

TECHNOLOGY and SOCIETY



IEEE

CONTRIBUTED PAPERS, REPORTS, REVIEWS, AND
CORRESPONDENCE OF THE COMMITTEE ON SOCIAL IMPLICATIONS OF TECHNOLOGY

DECEMBER 1978—NO. 24

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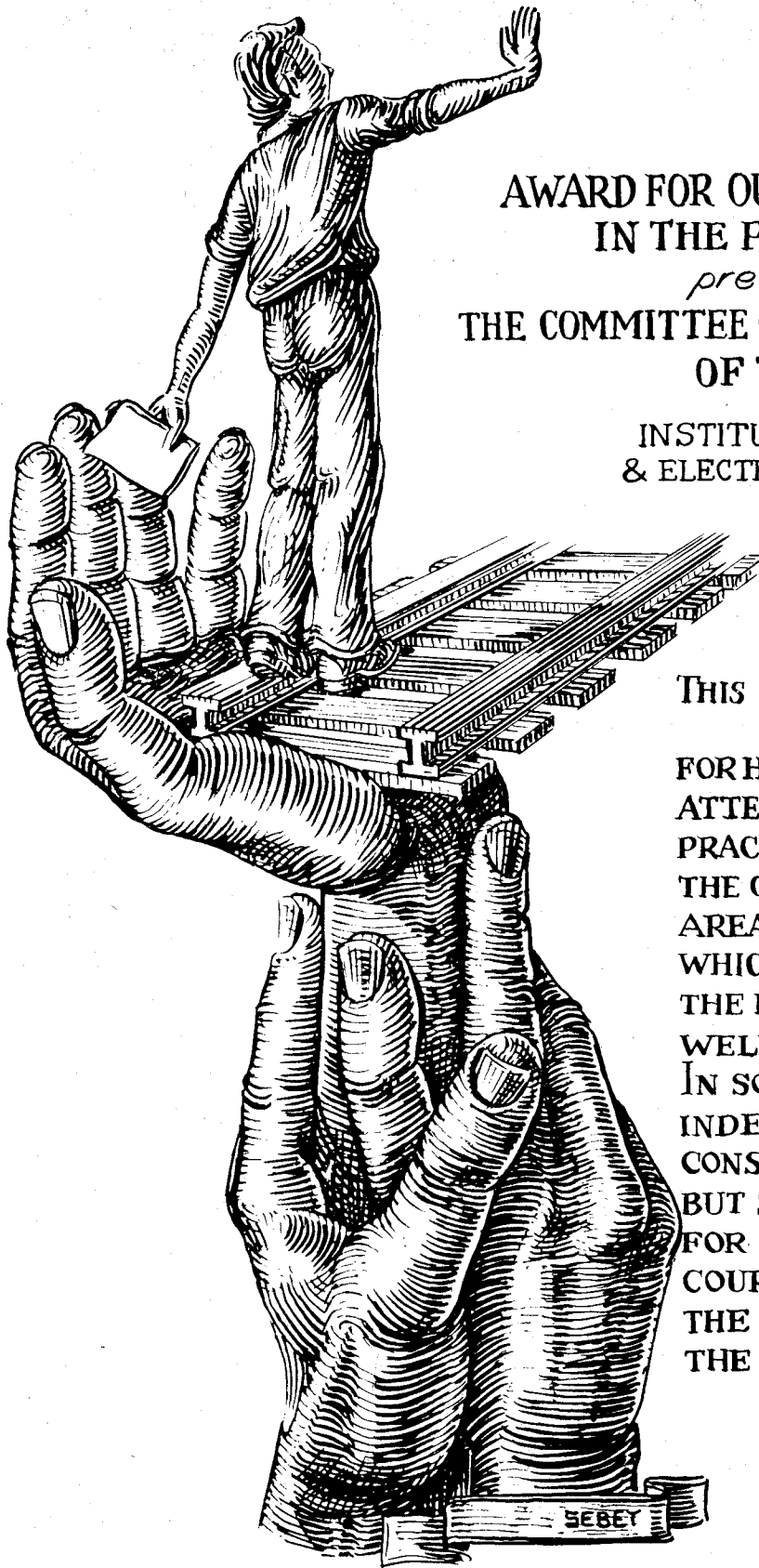
CSIT HONORS FORMER BART ENGINEERS

Presents Award for Outstanding Service in the Public Interest



Presentation of awards to former Bart engineers (WESCON, Los Angeles, September 13, 1978). Left to right: CSIT chairperson J. MALVERN BENJAMIN; BART engineers ROBERT BRUDER, HOLGER HJORTSVANG, and MAX BLANKENZEE; GILBERT VERDUGO of the Diablo chapter of CSPE, who helped to investigate (and confirm) their allegations; and *Contra Costa Times* reporter JUSTIN ROBERTS, who first published their story. (please turn to page 3).

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AWARD FOR OUTSTANDING SERVICE
IN THE PUBLIC INTEREST
presented by
THE COMMITTEE ON SOCIAL IMPLICATIONS
OF TECHNOLOGY
OF THE
INSTITUTE OF ELECTRICAL
& ELECTRONIC ENGINEERS

THIS AWARD IS PRESENTED TO

FOR HIS EFFORTS IN CALLING
ATTENTION TO ENGINEERING
PRACTICES ASSOCIATED WITH
THE CONSTRUCTION OF THE BAY
AREA RAPID TRANSIT SYSTEM
WHICH WERE DETRIMENTAL TO
THE PUBLIC SAFETY AND
WELFARE.

IN SO DOING, HE RISKED AND
INDEED SUFFERED
CONSIDERABLE PERSONAL LOSS,
BUT SET AN INSPIRING EXAMPLE
FOR OTHER ENGINEERS BY
COURAGEOUSLY ADHERING TO
THE LETTER AND SPIRIT OF
THE IEEE CODE OF ETHICS.

J. MALVERN BENJAMIN
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SEPT 13 '78 at IEEE WESCON

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CSIT Honors Former BART Engineers

On September 13, 1978 at a WESCON session, the Committee on Social Implications of Technology honored three engineers who had been summarily dismissed by the Bay Area Rapid Transit System (BART) in March 1972. Chairperson Mal Benjamin presented CSIT's first *Award for Outstanding Service in the Public Interest* to Robert Bruder, Holger Hjortsvang, and Max Blankenzee. The award consisted of a certificate and \$750 to each recipient. The three engineers had risked (and indeed suffered) considerable personal loss in an effort to protect the users of the transit system from the consequences of faulty engineering practices.

Holger Hjortsvang was a BART systems engineer whose job included monitoring the development of the automatic train control (ATC) subsystem, crucial to the operation of the highly-automated rail rapid-transit system linking San Francisco to surrounding communities. Hjortsvang warned his superiors, both orally and in writing, that proper engineering practices were not being followed and that, unless significant corrective steps were taken, an unsafe and unreliable system would result. Programmer analyst Max Blankenzee, a coworker of Hjortsvang, shared these misgivings and issued similar warnings. Robert Bruder, an electrical engineer in BART's construction section, independently arrived at the same conclusions and informed his superiors of the "unprofessional" installation and test procedures being followed on the project. All of these reports were rebuffed. The three engineers were warned not to become "troublemakers."

Unable to remedy the problems through normal channels, the engineers finally brought their concerns to a member of BART's Board of Directors. He in turn took the issue to the entire Board, thereby making the matter public. However, BART's management persuaded the Board that all was well and then proceeded to identify and fire the three "troublemakers." The fired engineers asked for written statements of the reasons for their dismissals, but they got no response; nor were they given hearings before any appeals body. A subsequent investigation by the Diablo Chapter of the California Society of Professional Engineers fully endorsed the actions of the three engineers, in a report written by Roy Anderson and Gilbert Verdugo. But no positive action on their behalf was ever taken by CSPE, despite the efforts of Anderson, Verdugo, and other individual CSPE members. Studies by other groups confirmed that the BART system was indeed poorly engineered. A more dramatic confirmation was the ATC failure that caused the now-famous Fremont crash in October 1972 (See photograph in *IEEE Spectrum*, March 1973, page 33).

IEEE TECHNOLOGY AND SOCIETY is published quarterly by the Committee on Social Implications of Technology of the Institute of Electrical and Electronics Engineers, Inc. Headquarters: 345 East 47th Street, New York, NY 10017. Subscription price: \$2.00 per year, IEEE members only, payable concurrently with IEEE membership dues, or else via the coupon on p. 15. Second-class postage paid at New York, NY and at additional mailing offices.

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initiated a lawsuit against BART charging breach of contract, deprivation of constitutional rights, and blacklisting. A report on the BART case was published by Steve Unger in the September 1973 issue of *TECHNOLOGY AND SOCIETY*. Steve's report led to a widespread discussion of the BART case within IEEE as an example of the difficulties encountered by employee engineers whose concepts of proper professional practice brought them into conflict with management. One favorable result of these discussions was that on January 9, 1975, in response to a CSIT resolution calling for support of the BART engineers, IEEE entered the case with a friend-of-the-court brief concerning the principles of professional conduct involved. Shortly thereafter an out-of-court settlement was offered by BART and accepted by the three engineers. More recently, IEEE set up a Member Conduct Committee, whose charter includes coming to the aid of IEEE members who are placed in jeopardy as a consequence of their adherence to the Institute's code of ethics. Blankenzee, Bruder, and Hjortsvang deserve much of the credit for this step forward.

About 40 people were present for the award presentations, which were made right after the WESCON session, "Engineering, Society, and the Evolving Relationship." Justin Roberts of the *Contra Costa Times*, whose investigative reporting brought the BART case to the attention of the public, gave a brief review of the history of the case. The second speaker was John Guarrera, who as 1974 IEEE president, and later as USAB chairman, played a major role in efforts to involve the Institute in matters of engineering ethics. Mal Benjamin then presented the awards to the three engineers—a moment which was deeply moving and gratifying to everyone present. Mal read a message from former IEEE president Arthur Stern to close the program. ■

Frank Kotasek, Jr.

Message by Arthur P. Stern in Connection with the IEEE Award for Outstanding Service in the Public Interest

Engineers spend their working hours in creating new technical concepts, in designing products and systems, in doing or guiding manufacturing, marketing or other work related to technology. Most of us find satisfaction in, and are accustomed to, dealing with the technical challenges which pervade the many functional areas involving engineering. We devote our leisure time to raising our families, broadening our education, having holidays and vacations, and enjoying life.

But from time to time there arises an unusual challenge which is also an unusual opportunity: when we must stand up, demonstrate that we have backbone in addition to brains, and speak up strongly, sometimes at great personal risk, for our technical convictions and for the benefit of our fellow humans. Many of us are never tested by such a challenge and opportunity. Others back out and seek personal safety and comfort at the critical moment. But there are those who are equal to the occasion and who, regardless of consequences, present themselves as leaders and examples to others in such situations. This is what Robert Bruder, Max Blankenzee, and Holger Hjortsvang did when they discovered in the course of their work that human safety was at stake in the San Francisco Bay Area Rapid Transit System. They did not shirk their responsibility to mankind, they did not place personal security above their professional duty by

receive the first IEEE Award for Outstanding Service in the Public Interest. They deserve congratulations for their actions and the Institute deserves congratulations for having identified the engineering profession with their upright stand.

[Arthur P. Stern was IEEE president in 1975—Ed.]

CSIT Awards Fund Urgently Needs Donations

A tax-exempt account has been established within the IEEE Foundation to receive donations to the CSIT Awards Program. Donations to this account will be used to fund the cash award (750 dollars per awardee) that goes with the *CSIT Award for Outstanding Service in the Public Interest*. Donations to support this award are urgently needed and are tax-deductible. Please be sure to make checks payable to:

IEEE Foundation Inc., Account no. 325.3

and send to:

IEEE Foundation, Inc.
345 East 47th Street
New York, NY 10017

A covering letter, stating that the donation is in support of the CSIT Awards Program should be included.

The *CSIT Award for Outstanding Service in the Public Interest* is intended to honor engineers who act to protect the public interest—particularly when such actions are taken despite personal risk. Readers are encouraged to direct any questions or comments about the CSIT Awards Program to the CSIT Awards Committee Chairperson: J. S. Kaufman, Bell Telephone Labs, Holmdel, NJ 07747; phone (201) 949-5241.

[Ed. note: The awards to the three BART engineers were funded through this awards program. The funds were provided through a single generous donation by an IEEE member who wishes to remain anonymous.]

Second CSIT Award presentation, April 24 1979, New York City

The second CSIT Award for Outstanding Service in the Public Interest will be presented at a special session of Electro '79. It will consist, as did the first award, of a certificate and \$750. The session is scheduled for Tuesday, April 24 at 1:00 pm (preceding the session on "The Engineer and Public Policy") at the Sheraton Center Hotel (former Hotel Americana), 53rd Street and 7th Avenue. (La Loire Room)

THE ENGINEER'S ROLE IN THE ENERGY CRISIS

John A. Casazza

NEVER has mankind needed new technology more than at present. What is the engineer's role in meeting that need? The value of engineers does not seem to be appreciated in solving our energy problems. Government and corporate positions are filled by persons who are not technically trained. As a result, the opinions of engineers too often fail to find their way into the decision-making process. What is the cause of this phenomenon? Are the engineers at fault? Have they failed to change as society's needs have changed? Or have the new forces which have come into play failed to recognize the role of engineers? What will be society's future problems? How can engineers help to solve them? Let us explore these questions.

Needed — Basic Philosophy

The bedrock foundation supporting the use of any profession's technical skills and knowledge is its philosophy and beliefs. Have our engineers and managers ever tried to outline our professional "axioms"? While they have prepared codes of ethics and statements covering conflicts of interests, these have been concerned mostly with the conduct of day-to-day activities — not their obligations to society. How do they justify their professional existence? How do they justify their share of society's goods, services, and wealth?

I would like to suggest the following "twelve professional beliefs and precepts" for use in our engineering and managerial decisions:

- 1) The welfare of future generations is of vital concern and must be protected, even at some expense to the welfare of our current generation.
- 2) People are fundamentally good and wise. The public is concerned about its future and, given the proper information, will react over a period of time with wisdom and justice.
- 3) The resources of this earth — natural, human, and capital — are limited and must be both conserved and used wisely, recognizing their great value to humanity.

[Reprinted with permission from Public Utilities Fortnightly, February 16, 1978. Copyright 1978 by Public Utilities Reports, Inc. The article is adapted from a talk delivered at the "Life Member" session at the 1977 IEEE International Meeting in New York City.]

John A. Casazza is vice president of Stone & Webster Management Consultants, Inc. From 1974 to 1977 he was vice president (planning and research) at the Public Service Gas and Electric Company where he began his career in 1946. Mr. Casazza graduated from Cornell University and is a professional engineer. He is a member of the IEEE USAB Task Force on Increasing Responsibility of Engineers in Society.]

4) The world's three major problems relate to food, energy, and land use, the solutions to which are closely coupled.

5) The benefits that technology has produced from the earth's natural resources are not widely realized. A peaceful mechanism to accomplish some redistribution must be found.

6) The technical and social systems that are most in harmony with the systems of God and nature are the best, recognizing that the welfare of human beings ranks higher than the welfare of lower creatures, and health before the visual amenities.

7) Our energy systems have great inertia, requiring evolutionary solutions to our problems which can be retrofitted into our existing systems and organizations while these are kept working.

8) Total system long-range incremental costs and benefits, including social costs, should be evaluated in making *strategic* decisions, without the distortions of man-made pricing policies, rules, and regulations on these economics.

9) We in the professions, both in business and in government, are the custodians of the public welfare and must provide the conduits and mechanisms through which the public's funds (customer's, stockholder's, and taxpayer's) are directed for their maximum benefit.

10) In a democracy, people vote in two ways: at the ballot box and with their dollars. Their choices in the use of their money can be far more important in determining our national future than their selections at the ballot box.

11) The optimum size process, plant, governmental unit, or business organization is one in which the benefits of the economy of scale are balanced by the benefits of the motivation and pride of those who will be responsible for its success. People must be able to see, understand, and be proud of their contribution to their community, their associates, and mankind.

12) Any form of energy conversion and distribution involves risks to human beings. These risks must be evaluated against the risks of not making the energy conversion and distribution. The overall welfare of all humanity, not of any one area or region, should govern.

Problems of Society

Increasing Lead Times

A major difficulty in achieving solutions to our energy problems is the trend toward rapidly increasing lead times; i.e., the time between a decision to embark on a

certain project and its completion. The significant lead-time increases result mainly from decisions on engineering matters being taken over by others who do not have the knowledge of the engineer. While engineers need to recognize the importance of having public input into the decision-making process, they need to oppose vigorously the assumption that engineers are not capable of evaluating the overall public welfare.

Regulation versus Management

Utilities are subject to a great deal of regulation, some of which borders on the takeover of management responsibilities. While regulation is necessary and justified, it is very important that the regulators not confuse their regulating responsibilities with the management of these organizations. Conversely, those in management need to recognize that good management works for what is best for the consumer — not just the stockholder — in the long run.

The amount of engineering talent presently being ground up uselessly in the eddy currents of regulatory paperwork and bureaucratic hearings is exceedingly damaging to both society and the engineering profession. The general public cannot afford the two competing management systems we are moving rapidly towards; namely, the duly authorized management and the regulators who feel they cannot fulfill their role or ambitions without actually participating in the company management.

Government Planning versus Private Enterprise

The major issue is the role of government planning versus the role of private enterprise; i.e., the conflict between political control and ownership. Some look at it as socialism versus capitalism. There are those who argue that in order to optimize from a long-term national basis, it is necessary for government to make the key decisions. Those who feel this way look at our energy crisis as a national emergency for which we need a military approach — some form of martial law to dictate what various enterprises and individuals should do to provide for our national welfare.

In deciding who should make the key decisions in our country, we need to recognize that people are people. The leader of a consumer movement or an advocate of citizen's rights can become just as ruthless a demagogue in the pursuit of his ambitions as the executive of a large company or a government official.

Freedom is the ability to decide for ourselves the things that affect each of us. We recognize, however, that for the benefit of the majority we have to give up certain freedoms and have done so when in our overall interest. The key issue is how much of this freedom should be given up in the energy area in order to achieve the benefits that we all want.

The conflicts between the rights and prerogatives of

various government groups in our country have been harmful. There is strong competition between the government of the community, of the state, of the region, and of the nation, and between the departments of each of these, for the power to make decisions that affect their respective areas. These conflicts have played a large part in the continually increasing lead times that we have been experiencing.

Role of the University

In this management-government situation, the role of the university should continue to increase. However, there is strong temptation on the part of some university people to adopt an anti-industry stance, designed to curry favor with government and so-called "consumer" groups. The irresponsible statements to the media of some university people are a major concern to industry and costly to the public. I believe an approach that could increase the constructive role of the university tremendously would be an impartial attitude toward the problems of society in the energy area. This role could be filled by having the universities serve along with the professional societies as a source for accurate and unbiased information. Such an approach would fill an aching void in our society.

Distribution of Limited Resources

Capitalism has been the most efficient producer of goods in the history of social and governmental systems on this earth. However, it has shown some weaknesses in the equitable distribution of resources when they are limited. A major challenge to private enterprise in the future is to improve the distribution of increasingly scarce resources while continuing to maintain its historically high degree of productivity. If private enterprise is not able to improve markedly its ability to conserve and optimize the distribution of scarce resources, the shift to government control of more and more activities will continue to accelerate.

Need for Results Now

A major problem confronting us is the problem of producing results "now." Government officials who regulate industry, the executives who work for industry, the stockholders, and the customers of industry want results now. Many do not willingly accept solutions which will penalize them now, even though they may provide more than compensating benefits later.

For example, the average age of stockholders in a typical utility is around sixty-five years. These stockholders do not want current dividends curtailed so that the company will be in a better position to provide for its customers twenty years from now. The people in elected government positions are not inclined to put

great stress on programs that will bring improvement two administrations down the road. Executives are concerned about the record and performance of the company while they are in charge. This results in the solving of 20-year problems with a four-year perspective. In spite of the obvious difficulties, private enterprise has to achieve a mechanism for long-term optimization if it is to survive.

Growth in Pension Funds

Another significant development that will play an increasing role in the future is the very significant increase in the percentage of our national capital that will come from pension funds. We have seen this recently in the case of New York city.

Presently, pension funds provide one-third of our nation's equity capital. By 1990 they will provide two-thirds of the equity, plus major portions of the debt capital. What will be the impact of this change? How much control will be exercised by the workingman? By labor leaders? By banking institutions? It is vital that control be by those responsive to the overall, long-range welfare of our society.

Energy, Food, Water, Land Use, and the Environment

We have too many partisans arguing for partial solutions to complex and interrelated problems. There is a strong coupling between mankind's need for energy, food, water, land use, and a good environment. Approximately 85 per cent of our fertilizer is produced from natural gas. Cooling towers used to keep down water temperature at power plants can consume considerable amounts of water, which will be needed in the future to increase our potable water supply. Water is also needed for hydroelectric generation. The impact of the recent droughts in California on food supply, drinking water, and energy supply illustrates this dramatically.

Need for Price Signals

A nation in which private enterprise is to continue to make its benefits available to the people must also have a pricing system whereby the proper price signals are given to the public so it will choose the optimum energy courses of action in the long run. This can be done only if pricing reflects long-term total system incremental costs. Essentially, pricing should be in proportion to replacement costs. This can be achieved in the private enterprise economy through enlightened government regulation.

"Man-made" versus "True" Economics

The "true" economics of energy are frequently
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camouflaged by man-made rules and regulations. We use taxes, subsidies, and political considerations as prime factors in establishing prices. A good example is provided by the utility commissions throughout the country, which often establish prices for various types of services based on political considerations; i.e., the impact on the next election. They have not generally been concerned with giving the general public the proper price signals.

We need to recognize that we cannot make long-term strategic decisions based on the arbitrary "man-made" component of our costs, such as subsidies and taxes. We need to recognize that these man-made inputs can change with changes in administrations, changes in individuals, and changes in the public mood.

Incremental versus Average Costs

In economic evaluations and decisions we need to use true incremental costs, recognizing the future costs to obtain additional coal supplies, additional oil supplies, additional uranium, or solar collector devices, etc. We also need to recognize that we are in a new era. Not only is our society capital-limited for the first time in the lives of most of us, but we are in a period where incremental costs are higher than average costs.

In the past, as our nation grew and built new facilities, our incremental costs for the output from the new facilities were lower than our average costs, causing an overall lowering of prices when the new facilities were "rolled into" the economics. This is no longer true, not only for our electric systems, but also for our gas systems, oil systems, nuclear fuel systems, transportation systems, land development costs, city development costs, and throughout our whole economy. As a result, most businesses are not accumulating sufficient capital to replace existing plants and equipment when they are no longer useful.

Role of the Professions

In recent years there has been a significant increase in the number of technical decisions being made by lawyers, politicians, and accountants. Engineers have stood aside and watched these other professional groups assume many responsibilities and duties which they are best qualified to meet. The Congress of the United States has had the General Accounting Office investigate such things as the safety aspects of liquefied natural gas tanks and the need for additional electrical interconnections, and engineers have not objected. Hearings in progress in many areas of the country comparing technical alternatives are run by technically untrained individuals, with final decisions being made by lawyers.

The typical approach in hearings to decide highly technical questions is similar to the approach used in criminal and civil proceedings; namely, to discredit the opposing side's witnesses, attack their credentials, and try to trap them into contradictions. The hearings have not been getting at the basic issues involved, the basic

because they do not wish to do so, but because they do not know how! It is discouraging to sit at these hearings and, for example, hear the question: "What is a logarithm?" and then hear an hour of cross-examination on logarithms. Such procedures are extremely wasteful of the public's money and, more importantly, of our professional talents.

The System Approach

Coupling between Systems

In deciding on energy strategy and tactics, engineers need to look at the overall "system." We cannot continue to optimize our electric systems, water systems, and transportation systems separately. We need to consider food and land-use requirements in order to find optimum solutions from overall viewpoints. In deciding how to use our coal we need to evaluate carefully its use for the production of liquid and gaseous fuels, its use for the production of electricity, and its need as a petrochemical feedstock by future generations.

Inertia of Energy Systems

In examining the future of any new energy source, engineers need to consider fully the "inertia" of our energy systems. What will the capital requirements be to retrofit new technology into existing buildings, homes, and factories? Answers to the optimum use for new technology cannot be obtained by looking at their cost alone. We need to look at their impact on our total resources — natural, capital, and human — with particular emphasis on our ability to use them in existing structures.

Standards of Risk

We all recognize that uncertainties in the reliability of our future energy supplies are increasing. It will require more of our resources and cost more to provide "insurance" for these uncertainties in the future. We have to determine and agree on acceptable standards for future occasional shortages in all energy supply systems. This will increase the use of probability techniques for analyzing our uncertainties and system characteristics to decide how much redundancy is needed, and what quantity of reserves is justified.

Rewards for Provisions for Contingencies

In order to provide needed motivation, we must devise systems whereby those who have contributed a portion of their current income and wealth to provide for future contingencies are not forced, without adequate compensation, to give these benefits to others who have not so

utility companies to provide for potential uncertainties and shortages. When we have an unexpected gas shortage, those who have provided adequate gas supply and adequate gas storage are forced to share it with those who have not. Ditto for oil shortages.

While recognizing the importance of the welfare of the overall region or nation during times of shortages, a mechanism must be developed for compensating those who, at their own expense, have provided the reserves that are used by the entire region in these emergencies. It is essential that those who use the reserves of others pay more than their costs. This is necessary because there will be many occasions when costs are incurred to provide reserves which are not used. In the long run, such a pricing arrangement should lead to much greater incentives for private enterprise, by its own free choice, to provide for uncertainties in the future.

Possible Solutions

In conclusion, I would like to provide a few specific suggestions for solution of our energy problems:

Global perspective. We need to recognize the international and interregional interdependence that exists. The mentality of self-sufficiency is no longer tenable. Our world problem is not so much the shortage of resources, but the inadequacy of the system that manages and distributes them.

Pricing in proportion to incremental costs. The proper price signals must be given to the general public. In general, prices should be *proportional* to long-range incremental costs, including depreciation charges based on replacement costs.

Increase energy efficiency at utilization points. Significantly increased attention should be placed on improving energy efficiency at utilization points. Significant additional capital expenditures are justified to improve efficiencies, to reduce losses, and to use heat that is presently wasted.

Technical jury of peers. The professional societies should establish panels from which juries of peers may be selected by the courts and regulatory agencies for reviewing and making decisions on complex technical matters. We need to work vigorously to set up new democratic processes in which peers are used as judges for complex technical issues. Only those with the technical expertise required can render the fair and impartial evaluations on such issues. Certified public accountants should judge accounting questions; lawyers, legal questions; engineers and scientists, technical questions; and economists, economic questions. In cases where disagreements extend across several of the professions, a panel including the proper expertise from each profession should be involved in the assessment procedure.

Industry, government, and university consortiums. The adversary positions frequently taken between industry,

terest. We must attempt to develop improved working arrangements between the three principal branches of our society so they may work together in areas in which they have common objectives.

Use existing organizations. The organizations that presently exist in our society provide effective teams for use in solving our problems. Whenever possible, we should try to make use of our existing institutional arrangements rather than establish new ones which can only function by robbing the existing organizations and

resources are scarce and we can usually make the best use of them by not destroying the organizations in which they presently perform.

Improve communications. We in the professions and management must become personally and regularly involved in communicating with the public. Personal appearances before religious and youth groups will be particularly valuable. We should work with the media representatives, and in many more cases we should work for newspapers, magazines, and television on a part-time basis. ■

UNCSTD 1979: TECHNOLOGY FOR THE LESS DEVELOPED COUNTRIES

Audrey R. Bickel and Neil D. Pundit

[ABSTRACT:

The exchange of technical knowledge (otherwise known as technology transfer) among the nations of the world has created both benefits and problems for the partners involved in the process. Questions arise regarding what and how much information should be disseminated to a developing Third World nation and the effects upon the political, economic, and national position of both countries involved in the transfer. The 1979 United Nations Conference on Science and Technology for Development (UNCSTD) will attempt to provide a forum for the scientific and technical leaders of the world to interact with academia, government, and industry. The engineering profession will lend its support to this endeavor via its established organizations. This paper is a brief summary of the activities surrounding the Conference and the role that engineers will play.]

In November 1976, before a National Meeting on Science, Technology, and Development, then Secretary-of-State Henry Kissinger delivered the following statement:

"I have believed for a considerable time that this country representing the most advanced technology in the world, must be able to make a contribution to what is, after all, the principal way in which development will take place; namely the development of technology around the world."

Dr. Kissinger proceeded to enumerate the plans the United States has made to disseminate technological information among less developed countries (LDCs). They include an inventory of U.S. national information sources and improved access to U.S. facilities; establishment of an International Energy Institute and an International Industrialization Institute; and U.S. support of the United Nations Conference on Science and Technology for Development (UNCSTD), to be held in Vienna in 1979. The motivation behind these plans is the ever-growing importance of technology transfer—the exchange of technological knowledge from an advanced country to an LDC. There are many controversial elements imbedded in this exchange of technology because of its long- and short-term impact upon both the private and public

sectors of nations. This article will provide an overview of some aspects of technology transfer and the role the United Nations Conference on Science and Technology for Development (UNCSTD) will play in encouraging more such transactions in view of the life needs of the world's population.

The initial work for UNCSTD was spearheaded by the creation last year of the Office of the Coordinator of U.S. Preparations. Ambassador Jean Wilkowski and Father Theodore Hesburgh were appointed Coordinator and Chairman of the U.S. Delegation, respectively. Preparatory activities for the Conference have consisted chiefly of meetings with the private sector, the drafting of national policy papers, and testimony before the Senate Subcommittee on Science, Technology, and Space in December 1977.

The main theme of UNCSTD will be technology transfer. The Conference will examine how science and technology can be more fully utilized to ensure the optimal evolution of human knowledge and skills in order to improve the quality of life throughout the world. Some areas the participants will explore are the growth of research and development programs in LDCs according to national needs and interests; methods to facilitate the exchange of information; and the creation of scientific and technological institutions that would facilitate the discovery of new techniques and the utilization of both new and established techniques. Another aim of the Conference will be to enable these LDCs to reduce their dependency on other nations and increase their own productivity. Besides contributing to international welfare, the United States has much to gain from this conference in terms of national, political and economic interests: Nationally, to enhance the U.S. role as world leader; politically, to remove elements of mistrust from international relations; and economically, to open new avenues of trade and revenues for the U.S.

Many governmental agencies have offered their support and services to the Coordinator's office. Universities and professional organizations have been asked to hold preparatory meetings to generate vital input for the Conference. The U.S. National Policy Paper was finalized in May, 1978. Background reports submitted to the Coordinator concentrated on the work of five topical panels: Health, Population and Nutrition; Energy, Resources and the Environment; Employment, Trade and Industrialization; Food, Climate, Soil, and Water; and Urbanization, Transporta-

[Audrey Bickel is Administrator for External Interface at IEEE. Dr. Pundit is IEEE Director of Technical Activities.]

throughout the country to provide a forum for discussing what the U.S. role should be in the development of the technologies of the Third World.

A recent article in *Fortune* Magazine (May 22, 1978) discusses the problems the United States faces in connection with technology transfer to foreign nations. The U.S. took in \$2.95 billion in fees and royalties from transfers in 1977, compared to \$666 million in 1965. However, the private sector is not too pleased with the long term results of the efforts at cooperation. What has happened is that the foreign businesses utilizing technology acquired from the U.S. have begun to successfully compete with our products in world markets and are overtaking our leadership position in these fields. For example, the article cites the fact that the United States had always been in the forefront in the area of semiconductor electronics. However, now we have become a great importer of electronic and communication equipment which has been produced via previous U.S. technology transfers to foreign nations. U.S. businessmen do have cause for concern. Technology transfer is a prime example of the problems inherent in the relationship between the private and public sectors of this country. It is precisely for this reason that the United States has decided to play such an active part in the forthcoming United Nations Conference. In this manner, government and business can negotiate suitable means for the transfer of technology to a foreign country.

The U.S. Senate Subcommittee on Science, Technology, and Space has been hearing testimony from concerned citizens who wish to provide input for the formulation of the U.S. stance at the 1979 Conference. The statements presented contain a number of possible solutions to the problem of preventing an overflow of technical knowledge to foreign countries while at the same time aiding in the development of the LDCs. Two excellent examples of testimony presented to the Senate are that of Paxton T. Dunn of the U.S. Council of the International Chamber of Commerce (in conjunction with Harvey W. Wallender, III, of the Council of the Americas) and Bruno Weinschel, IEEE Vice President for Professional Activities. All three view the Conference as a vital opportunity for the U.S. public and private sectors to develop innovative programs to promote the international transfer of technology as well as to attempt to control any unstable situations, such as a brain-drain of technological expertise from one nation to another. Dunn and Wallender maintain that UNCTSD would promote better understanding between the private and public sectors of the existing technology transfer infrastructure and would identify realistic programs to serve the needs to the LDCs. At the same time, the LDCs can be encouraged to accept the responsibility for modifying their environment by gathering the best scientific and technical minds in their respective countries. Weinschel advocates greater government support for R&D via "funding of long-range mission-oriented research, and by tax policies directed toward the encouragement of private sector support." Dunn, Wallender, and Weinschel all maintain that the technological leader is often exposed to considerable financial risk and should be eligible for some monetary compensation if the intended transfer plan does not work out satisfactorily. There is a great need for incentives to continue the flow of technical knowledge among the advanced nations, and U.S. policy should be directed towards meeting this need. In addition, such a policy should strive to create a better understanding of the technology infrastructure and the effects of technology on the environment.

There have been a number of conferences planned in preparation for the 1979 UNCTSD. Their basic purpose is to serve as

One such conference is being sponsored by the Federation of Material Societies (FMS) and will take place in Brazil in November 1978. Its organizers say that it will concentrate on materials technology for development and that workshops will investigate the topics of materials research, education, and application. The fields of interest include application of materials technology to the development process, with particular attention to energy considerations and environmental impact. Great emphasis is being placed on the technical sessions involving government, industry, and academic representatives from the Americas.

While the FMS Conference is taking place in Brazil, India will be hosting the International Forum on Appropriate Industrial Technology, organized by the United States Industrial Development Organization (UNIDO). The World Federation of Engineering Organizations (WFEO) is playing an active role in all these events to encourage the development of better relations with the Third World via technology transfer. One example of WFEO's interest in this field is its creation of a special entity, the WFEO Committee for the Transfer of Appropriate Technology, which will have direct input into the International Forum in New Delhi.

The WFEO has also given responsibility to Rogers B. Finch (Executive Director and Secretary of the American Society of Mechanical Engineers, and the Engineers Joint Council representative to the U.S. Coordinator's Delegation) to present the European Regional Paper at a WFEO Executive Committee meeting in Moscow. At this time, the WFEO will coordinate its efforts in the production of a final paper for presentation at the 1979 Conference. Finch's paper concentrates on a plan to allow the WFEO to work with LDCs towards the "accelerated mobilization of engineering for development." Basic goals include the education and training of engineers; greater emphasis on the exchange of technical information; and encouragement of liaison between the engineers of industrialized countries and developing countries. At the heart of Finch's thesis is a call for the creation of national and international associations of engineers in the developing nations; the resulting flow of technical knowledge from one association to another would be an effective and viable method of technology transfer.

In conclusion, there have been many theoretical solutions presented since the 1979 Conference was announced some years ago. How realistic these solutions—and the methods they implement—are will not be demonstrated at the event in Vienna but in the days following the endless stream of workshops, forums, and speeches. If the amount of energy put into the preparatory activities is any indication, then the future appears excellent for a productive relationship between the industrialized nations and the countries in need of further development.

REFERENCES

- [1] Benson, Lucy Wilson, Theodore Hesburgh, Jean Wilkowski. "United Nations Conference on Science and Technology for Development." Statement presented before the Subcommittee on Science, Technology and Space of the Senate Committee on Commerce, Science and Transportation. December 15, 1977.
- [2] Dunn, Paxton T. and Harvey W. Wallender III. "United States Private Sector and Preparations for the United Nations Conference on Science, Technology and Development." Statement presented to the Subcommittee on Science, Technology and Space of the Senate Committee on Commerce, Science and Transportation.

Technology Development." Paper presented to the WFEO Conference in Moscow, June, 1978. Available from the American Society of Mechanical Engineers, 345 East 47th Street, New York, N.Y. 10017.

- [4] Meyer, Herbert. "Those Worrisome Technology Exports." *Fortune*, May 22, 1978, pp. 106-109.

on behalf of The Task Force on U.S. Innovation in Electro-Technology of the U.S. Activities Board, Institute of Electrical and Electronics Engineers, Inc. The Senate Subcommittees on: Science, Technology and Space; and International Finance Concerning U.S. High Technology—Impacts on U.S. Policy Affecting World Markets." Presented May 16, 1978. Available from IEEE Washington Headquarters, 2029 K Street N. W., Washington, DC 20006. ■

SALT II: THE TREATY WE CAN'T DO WITHOUT

Coalition for a New Foreign and Military Policy

"SALT does not depend on Soviet good faith. It depends on effective unilateral verification, the ability to detect any potential violator, and the fundamental national interest of both sides in full compliance."

—Senator Edward M. Kennedy

The bargaining process has been slow, but now American and Soviet negotiators are closing in on a new SALT agreement. When their work is finished, the new treaty will be presented to the United States Senate for ratification or rejection. With a large bloc of Senators as yet undecided, ratification will depend on the efforts of treaty supporters.

How would the new treaty benefit the United States? Why would the Soviets be willing to sign it? How do we know they wouldn't cheat? As Senator Kennedy states, the answers lie in the strong interests which both nations have in controlling the nuclear arms race.

COMMON DANGERS

Nuclear weapons have made the notions of "victor" and "vanquished" obsolete. If nuclear weapons were actually used in some future war, the resulting destruction would make everyone a loser. It is in the self-interest of every nation on earth to prevent the outbreak of nuclear war.

Yet the two major nuclear nations continue to engage in a dangerous military competition. Driven by a mixture of fear, bureaucratic momentum, and the desire for international clout, the United States and the Soviet Union have accumulated massive arsenals of nuclear weapons. Each side now has the capability to

destroy the other many times over, although neither side could use that capability without undergoing immense destruction itself.

In spite of the overkill factor, both countries continue to develop new, more sophisticated weapons. This adds to the danger of war in two ways. First, more accurate weapons now under development are designed to destroy the other side's missile silos rather than its population centers. This seems humane, but the effect would be to undermine each side's ability to strike back in the event of attack—an ability which is at the heart of deterrence. By giving a theoretical advantage to the side that strikes first, these weapons could transform what now appears to be a stable balance of power into a nuclear nightmare. A political confrontation or a single accidental launch could trigger World War III.

Second, each side's temptation to "push the button" depends partly on whether it thinks the other side is ready to do the same. Continued weapons building activity reinforces exaggerated notions of the other side's aggressiveness and contributes to each side's willingness, especially during a crisis, to strike first in order not to be struck.

The Soviet-American arms race increases the likelihood of nuclear war in another way as well. Nuclear weapons stock-piling by the two superpowers encourages other, small nations to get a bomb of their own, as a way of achieving greater power and status in the world. The United States, the Soviet Union, Great Britain, France and China have the bomb. India has exploded a nuclear "device." The CIA believes Israel has an untested stockpile of atomic bombs. In 1977, South Africa was allegedly persuaded to hold off on its first nuclear test. By the end of this century, 25-30 more countries could join the nuclear club. Some of them—such as Pakistan or Taiwan—are entangled in simmering regional con-

[Reprinted with permission of the COALITION FOR A NEW FOREIGN AND MILITARY POLICY. The principal author of the article is Paul Bennett, who is currently an arms control specialist with the Union of Concerned Scientists. The COALITION FOR A NEW FOREIGN AND MILITARY POLICY coordinates the efforts of nearly 40 independent national organizations to promote a peaceful, non-interventionist U.S. foreign policy. These member organizations include: American Friends Service Committee; Americans for Democratic Action; Clergy and Laity Concerned; International Longshoremen's and Warehousemen's Union; National Council of Churches; SANE; and Women Strike for Peace. The Coalition works to pass legislation to protect human rights, reduce military spending, promote arms control and disarmament, support majority rule in southern Africa, and "resolve the unfinished business of the Indochina

War." The Coalition's Disarmament Working Group meets regularly in Washington, and it has specialized subcommittees working on nuclear disarmament, multilateral approaches to disarmament, re-conversion of the armaments industry, and international arms transfers. For further information, contact Bob DeGrasse, Coalition for a New Foreign and Military Policy, 120 Maryland Ave. N.E., Washington, DC 20002; phone (202) 546-8400.

Although the outline of the SALT II treaty was made public in late 1977, the specific details have remained in a state of flux throughout the negotiations. TECHNOLOGY AND SOCIETY invites comments from readers for publication and will publish more commentary on the proposed treaty when the final text is made public. —Ed.]

the Soviet Union could easily be drawn in. In addition, if more countries acquire the bomb, it will be easier for terrorists to steal one, which they would detonate if their demands were not met.

Even if nuclear war and terrorism can be avoided, the arms race may destroy by a different means. Today, the United States and the Soviet Union face many threats, including dwindling energy supplies, environmental pollution, and economic weakness. Weapons production consumes the money and brainpower which is needed to confront these other problems. The United States and the Soviet Union together spend over \$200 billion each year for military forces and that figure is constantly rising. Even a fraction of this amount could significantly improve living standards in both countries, if spent in areas such as education and health care.

Military spending throws a double whammy at the U.S. economy. It contributes to *inflation*—military programs give industry and employees more purchasing power without creating any new goods or services for them to buy. When demand increases while supply stays the same, prices go up.

Military spending also contributes to *unemployment*. Defense contracts are poor job-creators because most of the money is used to buy a lot of expensive equipment and to fund a relatively small number of highly-paid technical positions, rather than to create large numbers of jobs. The same money spent on civilian programs or released to individuals through tax cuts would produce more jobs, up to 50,000 more per billion dollars spent.

The Soviet economy also suffers under the burden of arms spending. The Soviets have many problems of economic development and they lag behind other nations in advanced technology. Military programs soak up the resources that could address these problems.

SALT is not a win-lose proposition. A new agreement would reduce the chances of war, restrain the spread of nuclear weapons, and prevent more resources from being squandered on arms. That would increase the national security and prosperity of *both* the United States and the Soviet Union.

Since the Soviet Union stands to gain from SALT, it would not want to jeopardize a SALT II treaty by cheating. In any case, the United States has the ability (through spy satellites and other intelligence means) to detect any significant violations. Since the ratification of SALT I, the U.S. has brought up a number of questionable Soviet activities before the Standing Consultative Commission, a body especially created to handle compliance issues. In every case, the Soviets either stopped the activity or demonstrated to our satisfaction that it was within the bounds of the agreement. We did the same in response to Soviet questions concerning some of our activities.

THE NEW AGREEMENT

The SALT II Treaty, which would run through 1985, would provide new, more substantial and comprehensive restrictions to take up where SALT I left off. Actually, part of the 1972 SALT I accord remains in effect today—the ABM Treaty banning “antiballistic missile systems” (defensive missile systems). The treaty halted what would have been a dangerous and expensive leap in the arms race. However, the other part of SALT I—an interim agreement freezing the numbers of offensive missiles—technically expired in October, 1977. Both sides have agreed to continue observing its provisions in anticipation of a new agreement.

SALT II would include two kinds of limits. First, neither side would be allowed to keep weapons in excess of specific numerical ceilings and sub-ceilings. Second, the agreement would place

vanced weaponry.

A number of points are still under negotiation, but agreement has been reached on major elements. The treaty would limit each side to a total of 2250 missiles and bombers. The Soviet Union would have to scrap several hundred older weapons in order to comply, while the U.S. could just nose under the ceiling with its current total.

The treaty includes sub-ceilings covering how many missiles out of the 2250 total could be equipped with multiple warheads (a more “advanced” arrangement than 1 warhead/missile) and how many bombers could carry cruise missiles (small, superaccurate missiles that fly like airplanes).

The race to produce more-technologically-sophisticated weapons would temporarily be held in check by a Protocol accompanying the treaty. Mobile missiles would be banned by the Protocol and the testing and introduction of other new (more accurate) missiles would be limited. Restrictions would be placed on the ranges of the various types cruise missiles. The Protocol would run through September, 1980.

The SALT II package also includes a Statement of Principles, which would serve as guidelines for the SALT III negotiations. The Statement is expected to call for even lower ceilings on the numbers of weapons as well as tighter restrictions on the development of new weapons technology.

What would SALT II accomplish? It would prevent sizable increases in the numbers of missiles and bombers on each side. It would require, for the first time ever, disarmament of existing weaponry (the Soviet arsenal now exceeds the overall ceiling). It would set important precedents for restricting the introduction of more accurate (therefore dangerous) missiles, and would buy time to negotiate more permanent restrictions on new technology. The very existence of an agreement would help to calm fears about each side's desire to avoid nuclear war. This would dramatically reduce the danger of either side launching an attack, even during a crisis. The agreement would demonstrate to nations that could “go nuclear” that the two superpowers are limiting their nuclear build-ups. And it would reduce expected increases in military spending. The Senate Budget Committee has estimated that the United States could save up to \$100 billion over what might be spent in the next 15 years if there were no agreement.

Ratification could also spur progress in other arms control negotiations (comprehensive test ban, prohibition of chemical warfare, force reductions in Europe) and help maintain the attractiveness of existing treaties (Limited Test Ban Treaty, Outer Space Treaty, ABM Treaty, and others). It would begin the process of controlling weapons that would threaten each side's ability to verify compliance with any arms agreement. These are cruise missiles, which are small enough to be hidden from the view of American or Soviet spy satellites, and mobile missiles, whose underground tunnels could secretly contain extra weapons.

In spite of these advantages, we should realize that SALT II would not actually stop or reverse the arms race—it would only slow it. Yet the new agreement would continue a process that could result in real arms reductions. Its Statement of Principles is a built-in bridge to SALT III, which hopefully would require disarmament of hundreds of missiles and bombers by both sides and place more stringent restrictions on the testing and introduction of new weapons systems. All the advantages of SALT II—reducing the danger of nuclear war, controlling the spread of nuclear weapons, and freeing resources needed for pressing problems—would be achieved to a much greater degree by a good

SALT III agreement. SALT II is the essential step toward that goal.

Progress in the SALT process is not automatic. If the SALT II Protocol expires and no new restrictions have been negotiated, the United States *could* go full-speed ahead with the introduction of its M-X mobile missile and all varieties of cruise missiles. The Soviets could proceed with the introduction of mobile missiles, other new land-based missiles, and the development of their own cruise missile. These programs would make it more difficult to negotiate SALT III and could sabotage the disarmament potential of that future agreement.

Our security therefore depends on mutual self-restraint in the introduction of new weapons. When we produce a new weapon, the Soviets eventually get the same thing (usually they master the necessary technology about five years after we do). Then we haggle over restrictions. Sometimes the weapon was supposed to be bargained away in the first place and never actually built. The United States should stop producing new weapons that propel the Soviets to do likewise. Such restraint is a prerequisite to the actual disarmament of existing weaponry below SALT II levels. The Soviets should be encouraged to reciprocate our restraint.

The ratification decision on SALT II will come at an exceedingly crucial time. Even as the Senate begins its debate, development work on dangerous new weapons technology will be moving closer to completion. The world will be on the verge of an acceleration in the spread of nuclear weapons. The SALT II decision will present what may be our final choice between the alternative paths of arms build-ups and survival.

WHAT CITIZENS SHOULD DO

The SALT negotiating table is in Geneva. But under the American system, the final decision on any treaty is made in Washington, D.C. Two-thirds of the United States Senate must vote in favor of ratification before a treaty can take effect.

That means the American people will be directly involved in the fate of SALT II. Senators will look to public opinion as a major consideration in deciding how they will vote. Citizen actions that

express and shape public opinion can make the difference in the outcome.

Witness what happened with the Panama Canal Treaties. Newspaper articles, editorials and actual radio broadcasts of the Senate floor debate informed the public on the issue. Individual Americans responded with "Letters to the Editor" and letters to their Senators. If a Senator sees pro-treaty mail and newspaper clippings pile up on his desk, his concern for re-election disposes him to cast a "yea" vote.

The anti-SALT forces in the country are well aware of how this political process works and they have mounted a campaign to sway the public against the new treaty.

We suggest that citizens who support SALT write a minimum of two letters to their Senators and two to their local newspapers. The first set of letters can be sent immediately, even before final details of the treaty are worked out. These letters should describe the dangers (including non-military threats) of arms expansion and the general need for arms control. They should stress that the way to achieve security in the nuclear age is not to build more missiles and bombers, but to participate in arms agreements, take independent initiatives to halt the arms race, and establish a new and more cooperative foreign policy that can deal with nations' common problems. Senators should be specifically asked: What is the best way to assure the security of our country and its people—arms competition or arms reduction? Read their response and write again if necessary.

The second set of letters should be sent after the SALT II negotiations have been concluded and all of the provisions of the finished treaty have been made public. These letters should offer specific support for the treaty. They should emphasize how the United States would benefit from SALT II as well as why the Soviet Union has a self-interest in complying fully. Senators should be urged to support the treaty and asked how they plan to vote.

SALT II is already a hot issue and the vote is likely to be very close. The citizen actions described here can enable us to, as President Carter put it, move a step toward the ultimate goal of eliminating all nuclear weapons from the earth. ■

We on the editorial staff of TECHNOLOGY AND SOCIETY would like to solicit from our readers contributions of articles, items of news, reviews of books, and correspondence on issues relating to our interests. Topics of interest include, but are not limited to, bioelectronics and medical technology, effect of automation of life and work, issues related to energy and the environment, responsibility of engineers for defective products, engineering ethics, engineering education for ethical and responsible conduct, information technology and privacy, weapons development and the arms race, and the application of systems engineering to societal problems. Your comments and suggestions for improving TECHNOLOGY AND SOCIETY would also be appreciated.

Engineering Foundation FELLOWSHIPS; proposal deadline June 1, 1979

The Engineering Foundation announces the availability of ENGINEERING FOUNDATION FELLOWSHIPS during 1980 for state-of-the-art reviews in fields recommended by its FOUNDER SOCIETIES. The fellowships are sponsored by the Engineering Foundation with the cooperation of its five founder societies—ASCE, AIMMPE, ASME, IEEE, and AIChE. The program is directed toward members of engineering faculties and industrial specialists who have established a professional reputation through publications. A grant of \$5,500 will be awarded on a competitive basis to a member of each of the founder societies for a proposed RESEARCH REVIEW in a field of direct interest to his founder society. The research review shall provide an analysis in depth of a specific field including recommendations on engineering research needed to advance the state of the art in that field.

PROPOSALS from IEEE members should be submitted to:

Technical Activities Department

IEEE

345 East 47th Street

New York, NY 10017

AND MUST BE POSTMARKED BY JUNE 1, 1979. Instructions for preparing a proposal and a list of recommended fields for IEEE members are available upon request from the IEEE Technical Activities Department.

Selected fellows will be notified on or about January 1, 1980. The fellowships will be effective as of February 1, 1980. A final report shall be submitted to the Engineering Foundation and to the founder society by each fellow for publication. The Engineering Foundation reserves publication rights. The Engineering Foundation will disburse 50 percent of the grant at the start of the fellowship and 50 percent at the end of the fellowship when the final report is presented. For further information, please contact Dr. Neil D. Pundit, IEEE Director of Technical Activities at (212) 644-7890.

ELECTRO 79, NYC.

A panel discussion likely to be of interest to readers of TECHNOLOGY AND SOCIETY is on the program of Electro '79. Entitled "The Engineer and Public Policy: Servant, Guardian, Gadfly?" the session will be chaired by the Chairman of the IEEE Member Conduct Committee, James F. Fairman.

Virginia Edgerton, who recently set an example of responsible professional behavior (see T&S issue No. 22), will uphold "The Right of Technical Challenge," the view that engineers must be able to challenge managerial decisions that they consider may endanger the public. Dr. Robert Baum will point out the necessity for engineers to convey to the public an understanding of the implications of alternative technological choices.

A narrower view of engineering responsibility, that of "The Engineer—The Problem Solver," will be espoused by Mr. Samuel C. Florman, while the corporation point of view will be put forward by Mr. Eric Weiss of The Sun Company.

The session will be on Tuesday, April 24, in the La Loire Room, 2 & 3.

CSIT Meeting, April 24, 1979

The next meeting of CSIT will be held at Electro '79 on Tuesday, April 24, 10 am to 12 noon at the Sheraton Center Hotel (formerly Hotel Americana), 53rd Street and 7th Avenue, New York City. CSIT meetings are open to all IEEE members, and we cordially invite you to drop in if you're in the neighborhood.

The session will be on Tuesday, April 24, in the La Loire Room, 2 & 3.

TO OUR READERS

As we said in our last two issues, the editorial staff has been hard at work clearing up the backlog from 1978 and trying to get TECHNOLOGY AND SOCIETY back on schedule. This issue is the delayed December 1978 issue. 1979 issues of T&S will come out at approximately two-month intervals until we catch up with our quarterly schedule.

With this issue, the editorship of TECHNOLOGY AND SOCIETY changes hands. All items for publication should be sent to the new editor:

Norman Balabanian

E&CE Dept.

111 Link Hall

Syracuse University

Syracuse, NY 13210

We call your attention to the subscription coupon on page 15 and urge any of you who have not subscribed for 1979 to do so now by mailing the coupon. Also please use the coupon to notify us of any 1978 issues of T&S you failed to receive so that we may mail you another copy. Please accept our apologies again for the delay.

OOPS, WRONG COUPON

If the subscription coupon that appeared in Issue Number 22 of TECHNOLOGY AND SOCIETY (the delayed June 1978 issue) seemed confusing, there's a logical explanation: We put in the wrong coupon; it's a copy of a coupon from an old issue of T&S and is no longer valid. We apologize for the goof, and we apologize especially to those readers who have sent in the coupon. This coupon cannot be processed, because, among other things, it doesn't provide for payment of the \$2 subscription fee.

If you renewed your subscription to T&S when you paid your 1979 IEEE membership dues, or have sent in \$2 subsequent to it, then you will continue to receive T&S in 1979, and sending in the coupon will have been superfluous.

If you canceled your 1979 subscription to T&S, then your subscription will remain canceled unless you send in a valid subscription coupon and the \$2 subscription fee. A correct coupon appears on page 15 of this issue, as well as in the September 1978 issue of T&S. You will receive all four 1979 issues of T&S, if you subscribe before July 1, 1979.

If you have any further questions, problems, or complaints concerning your subscription, please contact Frank Kotasek, Jr.; 73 Hedges Ave., East Patchogue, NY 11772; (516) 475-1330.

TO RECEIVE TECHNOLOGY AND SOCIETY

If you already renewed your 1979 subscription to TECHNOLOGY AND SOCIETY, we thank you. If not, but you wish to continue receiving this publication, or start a new subscription, please fill out this coupon and return, together with \$2.00, to the following address: Please make payment in check to IEEE.

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If you were a subscriber to TECHNOLOGY AND SOCIETY in 1978, but you failed to receive either the June '78 issue (issue No. 22) or the September '78 issue, please check the appropriate box(es) below, and we will mail you another copy while supplies last. (We have run out of copies of the March '78 issue.)

I did not receive:

☐ Issue No. 22 (June 1978)

☐ September 1978

LETTERS

Dear Editor,

I am writing this letter to express my strong admiration of the courageous stand taken by Ms. Virginia Edgerton. Her adhering to the IEEE Code of Ethics, which caused her to lose her job with the City of New York as well as jeopardizing her career, is something which should not go unnoticed. I think that the IEEE should bring the entire facts of this situation before its members.

I would like to add that all engineers should be proud of Ms. Edgerton, who has set a great example for all of us.

Yours truly,
Naresh K. Sinha
Professor of Electrical Engineering
McMaster University
Hamilton, Ont., Canada

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