energy, when properly handled is almost nonpolluting. . . . But the price that we demand of society for this magical energy source is both a vigilance and a longevity of our social institutions that we are quite unaccustomed to."²⁷

To some people this suggests that we cannot run the risk of more nuclear energy (security, diversion, etc.) without a military-type protection against sabotage and other dangers. In other words, the security demands of high technologies seem to threaten political liberties; yet it seems impossible to undertake the high technologies without adequate protection against their risks. Another line of argument would be that it is an illusion to suppose that even an authoritarian system has the guarantee of stability which the demand for protection against nuclear poisoning entails. Such arguments tend to increase preference for less technological solutions to the resource and environmental crisis.

Radical Change of Life-Styles and the New Asceticism. The radical changes in life-styles required by the sustainable society often lead to social pessimism and predictions of social conflict. But I believe this underestimates the new sense of meaning and the spirit of human solidarity which has come as one of the by-products of the debate about the world's economic and social future. This is particularly true of Christian thought and action in countries like Holland, Sweden, Denmark, and Norway where there is growing awareness of the technological mistakes made in the past and a readiness to develop new life-styles and to give up some of the "privileges" of previous times. Instead of regarding the new situation as a defeat for the technologically advanced countries, they are looking upon it as an opportunity to give more meaning to life and to do so in solidarity with peoples all over the world, particularly those who have never known any measure of freedom from hunger or disease or lack of proper shelter.

The churches face an enormous task of countering the fear and the hysteria which arise in so many rich countries when they begin to think about the possible threats to "the bourgeois ethos of economic advancement." There is needed a large work of discussion, information, and communication. Certainly, it must be a work of ethical and

ZYGON

social realism, not hiding or dismissing some of the costs but pointing to the possibilities for new and responsible life in community.

NOTES

1. Lynn White, jr., "Technology Assessment from the Stance of a Medieval Historian," *American Historical Review* (February 1974), p. 1.
2. "Report of the Working Committee on Church and Society" (Minutes of the Central Committee of the World Council of Churches, Canterbury, 1969).
3. Mary Hesse, "On the Alleged Incompatibility between Christianity and Science," in *Man and Nature*, ed. Hugh Montefiore (London: William Collins & Sons, 1975), p. 121.
4. See Wilfred Beckerman, *In Defence of Economic Growth* (London: Jonathan Cape, 1974), esp. the "Postscript on the Oil Crisis and Economic Growth," pp. 249-57.
5. Alvin M. Weinberg, "Science and Trans-Science," *Minerva* (April 1972), p. 209.
6. *Ibid.*, p. 211.
7. Wolf Häfele, "Hypotheticality and the New Challenges: The Pathfinder Role of Nuclear Energy," *Minerva* 12 (1974): 314-15.
8. *Ibid.*, p. 317.
9. *Ibid.*, p. 319.
10. See the Church of England's Doctrinal Commission's Project, *Man and Nature* (n. 3 above), as an example of a church taking up the implications of the environment issue for Christian doctrine.
11. Jean Ladrière, in a paper presented at a World Council of Churches study conference, Pont-à-Mousson, France, May 1973; my translation.
12. Langdon Gilkey, in *Anticipation*, no. 17 (1974).
13. Paulos Gregorius, "Mystery and Mastery" (paper presented at the 1974 Bucharest conference of the World Council of Churches).
14. *Ibid.*
15. Herbert Marcuse, *One-dimensional Man* (Boston: Beacon Press, 1964), p. 158.
16. *Ibid.*, p. 166.
17. Jürgen Habermas. *Toward a Rational Society* (Boston: Beacon Press, 1970), pp. 85, 87-88.
18. Barry Commoner, *The Closing Circle* (New York: Alfred A. Knopf, 1971), p. 280: "Both socialist and capitalist economic theory have apparently developed without taking into account the limited capacity of the biological capital represented by the ecosystem. As a result, neither system has as yet developed a means of accommodating its economic operation to environmental crisis; both will be severely tested by the urgent need to solve it."
19. *Three Reports from Church and Society* (World Council of Churches, September 1971), pp. 18-26.
20. Robert L. Heilbroner, *An Inquiry into the Human Prospect* (New York: W. W. Norton & Co., 1974).
21. As quoted in the *Report of the West African Conference on Science and Technology, Accra, Ghana* (World Council of Churches, Geneva, March 1972).
22. "Report of an Ecumenical Conference on the Scientific, Technological and Social Revolutions in Asian Perspective, Kuala Lumpur, Malaysia, April 19-23, 1973," *Anticipation*, no. 14, p. 36.
23. *Ibid.*
24. See "1974 World Conference on Science and Technology for Human Development [Bucharest, Romania, June 24-July 2, 1974]," *Anticipation*, no. 19 (1974), p. 12.
25. *Ibid.*
26. Heilbroner.
27. Alvin M. Weinberg, "Social Institutions and Nuclear Energy," *Science* 177 (1972): 33.