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COMMITTEE on SOCIAL IMPLICATIONS of TECHNOLOGY

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WHITHER INTERCON?

Perhaps a more accurate title would be "Wither INTERCON!" The boom years of the sixties left IEEE ill-prepared to cope with the harsher economics and changing attitudes of the seventies. This fact is manifest in the plan for INTERCON'74 and in the report of an Ad Hoc Committee of the IEEE Conference Board entitled "Long Range Plans for INTERCON" (May 7, 1973). The Ad Hoc Committee, chaired by F. H. Blecher, comprised C. J. Baldwin, F. J. Van Veen, and J. A. A. Raper (Technical Program Chairman for INTERCONs '73 and '74).

During the sixties the IEEE Annual Convention evolved into an exhibit-oriented technical meeting. The fact that it was also the only annual meeting of the world's largest engineering society seemed secondary. Success was measured in financial terms. The money crunch of the seventies has knocked a number of exhibit-oriented technical meetings into a cocked hat. WEMA has withdrawn from WESCON. AFIPS is now conducting one national computer conference, rather than two.

Blecher's report recommends merging NEREM and INTERCON. These contractions do make sense. What I question is the report's assumption that INTERCON's measure of success remain the same, i.e., exhibit attendance and profit, politely known as "surplus" in IEEE's tax-consciousness. This assumption has led to the notion that the Technical Program should become a prop for the exhibits. Since INTERCON is IEEE's annual meeting, it should fulfill a variety of purposes appealing to the broad interests of the membership. With the Constitutional change those interests have become more diverse. Blecher's report ignores this, except where it suggests that the Technical Program should include "sessions that emphasize the social-economic impact of technology." The Call for Papers of INTERCON '74 makes no mention of such sessions.

INTERCON should bring together a cross-section of IEEE membership, its officers, and IEEE activists. A persistent malaise of all large organizations is that the leadership is out of touch with the members. An exhibit-oriented annual meeting will not help bridge that gap.

I am not suggesting that the exhibits be dropped or that no sessions should deal with their content. What I am suggesting is that INTERCON should serve a broader purpose than the Blecher Report recognizes, whether through the Technical Program or through other aspects of the conference. An ambitious program and financial success are compatible, as illustrated by the recent NCC (National Computer Conference): a $200,000 profit and 103 (count 'em) sessions.*

I trust that by the time INTERCON '74 rolls around the overall program will be more diverse than it now seems, that CSIT, the Environmental Quality Committee and the USAC subcommittees will be recognized participants. If not, I would take it as a sign that IEEE does not intend to become a membership organization.

* See "1973 National Computer Conference," reviewed in this issue.

A. D. ROBBI

IN THIS ISSUE

Letters

DEAR EDITOR:

I have just read the extremely timely, appropriate and thought-provoking comments on cable communications by Dr. Norman Balabanian in the Issue No. 2 (March 1973) of your Newsletter. Dr. Balabanian ought to be congratulated on such a clear expose.

How-so-ever unjustly, one big stick that has been wielded against the scientists and engineers in the environmental debate is that this group of people has been remiss in their duties by not making the public aware of the likely impact of their technological developments. Among its laudable objectives, one objective of CSIT seems to be (or should be) to remedy this situation. Dr. Balabanian's comments go a long way in that direction. In view of this I suggest that CSIT make efforts to give these comments the widest possible coverage in both technical and popular press instead of being confined to the CSIT Newsletter.

I would also suggest that similar types of clear and concise though-provoking articles be prepared on other topical subjects. Some topics that immediately come to mind are: computers, advertising industry (sic), so called labour saving (status symbol) but energy consuming fanciful gadgets vis-a-vis energy shortage.

Yours truly,
O. P. Malik
Calgary, Alberta
Canada

DEAR EDITOR:

I write to applaud what I have seen thus far of the workings of CSIT, from your Newsletter and copies of meeting minutes provided me by SMCS liaison Stanley Shinners.

It is clear that as professionals engineers have been reluctant to confront value problems as part of doing applied science. How often have we heard that the profession must "remain aloof from politics". Such an assertion is clearly blatant nonsense, assuming politics is the art of how a people govern themselves, and that the process of communication within a society of professionals can assume standards of intellectual honesty and fairness.

Problems of long term survivability vs. short term technological fix, of militarism as a viable means of foreign policy, of distribution of wealth, whether and in what ways increased communication and mobility are beneficial, and of faith in technology as a substitute for traditional religion seem not only legitimate topics of dialog within the engineering profession--in a sense they are the only long term engineering problems.

CSIT raises an institutional problem for us. It provides a rallying point and forum for issues of concern to all the components of IEEE. From another viewpoint it suggests that the other societies and groups are uninterested or too uptight to foster open expression and make creative use of value conflict.

Speaking for myself, not for SMC, I have hoped for sometime that more of the spirit of your March '73 forum could pervade SMC sessions. Of course we claim to have now and have had some such spirit in the past. The "man" (person?!) is there intentionally, and not as just another machine.

I would invite CSIT to help us, to constructively criticize us, to conventure with us in these crucial problem areas.

Sincerely,
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Regional associate editors and book reviewers are being sought--interested parties please contact the editor.■

Human Communications

by Jerome B. Wiesner
President, Massachusetts Institute of Technology

(Editor's note: The following is the text of an address presented at the International Communications Association Conference on May 14, 1973. Reprinted with permission of author.)

I am very pleased to have this opportunity to behave like a communications engineer again, if only for a short time as I help you open this International Communications Association Conference.

Ours is a creative and dynamic industry and it would be very easy for me to spend the short time available this morning pointing with pride to our accomplishments; to our growth, to the great technical advances that have been made during the year since your last meeting as exemplified by the improvements in international communications, and to the many exciting developments that clearly lie ahead on which you will be able to spend your money.

But those very advances, and others on the horizon, are intimately related to serious questions that are being raised by people all over the world about the impact of technology on society, which they fear is continuously eroding the freedom of individuals. The communications industry obviously has some responsibility here, and this morning I would like to try to address some of these ideas.

One only has to recall the color television pictures from Peking that we saw last summer or realize that there are now several ocean-spanning, real-time data networks in daily operation to realize the current rate of progress, or at least, change. Furthermore, the advances in the power of mini-computers, making them useful for a variety of data processing chores, the availability of large-scale integration for the creation of complex circuitry, the development communications satellites for internal use, light pipes capable of carrying thousands of megacycles of bandwidth, and many new data handling devices make it obvious that the potential for vast expansion in telecommunications capacity remains wide open, that more change is coming. In fact, I believe that in spite of our impressive accomplishments we have just begun to realize the potential of electronic communications.

In every field of application -- entertainment, providing information for the individual citizen, communicating for business purposes, or providing effective management of our society at the local, national and international level -- the opportunities for improved telecommunication services abound.

Some of these opportunities are obvious, as those provided by cable video systems, video cassette systems, satellite systems for data distribution, etc. Devices for some of these applications are less advanced in development -- perhaps not even invented -- and challenge our wildest and best technical imaginations. Here I include the uses of communications systems and computer systems in education, the use of computers and communications devices to improve the delivery of health care and for direct customer information services, electrical communications to replace the mail system for many purposes and ultimately the use of communication facilities as a substitute for that long-distance travel which is undertaken primarily for the purpose of making possible communication between individuals or groups of individuals -- but not, I suppose, as a substitute for ritual meetings such as this where the going and being is much more important than the saying. And most important of all, the use of communications to make the pleasures of city living available in the countryside, and so hopefully reverse the mad rush to the metropolitan areas that is creating impossible living conditions in large cities all over the world.

With such trends it is certain that societies are going to be more, not less dependent upon electrical communications, computers and the many other information processing devices, for their proper functioning. In less than a century, man has moved from a world in which human capabilities, muscle power and brain power, were his primary resources, to a dependence upon machines which multiply his speed and power factors by millions. These devices have totally transformed our world, without anyone consciously deciding on the changes. We invented the process of invention and as a consequence an endless stream of individual creations have brought about an entirely new world, a man-made world, a synthetic world, a rapidly changing world, a world that is sometimes in harmony with nature and man's psychic and spiritual needs, but a world in which parts are frequently very disjointed, and which many individuals believe that it is impossible to understand, control or communicate.

Two aspects of modern technology in particular are the cause for much concern --the pace at which it advances and requires individuals to adapt, and the scale of its impact which frequently seems to be overwhelming. Because of my present job, I am frequently challenged to defend what we call "technological progress" so I have spent a good deal of time trying to understand the questions involved. I should say here that I am convinced that the benefits people in advanced societies have derived from technology far outweigh its negative aspects, which I define as the problems that the widespread uses of technology have generated and their associated costs. It would be impossible to maintain the quality of life we have achieved, much less improve it, without continuing technological developments. Nonetheless, one cannot deny that there are many unsuspected, undesirable, and very dangerous consequences of a rapidly growing technology. Dealing with such matters properly may be the most difficult task we face in the years ahead, second only to managing man himself.

Most of these troubles are the consequence of the large scale use of devices which in their early state present little or no problem. The automobile, fertilizers and pesticides, power-generating station, television, the airplane, computers, maybe even wiretapping devices, all have this characteristic. A particular danger of information technology is that its ready availability puts greater power than ever before available into the hands of both the government and those private interests that have the resources to use it. It threatens to undo that subtle balance achieved in the Constitution between the people and the State which avoids anarchy on the one hand and tyranny on the other. Nowhere is it more true that "knowledge is power". To the degree that the Constitution meant for the power to be in the hands of the "governed", the widespread collection of personal information poses a threat to the Constitution itself. There is also no doubt that technology can be and has been used to assist in the violation of the Bill of Rights. But it must be remembered that the violations are made by humans, not

by machines. To my nonlegal mind, there is even the question of whether the Bill of Rights, drafted in a simpler time, is adequate to protect man in his relation to the modern state and, whether there isn't a need for additional amendments providing protection for the individual against possible new infringements of his liberties by men armed with sophisticated devices.

A short time ago-- only a few decades--neither fertilizers, powergenerating stations, computers, television or data collecting devices were regarded as serious threats to the continued well-being of mankind, for they existed in small numbers. In a very real sense we are the victims of our great success in making the benefits of technology generally available. For a long time hardly anyone was concerned about problems technology was creating and even though most of them were obvious and were studied and talked about by many individuals, general public apathy about the issues made it impossible to do anything about them. The reason is obvious. Not only were the problems tolerable, as already indicated, but they were the result or the consequence of a large number of hard-to-control individual decisions or actions--to buy automobiles, to use fertilizers, to build manufacturing plants that polluted streams, to establish credit-rating systems, to move to the suburbs, etc. Their solutions, on the other hand, require collective action, frequently through legislation and the expenditure of considerable sums of money. Until very recently, activities to counter such social problems were initiated by single individuals or small groups; they were one-man crusades, so to speak.

Today many governmental and private groups are seeking ways of controlling the environmental and social impact of technological creations, but we could hardly claim that the situation is under control. In fact, for the moment the situation has been worsened by the elimination of the White House Office of Science and Technology and the President's Science Advisory Committee, which was the principal governmental agency that tried to cope with the problems of science and society in an organized and continuing fashion. Whatever the reason for their demise, the President's Science Advisory Committee, the Office of Science and Technology, and all of the associated panel mechanisms which existed for dealing with science policy problems and which were slowly learning how to interrelate technology and policy were eliminated during the next-to-the-last reorganization of the White House Staff, leaving a very large vacuum.

At the moment, interest and possible action appear to be shifting to the Congress. During the last session, the House and Senate authorized the establishment of the Office of Technology Assessment (OTA), whose purpose was to review emerging technological developments and to assess their probable impact on the society early enough to avoid repetitions of the major dislocations that we have been trying so hard to correct in recent years. The OTA is not expected to be an operating or a legislative organization, but rather one that provides the relevant committees of the Congress with information which should make it possible for them to do their jobs more effectively. It should also make a vital contribution to the public debates involving science and technology.

Many companies have begun to evince a concern with the social impact of their creations. This may be first of all a recognition of a responsibility to itself, a reflection of a desire to stay in business and hopefully to have some voice regarding the regulations which will control their operations. But there is also a growing recognition of a general corporate responsibility to society. Some companies have formed working groups and/or public responsibility committees associated with their boards of directors for the purpose of dealing with the social problems related to their activities. Some of this concern has no doubt been forced by legislation, as in the case of the anti-pollution work in the automobile industry, but much of it is a result of the growing realization that all members of society must share in the search for solutions to these common and massive problems if these are to be balanced, viable solutions that do not leave a whole new set of problems in their wake.

Industrial associations have also begun to make important contributions to the understanding of these problems and to the search for their solutions. For example, the American Petroleum Insitute has made a thorough study of the energy problem which might serve as a model for efforts by other groups.

My more general remarks about controlling the environmental and social impact of technological creations have an analogue in the communications industry. We have perhaps been somewhat complaisant because we do not have problems such as pollution--at least not in the usual sense--and the resource we use, namely spectrum, is not used up in the normal way. Even though it may get more and more crowded, it can in principle always be recovered. Furthermore, as an industry we have not yet had to contend with the same vigorous public or congressional criticism as have many others. The criticism has so far been reserved largely for users of information technology. Nonetheless, our industry poses the most serious problems that society will be required to face during the decades ahead. I say this because communication technology is introducing profound changes in the way we live, work and interact. And as I have previously indicated, it is changing the relationships between individuals and the organized society in quite fundamental ways--in ways which could make it impossible for citizens of a democracy to retain control of their destiny as individual freedom and liberty, the hallmark of our society, is abandoned for the "common good", defined by a technical system that we have all helped create.

Communications technology has extended our senses over the entire globe as you know better than I do. Through the computer the capabilities of the human mind are being extended, and through the marriage of these two technologies the ability to extend both the range and the tightness of control of organizations is being expanded. It is this aspect of technology that most concern those critics who fear a society increasingly dominated by technique. I believe that this is a very real problem.

The threat has two aspects to it. The first, and perhaps most insidious, is that which arises from reasonable and straightforward applications of new technology which make the whole fabric of society more complex and require that we all live and work within narrowly defined norms for the "system" to work effectively, trading individuality for efficiency in industry, government and school.

The second, more immediate threat comes from the surveillance which modern technology subjects us to. Inter-connected data banks, legal surveillance systems, easily employed and sometimes illicit electronics eaves-dropping devices are so common that many people just assume that their telephones are monitored. This was the state of affairs even before the recent revelations regarding the widespread espionage engaged in by persons close to the President. Even before these recent incidents, testimony before the Constitutional Rights Sub-Committee of the Senate Judiciary Committee, chaired by Senator Ervin, showed widespread improper surveillance of many citizens by agencies of the government. The effect of this has been to intimidate many individuals and make them draw back from perfectly legal

political and social activities. In a real sense these activities threaten the very guarantees of the Bill of Rights.

For several years I have been concerned that improperly exploited computer and communication technology could so markedly restrict the range of individual rights and initiatives as to eliminate meaningful life as we appreciate it. In other words, 1984 could come to pass unnoticed while we applauded our technical achievements. The great danger which must be recognized and counteracted is that such a de-personalizing state of affairs could occur without specific overt decisions, without high-level encouragement or support and totally independent of malicious intent. The greater danger is that we could become "information bound", because each step in the development of an "information tyranny" appeared to be constructive and useful. I used to suspect that it would be much easier to guard against a malicious oppressor than to avoid being slowly but most surely dominated by an information Frankenstein of our own creation. Watergate has demonstrated I was clearly not worried enough about improper uses of technology. Obviously, we must be on guard against both sets of problems. Such capabilities, through data-centralization and manipulation, will increase as our understanding of communications, computation and cognitive processes expand. Yet the means for effective record keeping, information gathering, and data processing are essential needs of a modern society. The problem is to determine how to reap the maximum assistance from modern technology in running a better society and at the same time, how to keep it from dominating us. We may have to adopt some stern measures in the form of very strict controls on who can do what with private information about any individual in the society. Private organizations, industries, universities and professional societies and industrial associations such as this one, must commit themselves to the protection of the democratic society. As a group, we should study the problem and publicize it. We should pledge ourselves to protect individual freedoms, in the face of an exploding information technology, through new technical means, through education and through legal action when necessary. Single companies may find it difficult to cope with these problems; individuals within a company will find it even more difficult but an industrial group should be able to play an important role in this vital effort. Shouldn't you do something about this yourselves?

In my testimony before the Ervin Committee, I made a point I would like to leave with you. There are those who hope that new technology alone can redress these invasions of personal autonomy, existing or prospective, made possible by information technology, but I don't share this hope. It is possible and desirable to provide technical safeguards against unauthorized access to data banks or information transmission systems. It is even conceivable that computers could be programmed to have their memories fade with time and to eliminate specific identity when the information was being processed to provide social profiles, etc. Such safeguards are highly desirable, but the basic safeguards cannot be provided by new inventions. They must be provided by the legislative and legal system of this country, themselves ultimately dependent upon the integrity of men. We must face the need to provide adequate guarantees to individual privacy.

As a society, we should be prepared to accept the cost of considerable inefficiency in our various social and governmental processes to safeguard our privacy and, as I judge it, our freedom, dignity, happiness and self-respect. By costs, I mean both the financial costs and the loss of a degree of control that the state might otherwise have over genuinely threatening individuals--criminals and violent revolutionaries. Our task is to achieve a proper balance between the ability to cope with individual threats to the society and its capability to abridge the freedom and happiness of its members. In countries where the legal system cannot be counted on, the people are at the mercy of the administrators and they must hope that the bureaucracy will be benign. Such a situation smothers freedom. Because I believe that an "information tyranny" poses a very serious threat to the survival of a free society in our country, I urge that we all act vigorously to take whatever steps are necessary to protect the Bill of Rights. ■

The BART Case:
Ethics and the Employed Engineer

Stephen H. Unger
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The Center for Policy Research

Introduction

There has been an upsurge of discussion recently about the status of engineering as a profession, the obligations of the engineer toward the public, and the relationship of the engineer to his employer. Some very important facets of these questions are illuminated by the fate of three engineers employed by BART (Bay Area Rapid Transit).

A few words about the structure of BART will be useful as a background. (The recent series by Gordon Friedlander [2] constitutes an excellent description of the overall project.) BART is a fast (80 MPH top speed), modern rail transit system, with 38 stations and 75 miles of track, serving the counties of San Francisco, Alameda, and Contra Costa. Ownership and control is vested in the Bay Area Rapid Transit District (BARTD), created by public statute in 1957 and governed by a 12 person Board of Directors, 4 from each county. It is financed by public funds.

Construction began about 1963 and the overall cost is now estimated at about 1.5×10^9 dollars [1]. Partial revenue service commenced, between Oakland and Fremont, on September 11, 1972, almost 3 years behind schedule [1].

A consortium of 3 engineering firms, referred to as Parsons, Brinkerhoff-Tudor-Bechtel (PBTB), was retained by BART to direct and engineer the construction of the system. They in turn contracted out various phases of the operation to other firms. In particular, Westinghouse Electric Corporation, on the basis of competitive bidding, was awarded (in 1967) a 26 million dollar contract to design, install and operationally qualify the Automated Train Control (ATC) System [1].

Bart itself has an engineering staff whose functions include system maintenance and operation, surveillance and status checking of construction, approval of design changes and general investigation of problem situations.

The following account is based on a collection of over 40 documents including letters, memos, newspaper articles and reports, ranging in length from a few paragraphs to over 100 pages. These were acquired principally through correspondance. Because it was not feasible to interview the participants (even by phone), certain details have not been clarified. However, these are not important enough to affect the overall picture that emerges. The same is true for a few pieces of information that were given to the writer in confidence; these only serve to reinforce the impressions created by other information.

The Events

Holger Hjortsvang, a systems engineer in the BART Maintenance Section since 1966, and a Senior Member of IEEE, was involved with the ATC system. He became, over a period of years, increasingly concerned with the way the development of this system was progressing. He felt that BART had not internal structure adequate to monitor this phase of the project, relying instead on PBTB, who were also not set up to oversee this task[3]. In part as a result of his having been sent to work for 10 months with the Westinghouse Computer Systems group responsible for ATC, Hjortsvang had grave doubts about the success of this phase of the project[4,5]. He expressed these concerns to his superiors both orally and in a series of five written memorandums dating back as far as April 1969[7]. In one of these reports criticizing the ATC system, he predicted a mean time between failures (each stopping a train) of 3 1/2 hours when the system was in full operation[4,5]. There was no significant response from his management.

Max Blankenzee, a programmer analyst working with Hjortsvang since 1971 had a similar experience. His memos to his superiors criticizing various aspects of the ATC development drew only vague verbal responses and warnings not to become a "trouble-maker" [5, 7].

Meanwhile, in BART's Construction Section, Robert Bruder, an electrical engineer monitoring various phases of the project since 1969 was growing increasingly disturbed about the "unprofessional" manner in which the installation and testing of control and communications equipment was being supervised by both BART and PBTB, as well as the obviously unrealistic opening dates being released to the public. His management was also not responsive to his expressed concerns [6].

Toward the end of 1971 the 3 engineers decided that in the public interest they must take steps to have their concerns dealt with seriously. Accordingly they made contact with Mr. Daniel Helix, a member of the BART Board of Directors, told him about the problems they were encountering, and gave him some written material. Mr. Helix expressed interest and was persuaded that action was needed. He conferred with two other board members and gave copies of a report on the subject to the entire board and the top management of BART [4, 5, 6, 7].

The next step (and the elapsed time here is not clear) was the release to the press by Mr. Helix of the news of the controversy [7, 8, 9]. This was followed by a public meeting on February 24 (or February 25) of the BART board at which presentations were made by Edward Burfine, a consulting engineer engaged by either Helix or the 3 engineers (possibly both--another unclear point) to present the criticisms of the handling of the ATC development, and by representatives of PBTB and Westinghouse in defense of their approach [4, 7]. The board voted 10 to 2 (one source said 8 to 2) in support of BART's management, in effect rejecting the criticisms.

Apparently the identities of the 3 who initiated the controversy had not been made public, and BART's management now proceeded to identify them [6, 9]. On the 2nd or 3rd days of March, Hjortsvang, Blankenzee and Bruder were given the options of resigning or being fired. Upon refusing to resign they were summarily dismissed with no written reasons being given [5, 6, 7, 9].

On February 23 (just prior to the public meeting of the board) Bruder, a member of the California Society of Professional Engineers, telephoned CSPE President, William F. Jones, outlined the situation as it then stood, and asked for support. Mr. Jones immediately contacted the Diablo Chapter of CSPE (to which Bruder belonged) and, along with the leaders of that Chapter, initiated a thorough study of the situation. Subsequent to the discharge of the 3 engineers, Jones (on March 13) attempted to reach Mr. B.R. Stokes, BART's General Manager. (All accounts attribute the firings to Stoke's initiative.) Jones was never able to reach Stokes. He did speak to Chief Engineer David Hammond, who expressed surprise that CSPE should be interested in the situation. BART's top management declined to meet with CSPE [10, 11, 12].

Requests by the fired engineers for hearings on their case, or even for written statements of the charges justifying their dismissals, met with no response, and in fact BART has refused to issue any explanation to anyone[6,7,9,10,11,12]. (Of 3 letters of inquiry I wrote to various BART managers -- including Stokes-- who were involved in the case, only one reply has been received. This was a refusal by Blankenzee's superviser to provide any explanation, on the grounds of pending legal action [13].)

A full investigation of the firings, the conduct of the 3 engineers and of the substance of their concerns about the BART project was then undertaken by CSPE. President Jones stated[10] that he and other CSPE members (Gilbert A. Verdugo, State Director Diablo Chapter CSPE, and Roy W. Anderson, Chairman of CSPE's Transportation Safety Committee, also played major roles) involved in the case were "convinced that the three engineers acted in the best interest of the public welfare in disclosing to the BART Board of Directors problems regarding train control, systems management and contractual procedures." He also stated that "a large volume of most distressing information on the employment practices of BART, and on its apparent disregard for public safety, has been gathered."

On June 19, 1972 a report of CSPE's findings authored by Roy Anderson and entitled: "The BART Inquiry" was submitted to the California State Senate. At about the same time, the Diablo Chapter of CSPE circulated a public petition calling for a wide ranging investigation of BART by the State Legislature (a number of specific charges were made, but the case of the fired engineers, and employment practices in general were not mentioned)[9]. CSPE also took some tentative steps toward a court action on behalf of the fired three, but never did follow through on this[9].

The State Legislature did investigate, producing what is known as the "Post Report" [1]. It acknowledges the CSPE report as its starting point. Several instances of mismanagement of the project are pointed out although no mention is made of employment practices or of the 3 men whose initial warnings led directly to the Legislature's investigation. The Post Report [1], a further study by a special panel of distinguished engineers [14], and several other independent studies all confirmed, in general outline, the concerns expressed by Bruder, Hjortsvang and Blankenzee. A great deal of information pointing to poor engineering design was uncovered.

A more dramatic confirmation occurred on October 2, 1972 when a BART train over-ran the station at Fremont as a result of an ATC failure and several passengers were injured [2]. This occurred just 3 weeks after the initiation of partial revenue service.

At this writing, the BART ATC is still under a cloud, with the trains being controlled ultimately in the traditional manner [2]. The 3 engineers are now suing BART for damages totalling $885,000. They charge breach of contract and deprivation of constitutional rights. Blankenzee also charged that BART officials intervened on several occasions to discourgae prosepective employers from hiring him on the grounds that he was a "troublemaker" [15].

Comments and Conclusions

The code of ethics of the NSPE states that the engineer "will regard his duty to the public welfare as paramount", and that "he will notify the proper authority of any observed conditions which endager public safety and health." The Employment Guidelines approved by many engineering societies, including IEEE, and published in the May 73 issue of Spectrum are also highly relevant.* The facts related above indicate that Hjortsvang, Blankenzee and Bruder acted in a manner fully consistent with the letter and spirit of this code and guidelines, a conclusion also attested to by the CSPE. There is no indication that they did anyting in this situation that could reasonably be called improper. When they felt it necessary to depart from normal administrative channels, they addressed themselves to the BART Board of Directors, an action difficult to interpret as irresponsible. (An interesting sidelight on the cautious approach of at least one of the 3 was provided by reporter Justin Roberts of the Contra Costa Times[16]. He stated that he has met Robert Bruder some months prior to the firings, and having heard, from other sources, of trouble in BART, "attempted to pump him." "He politely but firmly rebuffed my efforts." Only after the matter became public knowledge, did Bruder speak to the press.)

*Footnote: Objective #3: The responsibility of the professional employee to safeguard the public interest must be recognized and shared by the professional employee and employer alike.

Terms of employment #2: The professional employee should have due regard for the safety, life, and health of the public and fellow employees in all work for which he/she is responsible. Where the technical adequacy of a process or product is involved, he/she should protect the public and his/her employer by withholding approval of plans that do not meet accepted professional standards and by presenting clearly the consequences to be expected if his/her professional judgement is not followed.

"The chairman of the IEEE Employment Practices & Ethics Committee is:

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gineer" who was "ruthlessly sacrificed."

Nevertheless, having performed an obvious public service in the highest tradition of engineering, the considerable personal sacrifices of Blankenzee, Bruder, and Hjortsvang have been largely ignored in the reports that subsequently validated their claims. Only the CSPE showed any concern for them, and this group was apparently unable to take effective action on their behalf.

Unfortunately, the BART case is not a unique example of employed engineers being forced to choose between compromising their ethics or seriously jeopardizing their careers. It is imperative that the engineering profession develop institutional means for eliminating such dilemmas. The working Group on Ethics of IEEE CSIT is now exploring proposals toward this end and a progress report will appear in a future issue of this Newsletter.

Acknowledgement

The author's efforts to gather material on this subject were significantly facilitated by the cooperation of Messr's Gordon Friedlander (IEEE Spectrum), Gilbert Verdugo (CSPE), and Justin Roberts (Contra Costa Times).

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1973 National Computer Conference

June 4-8, New York City

Evolutions and revolutions in computer technology may affect society either on a global scale (management of the economy, law enforcement, etc.) or on a local scale (privacy of the individual, home computers, wired cities, credit ratings, etc.) or both. The 103 sessions comprising the 1973 National Computer Conference (NCC) dealt in part with these issues. Papers presented at three of the sessions are reviewed below. The written papers appear in the Conference Proceedings.(1)

Session 56: "A Day with Graphics,"

Graphic Applications I

Carol M. Newton's excellent paper entitled "Graphics in Medicine and Biology" stressed the importance of the "human engineering" aspects of a graphics system.

It is very important to deliver a completely developed system to the non-technical user. A non-technical user will quickly lose faith in a malfunctioning system--a faith that will be difficult to restore, even after the technical problems are solved. For example, Newton presents the following situation: A doctor is presented with a graphics system to aid him in diagnosis. He must be quickly convinced that the system gives correct answers and will save him time. He will initially try to fool the system by giving it tricky problems. If the software is not developed enough to handle tricky cases accurately, he will lose faith in the system. He must develop confidence in the system and will expect the software to be capable of giving him reasons why certain solutions were chosen.

Aside from direct use in diagnostics, graphics systems are in wide use in medical and biological research and education. The ability of systems to present the viewer with 3-dimensional pictures of complex molecular and biological structures (e.g., rotating molecules, the brain, etc.) has greatly simplified the understanding of these structures. Insofar as research is concerned, the field of biomedical research is so new that "hypothesis discovery" is as important as "hypothesis verification." Since graphics systems can display large amounts of data pictorially, and since the ability to recognize patterns is more easily accomplished via visual inspection than via computational algorithms, interactive graphics systems are expected to play key roles in future biological and medical research.
P.M. Russo

Session 63: Views of the Future I, II

Several techniques are currently in use in technological forecasting. These include:
--The DELPHI method

--Model Building (simulation)

--Scenario Construction (compare alternative cases)

--Correlation analyses

Since one of the more basic problems in forecasting both technology and its effects on society relates to identifying possible consequences and issues, the DELPHI method and scenario construction are currently the most popular forecasting techniques. DELPHI is a method of collecting expert opinion by using a series of highly structured questionnaires designed to provide feedback to the panelists (those undertaking the study) while avoiding undue peer pressures. (2) DELPHI is not necessarily statistically valid, and the experimental results may not be reproducible. The method does not "weigh" the relative "expertness" of the participants in relation to each question, and it does not test for the reliability of the data. It is most useful in attempting to identify issues and to predict various possible consequences.

On the other hand, scenario construction is most useful in answering "what if" type questions. Often it consists of comparing two diametrically opposed consequences arising out of the same technological development. Murray Turoff's introductory paper presents a scenario which compares two highly technological computer network interconnected societies. One is an open (free) society whereas the other is a closed (dictatorial) society. In both societies, the identical highly sophisticated technology is used to control and guide the societies' members.

In another area of interest, L. H. Day concentrated primarily on CAI (Computer-Aided-Instruction -- usually a large time-shared computer system programmed to interact with students sitting at terminals), and presented the results of a recent Canadian DELPHI study of CAI. The study concludes that by the early 1980's, all important cost and technical factors regarding CAI will be resolved. The major stumbling blocks appear to be social and behavioral in nature, e.g., faculty fear of being supplanted or having their importance reduced by computers, concern with the quality of the education, etc.

The excellent paper by B. Nanus, et. al., "Social Imapcts of the Multinational Computer, " was based on a DELPHI study sponsored by the AFIPS Social Implications Committee. Large distributed networks of computers are already in heavy use throughout the U.S. in government systems, law enforcement, and weather forecasting. Other large ARPA-like systems are beginning to enter the commercial market. Special purpose international networks are already in use (airline reservation systems, sales offices or multinational banks tied together by computers, etc.) It is only a matter of time before large, general-purpose computer networks transgress national boundaries. Several such networks are presently in the planning stage; these include among others:

-- UNISIST. A United Nations sponsored world science information system to permit nations, universities, etc. to share scientific information more efficiently.

-- U. N. central computing facility -- will interconnect all the U. N. centers throughout the world.

more specialized international networks for the private sector is growing. Global weather monitoring and forecasting, multinational banks, and airline reservation systems are but a few examples. UPI is currently installing a computer - based multinational news network. Mitsui has installed a fully computerized global communications network interconnecting 115 offices in sixty nine countries.

The results of the Nanus study fall into five categories:

Technological Requirements: Highly standardized software, cheaper channel capacity, improved switching equipment, and wider use of two-way CATV in homes will be needed.

Socio-Cultural Implications: Multinational computer systems will contribute to homogeneity of cultural tastes and attitudes; however, the over-all variety will increase. The level of fear among people regarding the mechanization of life will increase.

Public Policy and Administration: Increased public regulation is inevitable. Problems will arise as to who controls multinational data banks. Politically competing ideologies will have a very inhibiting role (capitalism vs. socialism, multinationalism vs. nationalism). Considerable conflicts will arise between individuals' rights to privacy and society's right to use data bases for planning.

Multinational Business Administration: It is anticipated that by the 1980's fully 25% of multinational organizations will have multinational information systems. This will result in better allocation of resources and accelerate the trend toward the professionalization of management around the world. It will increase the power of multinational organizations, which are dominated by the highly industrialized countries, and this influence may widen the gap between rich and poor nations. Conflicts of interest between loyalty to the local government or corporation will arise.

Impacts on Developing Nations: Multinational computer systems will help developing countries by tying them into advanced technologies (education, medicine, management). However, insistence of underdeveloped nations on large and expensive computer systems for prestige purposes may hinder their development. The gap between rich and poor nations will not be narrowed by multinational computer systems.

On November 9, 1972, the National Science Foundation formed a "Computer Impact on Society" section reflecting a growing need to understand the fundamental impact that computer technology is having on our social organizations and ways of life. Peter G. Lykos of NSF described their program. NSF is currently willing to fund research projects in the areas of computer or technology impacts on society. Support is available in the following general areas:

Economic Sphere:

--Automated Data bases (ease of use, accuracy).

--Computer conferencing, computer and information technology to aid management in decision making.

--Use of real-time computers in process automation, traffic flow, robotics, etc.

--Enhance public understanding of technology, "numanize" services such as welfare, public health, law enforcement, etc.

--Computer impacts on the individual, human-machine interfaces for the non-technically oriented user.

--Computer and information technology to service individual human needs (home use, etc.).

NSF is soliciting propsals in the above areas. Proposals may be submitted at any time (see reference 3 for details).

In my view, it appears that a computer-interconnected society will be technically and economically feasible by the 1980's, at least to a limited extent. Before such a system can come into being, however, many societal issues must be considered. Issue such as privacy of the individual, impersonalization arising from less contact with humans and more contact with machines, later human fears of machines controlling their lives, and loss of freedom should be resolved before society permits the computer interconnection of large segments of its members.

P. M. Russo

Session 88: Computers are for People

The catchy title of this session is more a hope or a goal that a reality. The "people" referred to here are the present or potential community of computer users other than computer professionals. This is not made obvious by the session abstract (below), but rather by the session content.

"Computers are supposed to be for people, but it's often hard to prove. The state of the art has reached a point where it is both feasible and mandatory that computers become subservient and palatable to human users. But real people are still scared away by psychological and physical barriers that we build. We must learn more about the reasons for our failures, to design better interfaces."

The first paper, by Harold Sackman of Rand (a psychologist/computer scientist), dealt with characteristics of the man-machine interface presented by a computer system. He cited six systems, one not yet operational, which were designed to be easy to use. The users of the operational systems were polled or surveyed to assay their attitude towards the system, how they learned to use it, whether it was a good problem-solving tool, etc. Sackman stated that the paucity of good scientific data in this area to date precludes general conclusions. I agree. However, this does not mean that no lessons can be learned from the cases themselves. Two of the systems discussed give the user access to a large data base: specifically, business executives to an MIS system and ghetto residents to community service information. The two groups have sufficient psychological similarity to result in identical functional design: the user calls in a request to an information expert who accesses the system (via a terminal) and responds by phone. The original intent of the MIS system was direct access by the executive, but that proved unfeasible. I found no real surprises in his studies of problem solving systems. For instance, it is not shocking that 26% of Air Force Cadets are turned off by a computer system when they learn that the system is an arbitrary universal requirement. Similar, or higher, percentages of schoolboys have been turned off by Latin.

medical doctors. Professor Alfred M. Bork discussed the progress and problems of CAI (Computer Assisted Instruction) in college physics instruction. Bork suggests that a successful CAI system for physics instruction should include the following: (1) a graphic terminal interface; (2) a responsive, not overly large timesharing system; and (3) a mix of CAI and student written programs. The two major roadblocks to CAI are an inadequate authoring system and high systems cost. Bork stated as a general rule of thumb that a CAI program had to undergo three cycles of writing and testing (on 100 students) to make it useful. Although computer hardware prices are dropping, one wonders whether full-blown CAI systems will ever be cost-effective.

Medical systems were discussed by Bruce D. Waxman of the National Center for Health Services Development. Although computers are being used more extensively in health care delivery systems, the new systems often fall short of their potential. Since the principal motivating force for devising new systems is the practioneer's desire to practice better medicine, a spirit of competition in the field of medical systems is natural. However, a discussant pointed out that striving for a competitive edge may preclude more widespread usage of successful systems, and so may be in some sense unethical. Other practical problems are exemplified by Weed's problem-oriented medical record system which is designed as a tool to help in making clinical judgements. Weed's system itself cannot be duplicated elsewhere because it grew on what is now technically obsolete hardware. Discussants pointed out that the availability of the data which is part of that system would make the development of modern versions much more practical. Waxman also discussed a system in which the patient is in most intimate contact with a computer--his life depends on it for one to a few days. This system is Kirkland's automatic monitoring and infusion system in the surgical intensive care unit at the University of Alabama. It is another proof that a machine can perform routine functions on a timed basis with fewer errors than a human system. With a conservative patient-nurse ratio of 3:1 his post-cardiac surgery mortality rate of 7% compares favorably with the best units in the country. What the computer lacks in imagination and creativity is apparently more than compensated for by its steady alertness and obedience to doctor's orders--when and under what conditions to infuse which medication, etc. The patient is a terminal!

The papers by Anthony Wasserman and Frederick Thompson were concerned with different aspects of user software--the former with its psychological properties, the latter with how to produce it. Wasserman's paper on idiot proofing interactive software seemed to consist of elaborated truisms. While other do-and-don't lists could be compiled, this sort of thing does need to be said periodically, judging from some of the interactive software around. Thompson described the REL system, which provides a meta-language for implementing a class of applications languages. Such systems are probably necessary to construct a clean set of user-oriented languages. The existence of several other meta-languages seemed to be unknown to him.

The social impact of a "Community Information Utility," or CIU, will be massive. A CIU is a CATV based terminal system which gives on-line access to a large-scale computer utility. If it were in wide-spread use its effect would be revolutionary. The direction that revolution could take worries Lawrence Press of U.S.C. He recommends a moratorium on construction until the year 2000. Press' paper is in a sense a minority report of the consensus reached at last year's CIU conference, (4) that a prototype CIU be constructed. More specifically it was suggested that the Sackman of Rand (see review above) is one of the leading spokesmen for the proposal and defended it with these arguments: (1) building a prototype now will give us information so as to reduce the long term social risk; (2) the Japanese are doing it and we will fall behind; and (3) if we just sit back and let private industry do it we could get a result like commercial TV. Press argues that a prototype system of this scale develops a momentum of its own that may warp technological development. It is hard to be objective in evaluating an experiment such as this, so the notion that it could lead to a scientific evaluation is wrong. Furthermore, complementary techniques are already being developed. Press advises that we see where they lead before we undertake such an experiment. There are general properties of a CIU which bother Press regardless of its exact form and capability. For instance, it forms a gulf between the computer-literate fraction of society and the rest. All taxpayers will in effect be subsidizing a middleclass experiment. Some of the specific services that could be provided by a CIU, such as remote education, an electronic cottage industry, remote shopping, etc., came under Press' attack. Basically he is concerned that the CIU may become an individual's principal interface to society. I share Press' concerns and, although the choice of the year 2000 is rather arbitrary, I would suggest holding off large-scale experiments until drastically lower communications costs can be foreseen. Norman Balabanian has ably presented his views on cable communications in general in the March 1973 issue of the CSIT Newsletter. I hope that more studies of CIU implications will be forthcoming.

In an unorthodox and entertaining finale to this session, Theodor H. Nelson delivered his view of the computer future. Nelson, a philosopher by training and self-taught in computers, sees in the computer a means of extending man's creative abilities. I quote the last two sentences of his written paper to give the reader a feeling for both the texture of his remarks and his aspirations.

"The psychic engineering of fantic fields-adult's hyperspaces of word and picture, child's gardens of verses-is our new frontier. We must look not to Asimovian robotics and the automated schoolmarm and librarian, but to the penny arcade and the bicycle, the clever diagram and the movie effect, to furnish this new realm."

His current system concept, called XANADU,[tm] comprises a minicomputer, a flexible and powerful graphics and text data base, a keyboard, and a display. The system may also be used for interpersonal communications via "umbilical cords." If such a system can be had for the price of a second-hand VW or a hi-fi TV console it could find widespread use in a certain segment of society. Nelson's style tends to make his concrete notions seem more far-fetched than they really are. But it was fun.

A.D. Robbi

References

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71-4), and "Grants for Scientific Research" (NSF 69-23) which may be obtained from the National Science Foundation, Washington, D.C.

4. H. Sackman and B.W. Boehm, Planning Computer Information Utilities, AFIPS Press, Montvale, N.J.■

NEWS NOTES & Comment

NSF Promotes Ex-SE Asia Expert
(Reprinted from "Science" 1 June 1973)

The National Science Foundation (NSF), in an attempt to respond to the "mounting interest throughout our society in the ethical and human value implications of science and technology," has appointed the one-time counterinsurgency task force chief for Southeast Asia under the Kennedy and Johnson Administrations, Charles Maechling, Jr., to head up a new program in ethics.

Maechling, a lawyer, served as the State Department's director for internal defense from 1961 until 1963 and was the chairman of a National Security Council task force on counterinsurgency from 1961 until 1966. Since then he has dealt with international matters in the general counsel's office at NSF, and represented the foundation at Law of the Sea meetings. Most recently he was appointed special assistant to the director.■

"SCIENCE FOR SOCIETY" BIBLIOGRAPHY

Reminder--"The Science for Society" bibliography described in the March issue can be obtained for $1.00 per copy from: AAAS, Dept. SE2, 1515 Massachusetts Ave., N.W. Washington, D.C. 20005.■

CORNELL PROGRAM ON SCIENCE, TECHNOLOGY, AND SOCIETY

The Cornell Program on Science, Technology, and Society is compiling a handbook of science and society activities that will include programs and courses, non-academic institutions and foundations, newsletters and periodicals, and fellowships and grants. The handbook is intended primarily for students, but should be useful to anyone working in some area of science and society. Those interested in assisting or desiring further information should contact Sharon Bryan, 632 Clark Hall, Cornell University, Ithaca, New York 14850.■

CORPORATE CONSCIENCE
(Reprinted from "ATP Newsletter" 1 May 1973)

The Social Responsibility Audit is a 14-point evaluation program enabling management to analyze objectively a firm's social performance. London's Foundation for Business Responsibility started it and now other Common Market countries have joined in.

Among the 14 points are pollution, race relations, education, working conditions and consumer relations. Authored by John Humble, director of London Management firm, Urwich, Orr & Partners, the audit asks 71 key questions covering such things as a consumer policy which considers safety information and advertising standards, an employee policy which encourages workers to participate in community affairs on company time, and several policies pertaining to health, safety, promotions, etc. One pivotal question is: "Is the business making the most effective and balanced use of its financial, physical and human resources?"

One firm which employed the Social Responsibility Audit has already engaged a pollution consultant, and management and race relations counselors.

Mr. Humble states, "The greatest social irresponsibility would be to so manage business that wealth was not produced for the country's fabric of schools, homes, roads and so on." He suggests that while companies are established to make a profit, "every company is also in business to make its society a better one as well as a richer one." His Social Responsibility Audit, under the aegis of Michael Ivens, director of the Foundation for Business Responsibility is working toward making this come true in England.■

upcoming events

Sept. 24-27	Intersociety Conference on Transportation	Brown Palace Hotel Denver, Colorado	Jack Ayer, Jr., Denver & Rio Grande Western Railroad, POB 5482, Denver, Colorado 80217
Sept. 25-28	Engineering in the Ocean Environment Conf.	Washington Plaza Hotel Seattle, Washington	Ted Hueter, Honeywell Inc. Marine Sys. Ctr., 5303 Shilshole Ave., N.W., Seattle, Washington 98107
Sept. 30	Engineering in Medicine & Biology	Leamington Hotel Minneapolis, Minn.	A. R. Kahn, Medtronics Inc. 3055 Old Highway 8 Minneapolis, Minnesota 55418
Oct. 15-19	"Energy, Europe and the 1980's" Conference	London, England	
Nov. 5-7	Systems, Man & Cybernetics Conference	Sheraton Boston Hotel Boston, Massachusetts	S. A. Meer, Signatron Inc. 27 Hartwell Avenue Lexington, Massachusetts 02173
Dec. 10-12	Joint Conference on Sensing of Environmental Pollutants	Sheraton Park Hotel Washington, D. C.	W. O. Davis, Nat'l Oceanic & Atmospheric Admin., Rockville, Maryland 20852
1974			
Feb. 26-28	Societal Systems Int'l Conference	Mayflower Hotel Washington, D. C.	
July 15-19	Int'l Conference on Frontiers in Education	City University, London, England	R. C. G. Williams, County Consultancy Svcs., 8 The Flower Walk, Guildford, Surrey GU2 5HH England
July 22-25	Nuclear & Space Radiation Effects Conference		
Aug. 21-23	Engineering in the Ocean Environmental International Conference	Nova Scotian Hotel Halifax, Nova Scotia	O. K. Gashus, E. E. Dept. Nova Scotia Tech. Coll., POB 100, Halifax, N.S. Canada
Aug. 26-30	Intersociety Energy Conversion Engineering Conference	Jack Tar Hotel San Francisco, California	A. D. Tonelli, Douglas Aircraft Co., 300 Ocean Park Blvd., Santa Monica, California 90405

1974 EUROPEAN CONFERENCE ON ELECTROTECHNICS (EUROCON)

The European Conference on Electrotechnics, EUROCON'74 is devoted to the general theme: The Engineer and Society. It will be held in the R.A.I. Congress Centre, Amsterdam, the Netherlands, during the period April 22-26, 1974. The meeting is organized by The Institute of Electrical and Electronics Engineers, Region 8 and by the Convention of National Societies of Engineers in Western Europe. The official language of the Conference will be English.

The Conference will:

- pay special attention to the social relevance of engineering activities
- provide a leading international forum for the announcement of important new advances in research, technology, development, design and manufacture
- complement existing specialist conferences by providing facilities for discussions on the state-of-the-art, as well as on trends and interactions of technologies
- provide an environment conducive to informal discussion between students, engineers, scientists and technical management

Authors must submit a 300-500 word abstract in threefold, in English, appropriate to a 20 minute paper, to reach the EUROCON'74 Office, Local Secretary: Ing. G. Gaikhorst, c/o F. M. E., Nassaulaan 13, the Hague, the Netherlands. Telephone 070-614811. Telex 32157 fme nl., before October 15, 1973.

CSIT Topical Working Groups

CSIT was formed in response to a petition, signed by some six hundred members of IEEE who felt concern about the social implications of their professional work. During the past year the committee has initiated a number of activities, hopefully responding in some measure to the desires of the petitioners. In order to learn more specifically what socio-technical areas are of interest, a questionnaire was circulated in the first CSIT Newsletter and in other communications. So far 74 questionnaires have been returned and a number of other IEEE members have attended committee meetings, the INTERCON'73 forums or otherwise indicated their interest in becoming personally involved.

The questionnaire listed eleven major topics and many subtopics. The response was remarkably uniform; i.e., there was almost an equal interest in each of the major topics. Consequently, an effort is being made to form working groups on many of the topics as described below. Just what sort of work and how it is to be performed will depend on the responses of the CSIT membership to the working group chairmen. As a start each group chairman is writing to those members who indicated substantial interest in his topic. Hopefully many other readers of this Newsletter will wish to participate. They are cordially invited to do so and should contact the chairman of the appropriate working group. Here are the working groups that are being organized; chairmen are listed on the 15th page of this issue.

1. Ethics (a code of ethics for engineers? personal responsibility for an engineer's work? the proper role for professional societies?).

2. National Energy Policy (and environmental problems).

3. Urban Technology. Considerable interest was expressed in the subject of transportation, relatively little in traffic control or public safety.

4. Communications especially as the subject relates to greater involvement of the public with the government.

5. National Security. There was considerable interest in the DOD budget and in conversion from military to civilian engineering, but little interest in arms control.

6. Data banks and electronic surveillance. There was equal interest in their use to control crime, in concern for privacy and in the social implications of classification.

7. Social Problem Solving, Applications of Systems Engineering and Information Theory to Social Systems. This clumsy title derives from two topics listed in the questionnaire (7d and 10) and is subject to change.

8. Education, of engineers on social implications and of students and the public about implications of Technology. Much is going on in this area. CSIT activities are being coordinated with the IEEE Education Group.

9. Bioelectronics. Opportunities for EE's and social and ethical implications.

10. Humanization of Automation. No interest was expressed.

At least for the time being it will be necessary for the groups to work through correspondence and the CSIT Newsletter in developing a concensus and drafting materials. Replies to the questionnaire were distributed as follows: New England-8, New York-13, Middle Atlantic-16, Southeast-4, Midwest-8, Texas-3, Far West-7, Alaska-1.

In some cases respondents have been referred to other IEEE committees, for example the U.S. Activities Committees concerned with employment, pensions and the like. Many of the topics listed above are of interest to other committees of the Institute. CSIT aims to provide coordination, where that would appear to be useful and to exert some influence. An objective of CSIT is to permit participation of any IEEE member in discussion of any area of interest to him. Hence the duplication, such as it is, would appear to be desirable and should help the IEEE to consider more diverse points of view than would otherwise be the case.

WILLIAM A. HIGINBOTHAM

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