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Harold P. Green

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THE NEW TECHNOLOGICAL ERA:

A VIEW FROM THE LAW

Some 30 years ago, a group of eminent scientists and social scientists, acting as the Science Committee of the Government's National Resources Committee, undertook to consider the significance of science as a national resource. The Technology Subcommittee of the Science Committee issued as part of this study a report entitled Technological Trends and National Policy, which was published in 1937 by the Government Printing Office. This report evaluated the unprecedented rate of technological change during the first third of the 20th Century and discussed the social consequences of the new technologies which had come into being. It also undertook to predict the course of technological progress which could be anticipated in the second third of the century.

We all know that the past 30 years or so have been an era of remarkable technological progress. How remarkable can be demonstrated by measuring the advances of the past 30 years against the expectations of those eminent scientists in 1937. It is clear that they did not in their wildest expectations foresee the level of technological development which would occur in the second third of the century. Their report includes not even a hint as to the possible emergence of nuclear technology, radar, computers, or the jet engine, although these were in fact reduced to practice within only a few years after the report was issued. As a matter of fact, discussing aviation, the report suggests that the technology had by 1937 largely run its course, and that future developments would lie in safety and comfort rather than speed. Other examples can be cited to demonstrate what seems, in retrospect, a startling short-sightedness on the part of the experts, but there is no need to belabor the point.

It would be useful, as we enter the last third of the century, to consider why these eminent scientists were so wide of the mark in 1937. In 1937, resources available to science were drastically limited. Scientific research was almost entirely a product of human curiosity and personal interest. Research equipment and funds to support research were scarce. Technological development was almost entirely a product of private, profit-seeking investment. Government support of scientific research and development was negligible. Since World War II, however, the game is no longer the same. In 1940, the Federal government expended only $74 million for research and development. By 1950, annual Federal expenditures on research and development had risen to the billion dollar level, and these expenditures have steadily increased until today they are at the level of $16 billion per year, representing about 15 percent of the Federal budget. All of these billions of dollars have been invested in scientific and technological advance. This investment has resulted not only in the direct procurement of technological advances, but also in the creation of a vast reservoir of human scientific resources capable of building cumulatively on the progress of the past to accelerate technological advance in the future. In short, the ready availability of immense Federal support has replaced the forces of the private market place as the principal determinant of scientific and technological progress. A large part of these Federal funds is, of course, expended for national defense; but a large part—perhaps almost half—is expended in the development of areas of purely peaceful significance. Our society seems to be wholly committed to the pursuit of technological progress—for reasons of the national defense, the domestic economy, the general welfare, and national prestige.

None of this was predictable or foreseeable in 1937. But it now seems clear in 1967 that extensive Federal support for science and technology on the present scale into the indefinite future will continue—in fact, that it is inevitable and irreversible. For one thing, the continuing solvency of thousands of universities and business enterprises, and probably continuing national prosperity itself, have come to depend largely upon continuation of Federal expenditures on research and development. It is likely, if not certain, therefore, despite the hazards of prediction evidenced by the 1937 example, that the technological advances in the last third of the 20th Century will dwarf even the immense advances of the past 30 years.

What are the consequences of this mushrooming technological advance? It is not necessary to spell out those multifold benefits to society which can be anticipated. Instead, let us recognize that technological progress may also bring with it some undesirable consequences. Under the best of circumstances, technological advances frequently involve major social disruptions: unemployment, excessive leisure, changes in social or moral standards, and the like. But technological advances may also involve hazards to the health, safety, and security of society. We are already aware of the massive assault on human privacy caused by the computer and electronics technologies; we are aware of the ill effects of pesticides, drugs, radiation, and automobile exhaust fumes; and we are aware of the potential dangerous consequences of producing and accumulating atomic, biological, and chemical weapons. Looking into the future, it is easy to visualize Washington bureaucrats determining whether, when, and where it will rain or snow; and it seems inevitable that society will be living with the sonic boom, the test tube creation of artificial life, genetics engineering, and machines which can think and reason.

Technological advances carry with them the very real threat of destruction of human beings and cherished human values. How much damage could a single demented or evil person have inflicted on society in a single act 25 years ago? Today, such a person in a single act may have the capability of inflicting upon society immense damage measured in thousands, if not millions, of human lives. If technological progress has not yet brought us to the point of crisis, it is clear at least that we live in an intrinsically perilous era with a constantly shrinking margin for error or miscalculation. Nevertheless, so obsessed are we, as a matter of national policy, with technological advance as an end in itself that scant attention is paid to the problem of protecting society against the hazards of technology.

Admiral Rickover is one of the few technological leaders today who has evidenced an awareness of this problem. In a series of remarkable speeches he has reminded us that technology exists to serve man, and has cautioned us against the enormous "potentialities for injury to human beings and to society" created by the pressures of the technologists to alter our lives—"almost as if technology were an irrepressible force of nature to which we must meekly submit." He calls upon the legal profession, as a special civic responsibility, to protect society against the incursions of rampant technology, but he says nothing about how this should be done. Admiral Rickover's summons to the legal profession squarely raises the question of the relationship between law and science and technology.

All human activity, including scientific research and development, invention, and utilization of technology, takes place within a social environment in which the law is a major element. Our legal system consists of a set of rules governing human activity and specifying the consequences of certain acts. Generally speaking, our system contemplates that men are free to think, to research, to discover, and to create within the limits of the resources available to them, and that technological progress will be achieved primarily through private, profit-seeking investment. The law is not, however, completely neutral in this respect. It reflects in many ways an effort to provide a social environment conducive to scientific research and technological progress. The patent system exists primarily to encourage invention; the tax laws are structured to provide at least modest inducements for research, invention, and technological growth; and the government has traditionally been interested in various ways in the development of an ever-expanding body of knowledge. Not infrequently, laws may provide direct or indirect government financial support for development of a particular technology. On the other hand, laws also impose some constraints on technological progress. For example, the possibility of liability because of intrinsic hazards of a new technology may discourage private investment in and exploitation of the technology, and the more stringent the rule of liability, the greater is the deterrent. Similarly legal rules prohibiting or regulating the use of animals or human beings in research may deter progress, and even legal rules limiting the use of property (e.g., nuisances, zoning, etc.) may increase the costs of certain kinds of technological development and deter progress in these areas.

When a new technology with intrinsic hazards comes into being, the law must inevitably deal with the technology because of the interests of people who are injured or threatened with injury. Usually the first steps in the law's cognizance of the problem involve suits by persons who have been injured and who seek compensation for their injuries, or who fear injury and seek to restrain a particular activity through injunction. In dealing with these cases, the initial response of the legal system is the courts' application of existing legal principles, created in other contexts, to the new problems through a process of analogy. This is often a long trial and error process until satisfactory rules of law are formulated to deal with the new problems, but the history of our legal system indicates that, given enough time, rules will be developed to deal with the new problems. The important thing to bear in mind is that the courts operate retrospectively, dealing with problems only after they have arisen and have been identified as problems.

Technology may also be the subject of law-making by legislative bodies and quasi-legislative administrative agencies. These bodies have the capacity to create rules of law to deal prospectively with a foreseeable, but not yet fully defined problem. They do not usually do so, however, for to lay down a rule in advance of the definitive emergence of a problem would tend to inhibit individual freedom and progress, or to channel progress along lines which may not in the long run be optimum. Moreover, the fact that a particular law is needed does not mean that it will be enacted, since legislation, dependent upon public understanding of the problem and upon the reconciliation of diverse private and political interests, may itself be a painfully slow process. It should be understood, therefore, that our legal system as a whole has traditionally dealt with problems only after they are shown to exist.

Adequate protection of society against new technological hazards is dependent upon the speed with which the courts and/or the legislatures identify the new problems and create adequate rules to deal with them. It is self-evident that this time factor involves two elements: first, the speed with which the courts and legislatures can act, and second, the speed with which the technology develops. Until recently, this time factor has been manageable. Only 30 years ago, the Science Committee of the National Resources Committee could say with complete accuracy:

> "Though the influence of invention may be so great as to be immeasurable . . . there is usually opportunity to anticipate its impact upon society since it never comes instantaneously without signals. For invention is a process and there are faint beginnings, development, diffusion, and social influences, occurring in sequence, all of which requires time. From the early origins of an invention to its social effects the time interval averages about 30 years."

This was written to support the assumption that the usual time interval between the early origins of an invention and its social effects provided an adequate opportunity for the imposition of effective social control, before the social effects got out of hand. But we know today that technological advance is so rapid that we do not have this 30-year interval. We know today, with the vast public resources available for scientific and technological development, that inventions appear suddenly and that very substantial social effects may be felt almost instantaneously. One example of this is the sudden emergence of atomic energy technology with its immediate array of major social effects.

The shrinkage of the time interval between the origins of a technology and the time its social effects are felt means that the practice of a technology with intrinsic hazards will result in more injury to more people at an earlier point of time. Yet there still remains inherent in our present legal system the need for a time lag between the first appearance of injury and the creation of new rules of law adequate to deal with the problem. Lawyers have recognized that, during this time lag, adequate justice may not be done on behalf of persons injured by the new technology, and this has been regarded as one of the costs borne for our form of society which places a high premium on private initiative, freedom, and progress. The price may, however, become intolerably high if the shrinkage of the time interval between the origins of the technology and the time at which the social effects are experienced results in substantial injury before the law can provide adequate relief and remedy.

The basic question is whether our legal system is capable of imposing effective social control over new technologies before they inflict very substantial, or even irreparable, injury upon society. It seems clear that we cannot rely on the courts alone to protect society against fast-moving technological developments. Judge-made rules of law always come after, and usually long after, the potential for injury has been demonstrated in the cases of individuals who have actually sustained injury. A hypothetical example is the fluoridation of public water supplies, which has been proceeding during the past 15 years or so on the basis of a high degree of confidence on the part of public health authorities that artificially fluoridated water is in no way harmful to living beings. Even if it is true that no case is known today of any person who has been injured by drinking artificially fluoridated water, it is not impossible that 20 years hence it may be learned that fluoridated water, consumed over a period of many years, is injurious to a significant segment of the public. If this were to occur, and if the courts then commence to award damages to injured persons, it might be small comfort to the injured persons who were gradually poisoned over the years. Furthermore, an outcome of this kind certainly could not be regarded as an instance of adequate or effective social control.

If we cannot rely solely on our courts to protect society adequately, reliance must be placed on our legislatures and on administrative bodies performing quasi-legislative functions. These have the theoretical capability to absorb and evaluate current information, to monitor developments as they occur, and to formulate laws controlling the development and use of technology. In the process of such law-making, legislative and administrative bodies are constantly required to weigh potential benefits of a technology against its potential hazards. But neither benefits nor hazards can be meaningfully quantified in this balancing process, and thus we can only hope that the law-makers will perform this balancing operation with wisdom and sound judgment. It should be noted, moreover, that hazards can never be reduced to zero; all human activity involves hazards and risks. Law-makers can only endeavor to establish rules which minimize the hazards to the point consistent with the conduct of activities which are regarded as socially desirable.

The increasing role of government, coupled with the present-day obsession with technological progress, has important implications from the standpoint of effective social control over technological progress. Conscious acceptance of "calculated risk" becomes an increasingly important part of the law-making process. The desire to deal with the public health problem of dental decay has led to government sponsorship of fluoridation of public water supplies despite some unanswered questions as to possible hazards. Considerations of national defense led to nuclear weapons testing, despite the consequent exposure of the public to certainly undesirable and possibly harmful radiation. Economic considerations and the need to uphold America's position of prestige are leading to development of sonic boom-producing aircraft which may in turn create major social problems. In short, governmental objectives are resulting increasingly in exposure of the public to consequences which range from undesirable to potentially hazardous, through the process of weighing expected benefits more heavily than potential undesirable consequences. To this extent, the national obsession with technological advance, supported with substantial Federal programs and expenditures, is preempting the normal operation of law as a mechanism for protecting the public against undesirable consequences of technological progress. Government programs, ordained by legislative action, based upon calculated risk judgments and the optimistic weighing of benefits against hazards, are subjecting people to hazards both immediate and potential against which they might otherwise have legal protection.

This is not to say that government technological programs are conducted without regard to their social consequences and costs. The immediate and potential adverse consequences are usually recognized and dealt with in the effort to minimize them. For example, research and development seeking ways to eliminate or minimize the sonic boom phenomenon are being conducted concurrently with development of the supersonic transport. There is, however, a tendency for the promoters of the technology to conclude that a way will be found to eliminate the undesirable social consequences, or if not, they can be made to be tolerable; and this tendency is present even when these consequences are not fully understood due to limited scientific knowledge at the time. Moreover, technological development proceeds on the assumption that if the technology proves to involve intolerable social consequences, the technology will not in fact be

practiced. This is, of course, a dubious assumption, since the existence and degree of social consequences are never matters of all black or all white, and there are immense political and practical problems in turning off a technology in which substantial vested interests have come into being.

The implications of substantial government support for technological development should be clearly understood. When technological development is left entirely to private, profit-seeking investment, the technology develops gradually on a trial and error basis, with opportunity for feedback from social, economic, and legal institutions, and with the opportunity for the technologists to pause, retreat, and reshape their technologies and their objectives. When, however, government intervenes to force development of the technology on a pre-determined time scale, the entire process of technological development is drastically compressed, and the processes of trial and error and feedback are replaced by scientific and engineering prediction and judgment. The public's protection rests with "engineered safeguards" rather than with legal protection. While it might appear theoretically that members of society who are adversely affected by the technology still have recourse to the courts to protect their interests, even when the government rather than private industry is sponsoring the technology, there are two reasons why this possibility is not realistic. First, the accelerated rate of technological development may result in the emergence of social consequences of considerable magnitude, which the courts may not yet be able to handle effectively because of inexperience with the problem. Secondly, where the Federal government sponsors the technology and is directly or indirectly a party in the litigation, the courts tend to rely on the expertise and assurances of the government as to the hazards of the technology and the causal relationship between the technology and particular injuries, and to avoid decisions which will burden government programs.

The growth of radiation-producing technology is a good example of this process. Practice of this technology involves the exposure of human beings to radiation either directly or indirectly through the air they breathe and live in, or the foods which they consume. Exposure of a human being to man-made radiation (i.e., radiation in addition to the background radiation inherent in nature) is regarded as undesirable, and possibly harmful, except, of course, when the individual is exposed for medical or dental purposes in which case there is presumably an offsetting benefit. It is known that certain large exposures to radiation produce lethal or somatic consequences, but, since exposure of large numbers of the population to man-made radiation other than for medical or dental purposes is a fairly recent development, relatively little is known about the somatic effects of exposure to small quantities of radiation, particularly over an extended period of time. On the other hand, it is known that any exposure to radiation may result in genetic mutations if the radiation reaches the reproductive organs, and genetic mutations are believed to be mostly harmful, resulting in defective offspring. The genetic damage, moreover, is cumulative, and depends on the total accumulated dose to the gonads.

The American legal system began to take cognizance of radiation in the early years of this century as doctors and dentists, and their technicians and patients, sustained X-ray injuries. Later, cases began coming to the courts involving radiation injuries sustained in industrial applications of X-rays and in industrial uses of radium. More recently, cases have arisen involving individuals alleging radiation injuries attributable to equipment and materials used in the atomic energy industry. It is apparent, from study of these cases, as well as from a theoretical study of the legal problems involved in radiation-producing technology, that the courts have not yet worked out adequate rules of law for dealing with the somewhat unique legal aspects of this technology.

The principal unique aspect of this technology from the legal standpoint is that radiation exposure may result in latent injury which may not become manifest until some years after the exposure. Since personal injury actions are subject to statutes of limitations requiring that litigation be initiated within a specified period of time, many cases of latent radiation injury may not be legally cognizable. In addition, since the latent injuries caused by radiation are non-specific (i.e., they are illnesses of the type, for example, leukemia, which also occur in people who are not exposed to radiation) it is exceedingly difficult for a person to prove in a legally adequate manner that his illness is attributable to radiation exposure sustained some time in the past, rather than attributable to natural or other possible causes. And beyond the problems in-

cident to the latent somatic effects of radiation, the legal system has no established mechanism for awarding damages for the genetic injuries and general life-shortening consequences of radiation exposure.

Despite the obvious hazards of radiation to human life, it has been a prime objective of national policy since World War II that the United States develop as rapidly as possible the peaceful applications of radiation-producing technology. The vehicle for achievement of this national objective is the Atomic Energy Commission which has, in a variety of ways, supported, promoted, encouraged, and subsidized private enterprise in the effort to bring radiation-producing and radiation-using technology into the mainstream of the national economy. As a consequence of this program, which has now brought the technology to a point approaching maturity, there are now large quantities of man-made radiation extant in the environment, and ever-increasing quantities of radiation will be brought into being in the future. This radiation, unless adequately contained and controlled, constitutes a significant threat to the health and safety of the public.

Government support has brought about in two decades a development of this technology which would, in the absence of such support, probably have required at least a century. Moreover, the technology has come to maturity with substantial capacity to cause injury to people before the legal system has evolved to a point at which it is capable of dealing appropriately and effectively with these injuries and, indeed, before we even understand fully the biological consequences of radiation exposure. Implicit in the technological development is the notion that people will be exposed to low levels of radiation and that this exposure, although undesirable, is accepted as a risk which is tolerated for the sake of obtaining the manifold benefits of the technology.

At the core of this approach to technological progress is the principle of government regulation: the commendable principle that radiation-producing technology will be subjected to stringent Federal regulation to assure that people will not be exposed to radiation which will be harmful to them. Thus the Atomic Energy Act requires the Atomic Energy Commission to prohibit any activities within its regulatory jurisdiction which will be injurious to the health and safety of the public. In implementing this responsibility, the AEC's regulations are based on the principle that persons producing, handling, or utilizing radiation sources must take precautions to assure that their employees, as well as the public at large, will not be exposed to levels of radiation in excess of levels which are regarded as tolerable. The regulations do not, of course, encourage industry to expose people to these tolerable levels; rather they exhort industry to hold the levels of exposure down to the lowest possible point. In fact, it must be emphasized, industrial practices actually result in routine exposure well below the maximum permissible levels established by AEC regulations.

The efficacy of this regulatory scheme from the standpoint of protection of the public interest is dependent upon two major factors. First, are the engineered safeguards adequate to protect against accidents which might result in exposure of large numbers of people to high levels of radiation? In this connection it should be recognized that judgments as to the adequacy of the safeguards are based primarily on scientific and engineering predictions, since there has been relatively little actual experience with the safeguard mechanisms. Secondly, are the legally permissible levels of exposure in fact safe? It is on this second factor that we shall focus our attention.

The maximum permissible levels of radiation exposure used in the AEC's regulations are based on the recommendations of the National Council on Radiation Protection and Measurements (NCRP). This is a private organization, previously known as the National Committee on Radiation Protection and Measurements, which has been in existence since 1929. Throughout this period, this body has set the principal radiation protection standards in the United States. Initially, its role was the establishment of standards for voluntary compliance by radiation producers and users, but in more recent years, the NCRP's standards have been accepted as authoritative, and have been adopted, almost automatically, by government agencies. It is recognized as a body of distinguished and cautious scientists and engineers who endeavor to perform their functions in a disinterested and objective manner. It has, twice since 1947, drastically reduced its recommended maximum radiation exposure levels, based on the growth of radiation-producing technology and the development of new information concerning the effects of radiation.

Despite the competence, conservatism, and integrity of the NCRP, its role raises significant questions of public policy. Its public pronouncements explicitly reflect that its recommendations are based on a policy of "calculated risk;" in making its recommendations, it balances the benefits of radiation technology against its hazards. It endeavors to adopt levels of permissible exposure which will protect the public but which will not, at the same time, stifle the radiation industry. As Dr. Lauriston Taylor, for many years the head of the NCRP, has pointed out, the NCRP and its international counterpart are

> ". . . scientific and technical in their makeup and hence do not attempt to solve the social problems that radiation control may introduce,"

and that

> ". . . the establishment of permissible levels of radiation exposure is not basically a scientific problem . . . it is more a matter of philosophy, of morality, and of sheer wisdom."

Despite these disclaimers of competence, the NCRP has, largely by default of others, undertaken to make recommendations as to "maximum permissible dose." Thus, we find an Ad Hoc Subcommittee of the NCRP reporting in 1959:

> ". . . any realistic recommendations of maximum permissible dose must be reached by balancing biological risks against the reasons for accepting exposures to radiation. It is highly improbable that such a balance can be made with accuracy, not only because of our limited knowledge, both of benefits and risks, but also because of difficulties in comparing social, economic, and other benefits with radiation risks."

It is apparent that the NCRP, in adopting radiation protection standards which are arrived at through the balancing of social values, and which are more or less automatically incorporated into government regulations and used as standards by the courts for determining whether a plaintiff's exposure to radiation caused harm, is performing a legislative function. As such it is an unrepresentative body, since it consists only of scientists and engineers, without representation from other disciplines (e.g., law, psychiatry, theology, economics, etc.) and other societal interests. There is, moreover, the further problem that the NCRP has no political accountability of the kind that should be incident to law-making bodies.

In any event, no one would deny that an individual is better off if he is exposed to no radiation at all, except, of course, for medical or dental purposes. The NCRP, as well as government agencies playing a role in this area, believe that the low levels of radiation specified as maximums in government regulations will not be significantly harmful to individuals or to society as a whole, although they agree that even these low levels will result in some undesirable genetic consequences. Their approach is, however, based entirely on the fact that there is no evidence indicating harmful consequences, and not on affirmative evidence to this effect. If in fact these low levels of radiation do result in significant injury to human beings, the chances are that this will not become apparent for some time; by then, extensive harm may have already been caused, and, of course, substantial vested interests in radiation technology will have come into being.

This means, of course, that the members of society are being required to incur at least the increased probability of some genetic damage and the possibility of somatic injury in the name of progress and for the accomplishment of national objectives, just as they are required to pay taxes for these purposes. They are in fact being exposed to the kinds of risks against which the legal system would probably afford them protection, if the industry were developing in the normal evolutionary manner in response to market forces. This is of considerable significance to the legal profession. If, as Rickover suggests, the legal profession has a responsibility to protect society against the hazards of technology, the focal point for such protection no longer is before the courts. The weight of government programs for accelerating technology, resulting in the drastic compression of the time scale of technological development, means that lawyers seeking to protect society against technological hazards must perform this role at the point where government policies are made. Individual rights must in these cases be protected at the moment and at the place at which the regulatory framework is created and implemented. At this stage, however, the lawyer has no client to represent, since no one has yet been injured and very few people feel sufficiently threatened to retain a lawyer.

The radiation example is only one of a number which can be cited. The development of sonic boom-producing aircraft, weather modification, computers, electronics, and biological and genetic engineering technologies all raise, in one way or another, pretty much the same problem. It is clear that such technologies, along with their obvious benefits for mankind, carry with them the potentiality of causing drastic changes in the physical and social environment in which we live; in addition they have the potentiality of infringing basic individual rights which have traditionally been respected and protected by our legal system. We should not, however, regard even basic rights as immutable. Our legal system has always recognized the principle that such rights are subject to adjustment and dilution to accommodate the rights of others, and that they are, at least to some extent, subordinate to the accomplishment of governmental objectives.

The major problem raised by the new era of technology from the standpoint of the legal system turns not upon the fact that basic rights are infringed, but rather upon the manner in which they are infringed. Unquestionably, a democratic society should be able to make the determination that certain technological goals are so worth pursuing that its members must pay the price of exposure to radiation, and to noise, loss of privacy, or tampering with the weather. It is questionable, however, whether meaningful determinations of this kind, based on candid disclosure of the facts and adequate public discussion, are in fact being made. On the contrary, our decisions are made within small, closed circles of experts on the basis of their expert judgments and predictions as to the magnitude of the social consequences and the feasibility of their being controlled through technological means. It would appear, moreover, that if, as suggested above, the effect of our present obsession with technological advance is to displace the role of the courts as the forum for protecting and vindicating individual rights which are disturbed by technology, the consequences of this trend should likewise be considered as one of the social costs of technological advance.

What are the basic rights of an American citizen in the second third of the twentieth century? Does he have the right to be exposed to nature's own weather? The right not to be exposed to man-made environmental contaminants injurious to health? The right not to be subjected to genetic mutations or life-shortening influences? The right not to be subjected to extraordinary noise? The right to privacy? And after the basic rights have been defined, what constitutes an impairment of these rights against which protection will be afforded by society? How much of an impairment will be protected against? Is a mere statistical probability of impairment enough to justify protection, and if so how large a probability? If, for example, practice of radiation technology requires a doubling of the population's exposure to radiation, is the individual entitled to protection if the effect of the doubling will mean that there is one chance in 10,000 or one chance in 100,000 that one of his children or grandchildren will be born with an apparent defect?

Lawyers would ordinarily expect that questions of this kind would be resolved, with the evolution of legal rules, in the courts on a case by case basis as threatened or injured persons seek relief; and that rules would eventually be fashioned on the basis of experience and in the light of general legal principles. In actuality, however, the rapid pace of technological advance results in a de facto judgment that people will be subjected to some degree of deprivation of some of these rights by governmental fiat, cast in a form which precludes, or at least discourages, effective assertion of such rights in the courts. Under these circumstances, there is little effective opportunity for lawyers, functioning as lawyers usually do in our present society, to accept Admiral Rickover's challenge to protect people against technology. And, if the ordinary legal processes are not adequate to protect people against technology, where and how can such protection be afforded?

Our national commitment to technological advance seems irresistible, irrevocable, and irreversible. Given the tension-filled world in which we live, it is perhaps unthinkable that the United States not continue its drive for continuing technological superiority. Protection of people against technology requires, therefore, that protective measures be built into the development and practice of technology.

The basic need is for the taking of a long view from the moment that development of a technology commences. Assuming that the technology will come into being, what will be its maximum potential impact upon people? It is not difficult to conceive of technological developments which would be of great value for limited purposes, especially national security, but which would also have social consequences of such magnitude as to warrant a decision not to proceed. For example, despite its obvious military value, would we really want to develop a mind-reading technology if we could visualize at the end of the line the likelihood that anyone could buy or build an effective mind-reading machine for $500? The long view should also include consideration of another problem which we tend today to put off until the technology comes to or is near the point of use; i.e., how can its use be regulated to protect people against its undesirable consequences? It should be pointed out that some regulatory schemes necessary to cope effectively with technology may involve curtailment of fundamental freedoms. This is another reason why, in making decisions to force development of a technology, our democratic processes should in weighing costs against benefits take into account not only the immediate dollars and resources costs, but also a whole host of important foreseeable social costs.

An indispensable element of such a process is the necessity for full and candid disclosure and discussion of potential social costs. To achieve this, the articulation of social costs must be separated from the articulation of the benefits. We cannot rely on those who are sponsoring the development of a technology to tell us candidly about its undesirable social consequences, since an inherent element of the promotional process is to minimize these consequences and to argue that they can be technologically overcome. There must be some form of independent, objective government agency—a devil's advocate—to inform the Congress, the President, and the public about these potential social costs, so that the ultimate policy decisions will reflect a realistic balancing of costs against benefits. Some steps in this direction have been taken in the form of pending legislation introduced by Congressman Daddario to establish a Technology Assessment Board, as well as by the form of other proposals to establish special congressional committees to take the long view of technology.

The legal profession can and should play a role in this process, although this role would be different from its conventional role in society. A lawyer's training and experience equip him to separate the relevant from the irrelevant, and to marshal and present all facts which are necessary for accomplishing the objective at hand. The lawyer whose client is the promoter of the technology can assist in the presentation of the strongest possible case for promotion of the technology. If his client is the agency charged with presentation of the social costs, the lawyer can aid in this presentation. Additionally, he can and should peer into the future to make some judgments as to the manner in which the technology could and should be controlled after it is developed, so that these judgments might be considered by the decision makers. Finally, the lawyer for the various decision makers can assure that the decisions are made with due regard for all relevant facts.

The legal profession has to date remained quietly in the wings, watching and aware of the technological revolution, seemingly awaiting the emergence of the new legal problems which the revolution will bring. In part this is attributable to the fact that the technological revolution involves issues and science with which lawyers are not familiar; in part also it reflects the fact that scientists and technologists, probably distrustful of the lawyer's characteristically restraining influence, have not yet seen fit to summon the legal profession to the problem. If, however, it is a correct hypothesis that intense government support of technological advance is transferring the locus for protection of individual rights from the courts to legislative and rule-making bodies, this trend has profound implications for the legal profession itself, as well as for public policy, justice, and legal processes, with all of which the profession has traditionally been vitally concerned. If this indeed is the case, the legal profession, as such, must sooner or later come to grips with the social consequences of the technological revolution and consider what specific role it will play, as an organized profession, in shaping the course of the future. This will essentially be a process of developing a means for subjecting the formulation of national policy for science and technology to some form of "due process," which will provide adequate assurance that the rights of individuals with respect to technological advance will be appropriately considered by an appropriate body at the appropriate time.