IEEE CSIT NEWSLETTER

COMMITTEE on SOCIAL IMPLICATIONS of TECHNOLOGY

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497 Park Avenue
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CODES of ENGINEERING ETHICS

A code of professional ethics for engineers serves to remind individual practitioners that they have obligations beyond simple commercial contracts with their employers (or, in some cases clients). It may also be useful in legitimizing difficult stands that individuals may sometimes feel called upon to take for ethical reasons.

In order to be effective, the code must satisfy three somewhat opposing constraints:

(1) wide acceptance within the profession,

(2) applicability to a wide range of situations that cannot be anticipated in any detail,

(3) significance, in that it has consequences in real situations - not a restatement of "motherhood."

The first two conditions require the principles enunciated to be of a basic nature, leaving to the individual the problem of adapting them to specific cases according to his own judgement and moral precepts. A code of professional ethics cannot by itself be a complete guide to behavior. It can in general only be one of the factors considered in the decision-making process. Hence two people agreeing to the same code might come to different conclusions in a particular situation because of variations in their interpretations of the relevant facts, or because they differ on certain ethical points beyond the scope of the code.

An example of the latter might be an engineer asked to solve a problem encountered in the production of whiskey. One person might decline the task because he regards whiskey as a social evil. Another, seeing no harm in whiskey itself, might have no such qualms.

Whether or not a particular code is more than a bland exposition of existing common practice (requirement (3) above) can be judged by the extent to which clear conflicts with the code are occuring.

Even if a set of principles satisfying the above three conditions, and otherwise being satisfactory, is found, there is still a question as to whether it would be useful beyond having a mild educational effect. Such doubt is based on the fact that most engineers (particularly electrical engineers) are employees subject to the dictates of management.* Especially in times when the employment market is tight, it may be argued that not many people will give up or forego jobs on ethical grounds.

This very important point is treated elsewhere. (See the article in this issue, "Supporting the Ethical Engineer" and the associated references.) However it is worth pointing out here that one

*See "The BART Case: Ethics and the Employed Engineer", CSIT Newsletter, September 1973.

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IN THIS ISSUE

Letters

Mr. A.D. Robbi whose affiliation was not given.* wrote a piece called "Whither INTERCON?" in the last issue of the CSIT Newsletter. In it he expressed concern that INTERCON, on its present course, would overemphasize the business aspects of electronics at the expense of social implications. As Exposition Director for the 1974 INTERCON, I would like to address myself to that subject.

It is certainly no secret that over the past 10 years most conferences have seen attendances decline. Now, rightly or wrongly, a conference's success is most often measured in terms of attendance. Every conference management sooner or later must come to grips with the fact that "artistic successes" are no more tolerated in conferences than they are in Broadway plays. And a conference that is not attendance-minded will experience declining attendance, until it either folds or retreats to a seminar format perhaps on campus.

So attendance is the primary though of course not the only, yardstick. And the attendance at INTERCON is chiefly exhibits-oriented; the statistics prove that conclusively. And the exhibit attendance relates to the number of exhibitors, which in turn relates to the expected exhibit attendance. The number of exhibitors then becomes a very, very important number. And the final link in this chain is that exhibitors do not exhibit to support the IEEE (some used to, but those days are gone forever) or even to support their industry, but to sell goods.

This is a hard fact for many IEEE members to digest -- that the existence of their major technical conferences in anything approaching their present formats depends on the conferences' abilities to ring the cash registers of their exhibitors. But self-delusion has gone on too long. We live in a market-oriented society, and it is the business of electronics, not the technology of electronics, that pays the rent for the vast majority of IEEE members. Mr. Robbi laments that "a persistent malaise of all large organizations is that the leadership is out to touch with the the members." True enough. In the case of the IEEE, the to organization has in the past failed to recognize that the under-w pinnings of almost all its activities, all its committees, all its meetings, were commercial.

Now, what place can social implications of technology have in an exhibits-dominated conference? A solid place, I would hope. It is true that our committee hopes to make the technical program "commercially relevant" by which we mean tuned to the technology of today rather than of 1990. But we are also trying to broaden the scope of the conference to include many non technological aspects of the electronics industry: marketing, finance, administration -- and the social implications of technology, which are certainly a concern of business today. In fact, I hope that social implications will be more and more prominent on INTERCON's programs in the years ahead.

First, however, I want to make sure there is a healthy INTERCON. Mr. Robbi cites the National Computer Conference as an example of a meeting with both an ambitious program and a profitable balance sheet. Agreed, the 1973 Computer Conference was highly successful (and highly commercial), but it is also worth noting that, where there were formerly two major computer shows (the Fall Joint and Spring Joint Conferences), there is now one -- not because there weren't enough papers for two, but because there wasn't enough exhibitor support.

FREDERICK VAN VEEN
Exposition Director
1974 INTERCON

*Editor's Comment: Readers are invited to address themselves to several points raised by this letter. Are the underpinnings of most IEEE activities commercial? What should be its functional base? What should be the relationship of the Institute to society, to industry and commerce, to the military?

Continued...

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New subscriptions: IEEE members wishing to receive this Newsletter should write to : IEEE, CSIT Newsletter, 345 E. 47th St. New York, New York 10017.

The editorial staff invites letters and articles from readers. We are interested in publicizing news of all up-coming meetings, study groups, discussions, lectures, or workshops that in any way relate to the interaction between technology and society. Correspondence may be sent to any of the above editors. Material for publication must be received at least by the 7th of each odd numbered month.

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

Affiliation is not a prerequisite for submitting material to the Newsletter. Mr. Robbi has been identified in previous issues of the Newsletter as the Vice Chairman of CSIT. He is also listed in the IEEE Membership Directory.

To the Editor:

On reading Issue No. 3, I noticed the column headed "Become a CSIT Activist". I wondered whether you, or some other member of the organisation, would like to send to me items of news which would be appropriate for publication in the Region 8 Newsletter.

As you are undoubtedly aware, the whole of Europe, and for that matter the parts of Region 8 which are not in Europe, is already increasingly interested in environmental matters, so that I am sure that your items would find an active audience.

The next date for receipt of subject-matter is 14 September, and thereafter at approximately three-monthly intervals.

Yours sincerely,

W. H. Devenish
Editor, IEEE Region 8 Newsletter

Editor's Reply: CSIT Newsletter material is freely available for reprinting in any other IEEE Newsletter without permission. Citation would be appreciated.

To the Editor:

Firstly I would like to thank CSIT for their Newsletter, thus providing a medium for interchange of ideas in this important area.

May I express the opinion that we engineers have a responsibility in this area in that we design and the way we design has a very significant impact on society. In particular, we can and do design with transcience in mind. This adds further to the rapid use of resources, increased pollution with our discarded products and the stress placed on society by rapid change. The automobile industry is an area to be challenged in this regard.

Further we can design with re-use in mind and not allow immediate economic considerations to dominate. An example here is food packaging.

How does one become a member/supporter of CSIT?

Yours sincerely,

R. M. Harrington
Development Engineer
Computer Centre
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Christchurch 1 New Zealand

Editor's Reply: CSIT has no criteria for "membership" other than IEEE membership and a willingness to contribute to its Working Groups and/or the Newsletter. Members should contact the Working Group Chairman of their choice directly or the Newsletter Editor, depending upon the nature of their contributions. Any IEEE member may request copies of the CSIT Newsletter without charge.

To the Editor:

In answer to CSIT's query (Issue No. 3) on whether the readership feels the AFTE* choice by Marshall** engineers will reduce their professional status and qualifications, my answer is no. It means that these individuals have settled a little closer to reality such that they have now shown that they are more qualified to evaluate their true position in the labor market, and that they have recognized that their interests can be better met by banding together. They have lost some of their naivete about how government or another employer will take care of them. They have become more professional in their desire to consider their own interests in a truer perspective. They are not willing to sacrifice their interests to those of their employer. Professionalism does not mean self-sacrifice.

I am a member of IEEE and of the Southern California Professional Engineering Association (a certified bargaining unit). This latter membership in no way reduced my qualifications as an engineer or scientist. My membership and that of many more engineers and scientists will help to advance our profession.

Sincerely,
Norman B. North

(*American Federation of Technical Engineers **Marshall Space Flight Center)

To the Editor:

In spite of several representations we in India have not been able to get the publications of IEEE regularly. Even when they do come they are delayed by as much as five to six months. However, your Newsletter appears to be reaching within the period of about a month. I therefore request you to consider the feasibility of incorporating the news of all fourth-coming conferences and symposia in your Newsletter. This will be of great help to us as the information given in Spectrum invariably reaches us too late to be useful to us.

Yours faithfully,

P. V. Indiresan

Editor's Reply: The IEEE does publish an annual master list of conferences and symposia. It would seem a simple matter for Newsletter Editors to contribute information regarding meetings in this area of concern to a monthly flyer which would be made available to regional and chapter officers for distribution to concerned individuals.

To the Editor:

I was pleased to see our conference listed in your September Newsletter. I would only ask that the following corrections be made to the entry in future issues:

Name: 1974 International Conference on Engineering in the Ocean Environment

Chairman: O. K. Gashus, E. E. Department
Nova Scotia Technical Coll.
POB 1000, Halifax, N. S.
Canada

Yours sincerely,

O. K. Gashus

the job without "laying one's career on the line."

In a paper delivered and discussed at a CSIT forum concurrent with 1973 INTERCON (3/29/73) the author proposed a 17 point code of ethics for engineers. It was then circulated to members of the CSIT Working Group on Ethics (WG-E), one of whom suggested that it would be useful to propose modifications of the widely known code of the Engineers Council for Professional Development (ECPD). This was done and, after further correspondence with WG-E member - Marc Apter (Project Engineer with the Naval Ship Systems Command Headquarters), code I below was proposed by Mr. Apter.

At the same time, the original 17 point code was submitted for consideration by the IEEE USAC Employment Practices Committee (EPC), which then appointed a special subcommittee consisting of E. Conwell (Chairperson) of Xerox Corp., J. J. Suran of G.E. and the author to edit and expand it. At its October 17 meeting, EPC adopted this revision (with one deletion as noted in the text of Code II below) as a formal position and recommended that the IEEE Educational Activities Board forward it to ECPD.

I. PROPOSED REVISION OF ECPD CODE OF ETHICS

FUNDAMENTAL PRINCIPLES

The Engineer upholds and advances the honor and dignity of the engineering profession by:

I. Using his knowledge and skill for the advancement, never the detriment, of human welfare;

II. Being honest and impartial, and serving with fidelity the public, his employer and his clients;

III. Striving to increase the competence and prestige of the engineering profession.

FUNDAMENTAL CANONS OF ETHICS

1. The Engineer has proper regard for the safety, health and welfare of the public in the performance of his professional duties, and he will regard his duty to the public welfare as paramount by notifying the proper authority of any observed conditions which endanger public safety and health.

2. The Engineer does whatever is practicable to assure the safety and reliability of products for which he is responsible and accepts responsibility for personal errors.

3. The Engineer makes a reasonable effort to inform himself as to the possible consequences, direct and indirect, immediate and remote, of projects he is working on.

4. The Engineer contributes his professional skills to worthy public causes.

5. The Engineer does not disclose confidential information concerning the business affairs or technical processes of any present or former client or employer without his consent, except in unusual circumstances where FP-1, FC-1 or FC-2 above may call for special action in the public interest.

6. The Engineer [illegible] his name by an enterprise of questionable character, nor does he become professionally associated with those who do not conform to ethical practices, or with persons not professionally qualified to render the services for which the association is intended.

7. The Engineer encourages colleagues and co-workers to act ethically in their work and supports them when they do so.

8. The Engineer does not undertake engineering assignments for which he will be responsible when unqualified by training or experience (without so notifying his client or employer).

9. The Engineer accepts compensation, financial or otherwise, from only one interested party for the same service, or for services pertaining to the same work, unless there is full disclosure to and consent of all interested parties.

10. The Engineer cooperates in extending the effectiveness of the profession by interchanging information and experience with other engineers, junior colleagues, technicians, and students, and he endeavors to provide opportunities for the professional development and advancement of those under his supervision. The Engineer does not discriminate against colleagues or co-workers on such irrelevant grounds as race, religion, or sex.

11. The Engineer seeks, accepts, and offers honest criticism of his and others' work.

12. The Engineer does not injure, maliciously or falsely, directly or indirectly, the professional reputation, prospects, practice or employment of another engineer, nor does he indiscriminately criticize another engineer's work.

13. The Engineer endeavors to extend public knowledge, and to promote understanding of the contributions and achievements of engineering and the alternatives offered by modern technology.

14. The Engineer gives credit for work to those to whom credit is due, and recognizes the proprietary interests of others.

15. The Engineer advertises his work or merit in a dignified manner, and avoids conduct or practice likely to discredit or unfavorably reflect upon the dignity or honor of the profession.

16. The Engineer is guided in all his professional relations by the highest standards of integrity, and acts in professional matters for each client or employer as a faithful agent or trustee.

17. The Engineer supports the professional and technical societies of his discipline.

18. The Engineer upholds the principle of appropriate and adequate compensation for those engaged in engineering work.

II. PROPOSED CODE OF ETHICS FOR ENGINEERS (EPC DRAFT 10/17/73)

In performance of their duty, engineers shall:

1. Maintain high standards of diligence, creativity and productivity in their work;
2. Not falsify data or make dishonest or unrealistic claims or estimates;
3. Not violate established laws;
4. Accept responsibility for their actions, including those in error;
5. Keep their professional skills up to date;
6. Assist colleagues, technicians and others working with them in developing their skills;
7. Give proper credit to others for their contributions to their work;
8. Seek, accept and offer honest criticism of work;
9. Not undertake engineering responsibilities for which they are not qualified by training or experience;
10. Encourage colleagues and co-workers to act ethically with respect to their work; support them when they do so;
11. Not discriminate against colleagues or co-workers on irrelevant grounds such as race, religion, sex, age or national origin;
12. Promote safety in work situations;
13. Within the limitations spelled out elsewhere in this code, act as a faithful agent or trustee for their employers or clients in professional and business matters;
14. Not accept outside employment without previously notifying their employer;
15. Inform their employer, client or any public agency of which they are a member or to which they are making representations of any business connections, interests or circumstances that could lead to a conflict of interest;
16. Not give or accept directly or indirectly payments or gifts of more than nominal value in interactions with people dealing with their employer or client;
17. Within the limitations spelled out elsewhere in this code, not divulge information concerning the business affairs or technical processes of an employer without his agreement, either while employed or afterward;
18. Make available to others clear accounts of non-proprietary developments that may be of value to them;
19. Keep reasonably abrest of current events, particularly in areas that may affect or be affected by their work;
20. Inform themselves and their employers about the possible consequences, direct and indirect, immediate and remote, of projects they are working on. Where appropriate, encourage more complete analysis;
*21. To the greatest extent possible, focus their efforts on work that they deem on balance to be of positive value to humanity;
22. Where abuses of the public interest (i.e., unsafe or unreliable products, misleading claims, products or processes detrimental to environmental preservation) are encountered in the course of professional activities, and where normal channels are ineffectual in averting them, speak out in whatever form is best calculated to lead to a remedy;
23. Help inform the lay public about technological developments and the alternatives they make available;
24. Contribute professional skills of an advisory nature to nonprofit, civic, charitable or religious organizations;
25. Advance the well-being of the profession of engineering by seeking adequate compensation and by practicing in a dignified manner;
26. Support your professional society.

*(Refers to item 21 of Code II)
EPC deleted from the proposal submitted by its subcommittee an additional sentence in item 21 which read, "Refuse to work on projects opposed to your moral values".

STEPHEN H. UNGER

(Editor's Note: A Conference on "Scientists in the Public Interest: The Role of Professional Societies", was held at Alta, Utah, September 7-9, 1973. Reports by task forces in the areas of public interest science information, defending professional responsibility, congressional fellows, public interest science study program, and the role of professional societies in improving science advising, were presented and resolutions were adopted. The symopsis of the report of the task force on defending professional responsibility and the companion resolution adopted by the conference are presented below. The American Chemical Society Legal Aid Loan Program is also presented. Information on the other areas mentioned above will be published in future issues of this Newsletter).

RESOLUTION: "This conference endorses the development by the Professional Societies of a mechanism to protect the professional status and employment conditions and opportunities of engineers and scientists who have encountered problems resulting from discrimination due to the exercise of their constitutional rights and professional responsibilities."

REPORT: (Task Force Chairman, Alan Nixon, President, ACS) Development of a Mechanism Whereby Scientific Societies Can Defend the Professional Rights of Their Members.

I. The problem of defending professional responsibility is a serious one. We are aware of many cases in industry, government laboratories and even universities where scientists have been retaliated against when their professional standards interfered with the interests of their employers or funders. This retaliation has taken many forms ranging from loss of employment and industry-wide blacklisting to transfers and withholding of salary increases and promotions. We are convinced that the visible problem is only the tip of the iceberg. For every scientist whose case becomes public there must be many who accept their punishment quietly in the belief that an airing of the issue would brand them as "controversial" and worsen their plight. For society at large, however, the most serious problem is that most scientists "get the message," do as instructed, and, when necessary, swallow their professional ethics and personal feelings. The result is that many threats to the public health and welfare fester quietly and unnoticed by the larger society and its institutions until, when they finally burst into public view, they represent real emergencies and can be dealt with only unsatisfactorily and at great social cost.

If the professional societies do not recognize the importance of defending the professional responsibilities of their members, who will? We therefore submit the following outline of a program of action for professional societies in this area.

II. Society organization required.

A. Professional Relations Committee

In order to operate effectively in the sphere of protecting the professional status and employment conditions of its members a society must have an operating mechanism. This is best embodied in a strong committee which could be called the Professional Relations Committee. This Committee must have the full support of the governing bodies of the society.

It must be headed up by a strong, independent minded, widely respected member and populated by members representing a variety of occupational and geographical categories. The ACS has found that a committee of 15 can work effectively by dividing the tasks up amongst various subcommittees. The duties of the subcommittees indicate the variety of tasks that come before the committee, e.g. Member Assistance Cases, Layoff Investigations, Guideline Development, Model Contract Development, Legal Aid Fund Program, etc.

The committee must be backed up with adequate staff since much of the task of assembling the information regarding member assistance cases can be done by the staff and thus expedite the handling of cases. At the present time, the ACS has one full-time professional plus a secretary in Washington and three part-time consultants (geographically distributed) assisting the committee.

When a request for assistance is received from a member, he is asked to submit full details of his complaint and also to sign a waiver form which absolves the Society of legal responsibility in the case. A determination of the apparent merits of the case is made by the Subcommittee on Membership Assistance Cases (SMAC). They may decide to contact the member's local section at this stage. If the case appears meritorious, the member is so notified and the employer involved is contacted to learn his version of the case. If this is largely different from the member's version (as is usually the case), the member is contacted again in an attempt to resolve the differences. This procedure is continued until a resolution is arrived at or it is apparent that none is possible.

B. Legal Aid Fund

At this stage the member is so notified. He then has the option of taking the matter to court. If he decides to do this, he may now apply for a loan of up to $10,000 at the lowest possible rate of interest which is to be repaid after three years (this can be extended and indeed may be waived in case of hardship). If it develops that the case is of the "landmark" variety, the Society may arrange (with the member's permission) to take over the prosecution of case. In all cases, however, the CPR with assistance of Society Counsel, must certify to the Board of Directors that the case has merit before the loan is granted.

In order for a society to set up such a loan fund they should have legal advice and submit the proposed fund statement to the IRS to be sure that it does not adversely affect the Society's tax status. (The ACS statement (attached) which is now before the IRS, could be used as a model.)

C. Local Section Action

As indicated above, local sections or chapter etc. of a society can also participate in this mechanism -- in fact they should be encouraged to do so. Some of the 178 local sections of the ACS do indeed have local committees and some have been useful in gathering information -- mainly in regard to mass terminations (usually called layoffs). Their effectiveness in member assistance cases has been minimal, however, because of the possibility of pressure being applied on the committee members by their employers, which inhibits their freedom to conduct a vigorous investigation. However, there are now available to all societies many more members who have suffered early retirement and hence would feel more free to act with vigo

Continued.

(although it must be noted that most employer-funded pension plans state that the employer can withdraw the pension if the pensioner acts against his former employer's interests).

D. Sanctions.

An important aspect to consider, which needs more development, is the question of what sanctions can be taken against a recalcitrant employer. If he can be taken to court, the situation is fairly straight forward. In addition, this fact should be publicized in the society's newsletter or magazine, the debate of the case reported, and progress reports noted from time to time.

However, many, in fact most, employer actions against employees are not in fact regarded as illegal, so relief through the courts is not possible -- and, even if it is, in some cases the member will not wish to submit himself to the trauma and expense of a legal battle. In this case, publicity appears to be the only recourse that a society has. The details of the case should be written up, omitting the name of the member, if that is his wish, so that the employer may be persuaded to be more reasonable in the future. It should be noted that this may ensure the threat of legal action against the Society by the employer involved. ACS counsel feels that this is an empty threat but it is one a society should be prepared for.

Another plan that the ACS is pursuing is to compile an annual publication listing the employment parameters and practices of all major employers of chemists or chemical engineers (about 900). In this would be listed each employer's performance record with respect to layoffs and member complaints, and should in time be an effective influence to improve employment practices.

An extension of this idea is to actually formally censure the employer for the action he has taken and publicize this fact.

The legislative institutions that societies should consider to protect members from harassment, retaliatory termination, or demotion include:

1. Amendment of the National Labor Relations Act to include "bill of rights", based on existing Guidelines for Employers, for employees presently exempted from wages and hours laws (e.g., professional, technical, managerial) to be enforced through the National Labor Relations Board system.

2. Amendment of the Federal (and/or State) equal employment opportunities laws to include discrimination against employees who exercise their professional and first amendment rights. Such amendments would make available not only the administrative remedies currently provided by the Equal Employment Opportunities Commission (EEOC) but also judicial remedies providing damages and attorney's fees under Title VII of the Act.

3. A separate law prohibiting malicious discharge or interference with a person's right to practice his or her profession. Such a law would permit direct access to the courts to obtain damages or injunction as appropriate, including reimbursement of attorney's fees and costs of litigation. It might also require that adequate notice of any changes in employment status be provided in advance of the action and that the notice include a detailed explanation of the reasons for the action.

4. Laws or amendments to present laws which would (a) give the employee the right to inspect his or her own personnel file and to correct or amend the material therein (b) protect any fellow employees who might be called to testify on behalf of the complaining employee (c) protect employees from retaliation for acting in compliance with or reporting the violation of other laws. (Models exist in the 1971 amendments to the Water Pollution Control Act and the Occupation Safety and Health Act.)

In addition to these legal defense and legislative initiatives, societies should have a follow-through program of support for a scientist whose professional career has been disrupted by one of those controversies. In particular they should defend the professional reputation and employability of the victim. Societies could for example put themselves on the record as endorsing the credentials and appropriateness of activities of an embattled scientist. An appropriate society committee could obtain the good offices of influential individuals in obtaining suitable new employment for a scientist who has lost his position as a result of his adherence to his professional code of ethics and the society could provide loans to tide him over the period of dislocation.

In order to strengthen the general respect for professional codes of ethics, societies could even give certificates of commendations to individual scientists whose integrity has defended the public health and welfare against significant hazards -- as in the famous case of the FDA medical scientist, Dr. Frances Kelsey, who held the line on Thalidomide.

E. Summary and Comments.

1. The process of complaint, investigation and support by local chapter, if any, investigation and support by national organizations, censure of employer and continous publication of blacklisted employers until redress is assured. This procedure might not be effective when:

a. the complaint is isolated in a small community of colleagues and cannot get their local chapter support; and

b. in the case of many corporations (except the largest who are most sensitive to their public image)

2. Support of complainant in a resort to the courts for redress of infringement of First Amendment constitutional rights of free speech, by providing an experienced lawyer and paying his fees on behalf of the member.

3. Continuing support of complainant after resolution of his case in the courts when he is seeking re-employment and can expect to find himself blacklisted. This requires continous monitoring also after re-employment to combat discriminatory employment practices. Methods are by publicizing contemporary experiences of member, maintaining and employment service and providing a loan at low interest rates.

4. Initiation of action to amend the Labor Relations Act and/or the Equal Opportunities Employment Act for the purposes described in D above.

5. Editorial disclosure and discussion of misstatements of the law concerning the legal options open to corporations whose employees publicly disclose information possibly detrimental to the employer, when such information involves no proprietary interests.

Continued...

titude of the courts in declaring "unconscionable" those contracts that place unduly heavy penalties on the signer for minor infringements of the contract, even when the signer has read the contract before signing.

APPENDIX: ACS LEGAL AID LOAN PROGRAM

Purpose:

To provide financial assistance in the form of loans to individual chemists and chemical engineers so that they may pay necessary legal fees occurring from litigation involoving their professional status or affecting their careers in chemistry.

Nature of the Loan:

The loan limit for any chemist or chemical engineer, as defined below, shall be $2,000, except that it may be as much as $10,000 when suitable security is provided. The rate of interest shall be determined by the ACS Board of Directors and shall be the lowest prevailing rate charged by reputable financial institution for a secured loan. Loans will normally be repaid in monthly installments over a period of up to three years, but special arrangements may be made. For example, repayment may be deferred until the litigation has been adjudicated, or other repayment schedules agreed upon. The period of repayment may also be extended on request, in cases of special hardship. In cases with general applicability and potential benefit to all chemists and chemical engineers the Board may waive repayment.

Eligibility:

An applicant for an ACS Legal Aid Loan must be a member of the Society or provide written evidence of professional training and work experience that would qualify him or her as a professional chemist or chemical engineer eligible for membership (as specified in Bylaw I, Section 3 of the Society's Constitution and Bylaws). The applicant must be a litigant, or expect soon to become a litigant in a case involving the applicant's professional status or affecting his career in chemistry. If a member of the Society, the applicant must first have applied to the ACS Council Committee on Professional Relations for help under the Member Assistance Program of the Committee, and the matter judged to be unresolvable through the customary procedures of the Committee. If not a member of the Society the applicant must provide evidence to the Committee that prior to application he or she has pursued the normal avenues of interaction with his or her employer or other party involved in the pending or expected litigation.

Application Procedure:

The applicant must submit to the ACS Executive Director a completed loan application form, to be provided by the Society, supplying such information as the nature of the litigation, prior efforts to solve the problem, the need for a loan, the amount of the loan, and proposed repayment arrangements. If the applicant is not a member of the Society, a service charge may be levied. After review and comment by the Council Committee on Professional Relations, the Executive Director will submit the loan application to the ACS Board of Directors for action. The ACS Board of Directors in its sole discretion shall make the final determination regarding approval or disapproval of the loan application. Prior to receiving payment, the applicant must sign a promissory note specifying the amount and terms of the loan.

A PROPOSAL TO SUPPORT THE ETHICAL ENGINEER

Stephen H. Unger

Introduction

An important function of an engineering society should be to encourage engineers to act ethically in their work. However, in many cases, the employee engineer finds that such action will bring him into conflict with his employer. He is then faced with the possibility of severe reprisals that may extend as far as summary discharge and even blacklisting; a flagrant example of this is the BART case[1]. Such discharge, bad enough in itself, becomes even more serious where the loss of substantial accumulated pension credits may also be involved.

It is thus relevant to consider means whereby the engineering environment can be so altered as to make it possible for the employee engineer to operate as a responsible professional without being subjected to major risks of unfair employer retaliation. One could attempt to achieve this goal under the aegis of government or of trade unions. However, because government itself is often the employer, and because trade unions tend to give top priority to narrow economic issues, it is suggested that professional societies are better suited for this purpose. The American Association of University Professors (AAUP) provides a good example of how to achieve a significant measure of independence for employed professionals.

The proposals outlined here stemmed from a number of earlier reports[2-5]. It should be understood at the outset that they are intended to create an atomosphere more conducive to responsible behavior. They satisfy a necessary condition. The proportion of individuals who would respond positively to the situation is a function of other factors.

Subgoals and Basic Tools

The most fundamental threat to the employed engineer is that of summary discharge. It is thus important to establish the principle of dismissal only on valid grounds. This would entail requirements for written contracts or published policies that clearly define the conditions of employment, grounds for dismissial, notice required, the process to be followed, etc. Where feasible, employers should be encouraged to grant tenure to senior engineers, so that, as in the case of tenured university professors, dismissal is permitted only for cause (established by due process) or major financial dislocations.

Enforcement of such contracts can be accomplished in courts of law or, more effectively, thru the procedures employed by the AAUP. These entail a small (2 or 3 members) ad hoc investigating committee that ascertains the facts and tries to mediate the dispute. If the employer is found to be at fault, mediation fails, and a larger AAUP body ratifies the committee's findings, then the offending institution is placed on a censured list published in the AAUP Bulletin and the committee's report is published. This rather mild sanction has proved very effective.

Continued...

suitably modified - it might also serve the needs of engineers. Other pressures that may compel an engineer to violate his professional ethics include threats of punitive transfer and skipping of bonuses, promotions or pay increases. Here we are on rather soft ground and only in obvious cases would it be possible for an investigating committee to clearly establish that an unfair practice has occurred.

Recommendations and Conclusions

Several large corporations employing substantial members of engineers are successfully ecperimenting with the ombudsman concept as a means of settling employee grievances. The ombudsman is outside of the conventional managerial structure, reporting directly to the company president.

It is proposed that all companies employing substantial numbers of engineers be urged to institute such a practice. This would lead to quick and quiet settlements of most of the abuses of the engineer's professional prerogatives that derive from hasty, ill considered decisions made at low and middle levels of management. It would tend to prevent a company from being locked into awkward positions resulting from such errors and hence benefit all parties concerned.

Within IEEE it is proposed that an ombudsman's office[6] be set up with at least one full time staff member. This office would hear, in confidence, those complaints against management involving alledged violations of the public interest or of the engineer's professional prerogatives that could not be settled by the employers' ombudsmen. Some cases would be dismissed as being obviously without merit, and others would be settled directly by informal negotiations between the ombudsman and the employer. Where a prima facie case has been made, but where the situation is not simple, the matter would be referred to a regional IEEE section, where a 2 or 3 man ad hoc investigating committee would be appointed to make an on-the-spot study.

The findings of this committee, upon ratification by an appropriate IEEE body (perhaps the Employment Practices Committee), would then be acted on. Efforts to arrive at informal settlements would be made at all stages. Where it is decided to censure an employer it is recommended that the process parallel AAUP procedures:

1. The committee report be published in Spectrum, where the list of currently censured institutions be printed monthly.

2. This list serve to inform engineers that the listed employers have acted unfairly. Although readers would doubtless wish to take such censure into account when seeking employment, they (including IEEE members) would be under no formal obligation to refrain from accepting positions with censured employers.

3. Continuing efforts be made to settle the cases that resulted in censure. When this is accomplished, the supervising IEEE committee would remove the employer from the censure list.

Consideration should also be given to supplementary measures such as litigation where written contracts have been violated and the exclusion from IEEE publications of advertisements from censured organizations. Achieving portable pensions (now being studied within IEEE) would reduce the hardship to the unfairly fired engineer.

Although the above discussion is concerned with controls and sanctions, there is good reason to expect that if a system along the proposed lines were to be set up, there would soon evolve a situation in which employers, for the most part, adhere to reasonable guidelines that would preclude major abuses. (In many cases this would involve no significant policy changes; other employers who did have to make changes would find their engineers becoming more productive in the resulting environment). This has been the experience of the AAUP.

Since the problems addressed here are common to all fields of engineering, it would be most desirable to join with as many other engineering societies as possible in formulating a unified plan. This approach would carry more weight with employers, particularly those that employ many engineers from a variety of subdisciplines. There are groups within ASME and ASCE actively concerned about the problem of backing up the professional prerogatives of their members and this should facilitate intersociety cooperation.

References

1. S. H. Unger, "The BART case; Ethics and the Employed Engineer", IEEE CSIT Newsletter, Sept. 1973, pp. 6-8.

2. V. Paschkis, "Moving Toward Responsible Technology, ASME Paper 71-WA/AV-1, Winter 1971

3. J. Stitelman, IEEE CSIT Memorandum, 4/10/73

4. S. H. Unger, "Engineering Societies and the Responsible Engineer", Ann. NYAS, v. 196, Article 10, pp. 433-437, 2/28/73.

5. S. H. Unger, "The Need for Heroes", Computer, Jan/Feb/1972, pp. 22-23.

6. The ombudsman concept was suggested to the author by Robert Bruder.

Note: The BART case has stimulated considerable interest in measures to support the ethical engineer. The above proposal was endorsed by CSIT at its 9/5/73 meeting. It was then brought before the IEEE Employment Practices Committee by Mr. Lawrence A. Tate and is now being studied by that group.

COSTS AND CONSTRAINTS

R. B. GOLDNER
Tufts University

One common difficulty with assessing the worth of a (usually non-standard) technique is how to judge the costs of the technique. Unfortunately, short-range, narrow economic notions are predominantly used. This often destroys an idea before it is given a fair forum.

Consider the present "energy crisis." Even the most optimistic enthusiasts of solar energy judge their own designs in the traditional economic manner and thereby are forced to concede that a difficulty with existing schemes for utilizing solar energy is that they might "cost too much" compared to other sources of energy. But, what do we mean by "cost too much"? What costs are involved? In particular, how do we weigh in the following "costs": (1) The possibility of going to war, etc., to obtain "less costly" sources of energy (e.g., oil, from the Middle East); (2) The ecological costs; (3) The political (intra-and inter-national) costs; (4) Health (and safety) costs; and other subtle costs which the reader might envision?

I should like to suggest that our bookkeeping has been to naive; that we are wasting human intelligence, energy, and time, and other vital resources, by solving problems subject to an incomplete set of constraints.

Engineers have traditionally been concerned with the physical constraints to a problem, and it is generally agreed that much progress has been made therein. In fact, we should be proud of the contributions that have been made to the identification and understanding of physical limitations. Unfortunately, engineers have not paid the same attention to the other ("non-physical") constraints, in the sense that engineers have both accepted and promoted traditional economic and social theories without truly testing their applicability. More often than not, engineers have left the initiative to others, and I suggest that engineers should no longer do so. It behooves us to apply our thinking to redefining, identifying and understanding the "other " constraints, the "non-physical" constraints. Cost analysis should be revised and its core by identifying many of the costs which, traditionally, have been ignored. Measures for the costs associated with conflict, ecology, health (and safety), etc., should be developed, tested, evaluated, and rapidly be brought into the "balance sheet" of accountability. At the least, by being more conscious of the non-physical constraints; and especially by expressing social concern and exercising his/her political strength within his/her company, community, and professional society, the engineer can more effectively help solve many of the world's problems.

Reprinted below is a paragraph taken from a recent review (of Daniel Bell's book, "The Coming of Post-Industrial Society") by Joseph Featherstone in the September 15, 1973 issue of The New Republic, which expresses similar thoughts.

> "The environmental issue is only the first of many issues that may awaken Americans to the divergence between corporate and public interests. The drawback to the corporate outlook are the same as those of what Bell calls the economic mode of looking at things. It is concerned with economic goods alone, whereas many of the goods that count for so much in our reckoning of our well-being do not even show up in economists' calculations. The GNP measures wealth, not our true welfare, giving equal weight to expenditures on nerve gas and money spent for hospitals. Indeed as Bell notes, a major problem with our present system of social accounting is that it only measures costs, not benefits, assessing health services, for example, in terms of money spent on drugs and fees and not by numbers of people cured. A second flaw in the economic outlook is that unplanned technological growth generates more and more of what economists call externalities, costs of private economic acts passed on to the public, such as the air pollution from auto exhaust. Market prices do not reflect the true social costs of many of our goods, and Bell is undoubtedly correct in thinking that a major political issue of the 1970's will be deciding who is to foot the bill for these externalities. A third difficulty with the economic view is that it emphasizes individual, private consumption, which makes planning impossible and systematically creates an imbalance between public and private sectors. We are not as affluent as we like to think; our wealth is heavily mortgaged by unpaid debts to the poor, the old, the minorities, the victims of technological progress and the starved public sector."

In conclusion, one might ask, are we on the verge of, and should we engineers be involved in, developing an improved system of accounting and, therefore, an improved system of problem solving?

EMB SESSIONS AT WESCON

M. GUBEREK

Session 5
MEDICAL DEVICE STANDARDS

Organized by Michael Miller - executive director of the Association for the Advancement of Medical Instrumentation - this session turned out to be the most controversial of the four meetings on Medical Electronics presented at WESCON 73. The roles of Government and the private sector in standard setting were discussed by Dr. H. Ley and the methodology for the standard setting was outlined by FDA spokesman Bob Cangelosi. A look at standards from industry's point of view was introduced by Mort Levin from Hewlett-Packard. To wrap up, Dr. Miller made his presentation on the legal implications of the new standards to become effective once Senate Bill S 2368 (Kennedy-Rogers) is enacted into law.

The reaction of the industrial and research representatives in the audience ranged from mild to severe shock. The consensus of opinion here seemed to be that government should only regulate physical parameters as opposed to design details, which would stifle competitive innovation. The outrage of some participants was apparently due to the realization that under the new laws (in Dr. Miller's estimation these will be effective in 1974) FDA will have the authority to check a design before it is marketed. In contrast, today an unsafe medical device may be produced and legal action cannot be taken against the manufacturer until negative results are recorded from field use of such a device. Expectably, this preclearance procedure added to the burden of detailed paperwork would force a number of small medical instrumentation firms out of the market.

We have here a clear example of a situation in which political involvement of the bioengineer is of paramount importance to the success of his industry as well as the protection of the patient, ultimate consumer of medical instrumentation.

Session 7
THE ELECTRONIC ENGINEERS" CONTRIBUTION IN BIO-MEDICAL RESEARCH

An interesting combination of high-power technology applications, engineering modeling of disease and opinions from the physician's world was presented at this session.

A welcome improvement in the famous reading aid for the blind: the Optacon, is the one-hand Optacon. This pocket sized instrument converts the optical image of printed material into a tactile image using a matrix of vibrating elements. The device should be available to the blind community in two years.

The impact of computerized modeling of infectious disease on the health of developling nations could be enormous, provided it is used extensively under such and Agency as the World Health Organization. This was illustrated by the results presented by

E. R. Lewis and Keh-Lon Lee. Their engineering model of an infectious disease and its dynamics was able to accurately predict at what point of the infectious cycle preventive and curative chemotherapy should be applied in order to eliminate the disease.

Recently, many physicians have complained that biomedical engineers have neglected real needs and have applied themselves to develop fancy instrumentation of little value to the patient. A partial answer to this situation could well be to have more communication between the medical and engineering professions. The kind of communication provided by Dr. J. L. Lewis (MD, Kaiser Medical Center) in his challenging talk on "What Engineers Could do for Me". It must be a two-way channel so physicians can be invited to explore the possibilities - and recognize the limitations and dangers of our technology - along with the engineering community.

Session 13
NEEDS AND TRENDS IN MEDICAL ELECTRONICS 1973

Following an established tradition at Wescon's medical electronics program, IEEE's Region 6 Council of the Engineering in Medicine and Biology Group presented a series of papers reflecting the present status and future guidelines to be followed in biomedical engineering.

Outstanding educators in the field Dr. M. D. Schwartz and Dr. M. Ridgway underlined the present and future needs of the multi-billion-dollar health care industry. Of special interest to clinical engineers was Dr. Ridgway's presentation of a plan for sharing engineering services among hospitals. He pointed out that several hospitals across the country already have active Shared Biomedical Engineering Services (SBES) programs in operation. A feature of the plan is that it provides many hospitals with a service which could probably not be afforded by them on an individual basis.

Session 17
THE MEDICAL INSTRUMENT INDUSTRY-FACT OR FANTASY?

Bringing some hard facts about the medical instruments industry to the discussion table has long been waited for. With a touch of pessimism the speakers gave an overview of a few things that have made successes in this industry and of many that have failed.

Dr. H. Rose (Bio-Optronics, Inc.) presented the classical failure formula = engineer+family doctor. In this instance, naivete triumphs over businessmanship leading most of the time to economic disaster to the parties involved. For the lighter side of the picture, Mr. F. Weibell (VA Hospital, Sepulveda) introduced the recently established clearing house for biomedical engineering jobs. This house functions through various engineering groups, including IEEE.

Finally, Dr. G. Bekey (USC) discussed the feasibility of creating non profit Clinical Engineering Institutes which would serve as a catalyst for introducing new medical instrumentation. Such a program will require close cooperation between industry and the academic institute involved, with obvious benefits for both.

CSIT REPORT ON CURRICULUM

The survey was conducted during January and February, 1973, and approximately 700 questionnaires were mailed. The following summarizes the numerical data and the replies of many schools on various programs concerned with technology and society.

I. Numerical Data

There were 259 replies received – a surprisingly good response and a measure of the considerable interest that engineering schools have in bringing new material on the relation between technology and society to their students. The first seven questions were posed so that simple numerical or yes/no answers were given. The results were as follows:

1. Is there a credit course offered in the general area of social implications of technology?

YES 179
NO 78

a) Number of credits

1-2	26
3	117
More than 3	26

b) Required of all students?

YES 25
NO 124

c) Offered by

College 144
E. E. Dept. 29

d) Approx. No. of students/year

0-25	49
25-100	81
More than 100	30

2. Is there a non-credit course or seminar offered?

YES 37
NO 197

a) Required of all students?

YES 0
NO 42

b) Approx. No. of Students/year

0-25	13
25-100	15
More than 100	6

3. Is there any annual lecture series by faculty or visiting lectures concerned with social implications of technology?

YES	67
NO	185

4. Are there any activites of student organizations which have specific programs (lecturers, discussions, etc.) on social implications of technology?

YES	111
NO	119

5. Are any courses offered on technological forecasting and the impact of new technologies on society?

YES	65
NO	182

6. Are any courses offered by the engineering faculty to students not in engineering which consider the role of technology in society?

YES	155
NO	85

7. Are there any courses offered where a major topic concerns the application of technology to solving some of the large problems of a modern industrial society?

a) Energy needs

YES	141
NO	79

b) Mass transit

YES	116
NO	94

c) Environmental quality

YES	192
NO	36

d) Privacy in communication

YES	18
NO	171

e) Waste disposal

YES	165
NO	54

f) Urban housing

YES	84
NO	116

g) Health care

YES	80
NO	118

Some of the highlights of these data are:

1. A large percentage of those replying (179 to 259) offer at least one credit course.

2. The courses are much more likely to be offered by the college unit (5 to 1).

3. Non-credit courses, seminars, and other informal offerings are less likely.

4. Many schools offer courses for the entire university community on technology in society taught by engineering faculty (155 of 259).

5. Specific applications of technology to solving problems of a modern industrial society were predominantly for energy needs, mass transit, environmental quality, and waste disposal.

Many respondents made extra comments concerning their own interpretation of the questions, and, as expected, more than a few felt constrained by any format such as this. Nevertheless, it is clear that interest is high in helping engineering students understand their roles in society as well as in bringing about a better understanding on the part of the public of the great potential of a responsible engineering profession for solving many critical problems.

II. Comments Received

About 20 respondents were interested enough to send information concerning their own activities or other comments. Two are quoted here since they are representative of many, and they also should serve as points for discussion in future Newsletters.

> "...teaching a class dealing with the social implications of technology is a very demanding job. It requires someone who is really enthusiastic about the idea and someone who is willing to read very broadly in the social sciences as well as in the natural sciences and engineering."
>
> "...the students taking such courses are quite unhappy unless the course is placed on sound intellectual bases."
>
> Professor Charles A. Walker
> Engineering and Applied Science
> Yale University

> "I am in complete agreement with the view that engineering students should be given a broad ranging view of the impact of technology on our environment in order that they may understand the complex inter-relationships that are involved. However, I feel that society must realize that much of the required technology is available and has been taught for many years to engineering students. It has not been applied because society has not seen fit to apply it and to throw the blame on the engineering profession for this state of affairs is, to me at least, unacceptable. The problems and their solutions are essentially political. Despite the clamor set up by the communications media, there are no perfect solutions, only trade offs between imperfect actions. Engineers can and should advise society on the consequences of various actions, however, ultimately society as a whole must decide what it wants to do. Having made the decision then it is our duty to help in carrying it out, but it is certainly not our duty to impose solutions on society."
>
> Dean T. H. Barton
> Engineering
> McGill University

In addition to many comments, there were descriptions of activities at several schools. The variety of ways for introducing material relating technology and society into academic programs is great, and this summary is admittedly too simplified. The range is from rather ambitious new academic programs (offering new degrees) and new research groups to an elective course or two. An intermediate solution is the offering of a block of courses for majors or minors in existing programs. Viewed in these categories, the following examples were chosen from the material received:

1. New degree programs

   - Washington University has B.S. and M.S. programs in Technology and Human Affairs. Also, a Center for Development Technology has been established to apply science and technology to the needs of society.

   - Carnegie-Mellon University has a B.S. program in Engineering and Public Affairs.

2. New majors or minors within existing administrative units

   - Vanderbilt University has organized the traditional engineering programs plus one in Socio-Engineering to form four interdisciplinary divisions, one of which is called Socio-Technological Systems. At least eight new courses stressing the interdependence of technology and society provide the emphasis on the social responsibility of engineers and the importance of the use of an engineering systems approach to solving some problems of society.

   - Stevens Institute has a new curriculum entitled Technology and Society and courses in energy and natural resources, environmental quality, privacy in communication, and urban housing.

   - Stanford University offers an innovative major within engineering called the Engineering and Society Program. Also, an interdisciplinary program called Values, Technology, and Society is concerned with "...technology in its interactions with various other dimensions of life in contemporary industrial society."

3. New groups of courses

   Many approaches were described in the responses, and programs of unusual interest were noted at the following: Neward College of Engineering, U. of Detroit, Ill. Inst. of Tech., U. of Wisconsin, Yale U., Lafayette College, Dayton U., Carleton U., Auburn U., Florida International U., Sir George Williams U., and U. of Hawaii. U. of New Mexico has a very substantial program of engineering courses for non-technical students. Many schools emphasize team projects as a way of bringing together diverse interests, and many schools have developed programs originating from courses in the history of science and technology. Technological forecasting also was cited several times.

In view of the interest of many people in the curriculum aspects of the social implications of technology, our hope is to promote further discussion within the CSIT Newsletter. Schools where curriculum changes are in progress (and that seems to be most of us!) should be able to find good ideas within these pages.

JOHN B. LEWIS
IEEE-CSIT Subcommittee on Engineering

Workshop held at the IEEE International Convention, March 29, 1973, New York City. Moderator: Dr. Bruce B. Barrow, Vice-Chairman of IEEE Technical Activities Board, and Chairman ex-officio, IEEE Committee on Social Implications of Technology.

Guest speakers: Dr. Edward Ramberg, Mr. Harry Davis, Dr. Howard Levy, Prof. William Davidon, Mr. William E. Cory.

(Ed. note: Dr. Levy and Mr. Davis did not authorize the publication of their remarks in the Newsletter)

DR. BARROW

We welcome you to the Workshop on the "Engineer and Military Technology". The Committee on the Social Implications of Technology is a new Committee within the IEEE. It is administratively responsible to the Technical Activities Board; it is responsible in some sense to the Executive Committee of the Institute and it has a significant measure of support at the highest level of the Institute among members of the Board of Directors who feel it is critically important that we as engineers address ourselves to some of the wider considerations which affect us as human beings and the society of which we are a part.

To get to the panel, I think I will sit down so you can listen to the people you came to hear. Each of the panelists will speak briefly; we'll talk awhile among the panelists, and when it seems reasonable, we will move into individual discussions around individual tables or we will do what the panelists and you wish. It is strictly a workshop and it is not intended to be formal 'we-talk-to-you' kind of situation. I will introduce the panelists briefly:

Dr. Edward Ramberg has retired after an extremely distinguished career at the RCA Laboratories. He was closely associated with Dr. Zworykin, in the development of television, the electron microscope, and the color TV tube. He is a Fellow of the IEEE, and RCA awarded him the David Sarnoff individual award. During World War II, Dr. Ramberg chose to make his contribution as an attendant in a mental hospital in the Haskins Laboratory where he worked on electronic aids for the blind.

Mr. Harry Davis is now a consultant in private practice. He also is a Fellow of the Institute. His very distinguished career of Government Service culminated with his last assignment as Deputy Under-Secretary of the Air Force.

Dr. Howard Levy is a physician. His concerns are with local delivery systems, medical ethics, and prison health care. He has been most widely known because of his extremely strong stand resulting in his serving 2 1/2-years of a 3-year court-martial sentence in the Federal Penitentary in Lewisburg, because he refused to instruct Special Forces trainees for service in Viet Nam in dermatology at Fort Jackson in 1967.

Dr. William Davidon, our fourth panelist, is Chairman of the Physics Department at Haverford College. He has been deeply involved in questions of social responsibility, he is the past President of the Society for Social Responsibility in Science, and he has participated in the Pugwush Conferences of Scientists on World Affairs. He started out as an Electrical Engineering student before transferring to Physics.

Gene Cory (William E. Cory) is also an IEEE Fellow and is currently the Technical Vice-President and the Director of the Department of Electronic Systems Research at the Southwest Research Institute in San Antonio, Texas. He has been involved in security with the U.S. Air Force Security Service in Communication, and with Lockheed Aircraft in Communications navigation and intelligence.

DR. RAMBERG:

I must address myself briefly to the question: "How Could the Engineer Discharge his Ethical Obligations in Relation to Military Technology?" In a sense military technology is just a special instance of technology in general. Thus, in this area also, the engineer is bound by the obligations which apply to him in all of his work covering both his relations with his employer and his obligation to society at large. The engineer, like indeed any worker, should be able to answer affirmatively these two questions: "Is the work well done?" and "Are the goals worthwhile and are the social consequences of the work acceptable?" However, it is clear that greater diligence is demanded of the engineer as compared with the ordinary worker, insofar as errors in design and planning have a much greater impact than errors in the execution of individual items.

Scarcely anyone will contest the requirements that work be well done; that is, that an engineer be knowledgeable in the fields to which he applies his skills and that he utilizes his knowledge with diligence. On the otherhand, we have heard only too often that goals and social consequences are no concern of the engineer insofar as they fall outside of his field of special consequence. Assume that they do fall outside of the area of his specialization. Isn't he still obliged to be concerned with the purposes to which his work will be put and the effect of his work on society? Are his obligations any less than those of a citizen during an election where the citizen must find out as much as he can about the issues to be decided and the qualifications of the candidates and cast his ballot on the basis of judgment formed in the light of that knowledge. In either case, the fact that the consequences of a particular vote or those of a particular engineering project may seem not foreseeable in detail does not excuse the citizen on the one hand and the engineer on the other from making an estimate on the basis of the best knowledge available to him and, furthermore, it does not excuse them from basing their decision, with respect to the vote or the carrying out of the project, on this estimate. It is, of course, easy to think of circumstances in which the criterion of the job well done could not measure up to the ethical obligations of an engineer. Suppose, for instance, that the reputed head of a crime syndicate asked him to set up systems of demolition charges at various points in the city with timing controls activated from his client's residence. Might not some concerns on the goals and social consequences of such a project be appropriate in this case? I don't think anyone would contest it.

Let's get tack to military technology. Here the goals are at least relatively clear. They are to create the capacity to destory, incapacitate, or kill, which may be employed directly or used as a threat against people outside and, in case of civil unrest, people within the national boundaries. The secrecy attached to a major portion of military technology is a logical consequence of this goal. To let our prospective victims know about our new weapons would be to invite their being turned against us. The engineer

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worth-while, and are the social consequences acceptable?" His answer will depend on his view of society as a whole, of the role of his government in society, and, eventually, the character of the military technology considered. If the engineer believes that his country is besieged by demonic forces bent on destroying it, forces that can only be stopped by developing a greater destructive capacity of its own, he will, of course, be eager to help develop the needed military technology. The view that security can be developed through and only through military hardware is almost invariably held by both sides during major wars and, even in peace times, it is held traditionally by those who have a vested interest in military hardware. If, on the other hand, the engineer's observation, either direct or indirect, convinces him that people everywhere, regardless of their social organization, are primarily concerned with building up an acceptable life for themselves, and that armaments which appear directed against this country are but a fear response to his own country's aggressiveness, he may seriously question the social value of military technology projects. He may oppose them because he can see them as increasing fears abroad, contributing to an armament race, and thus reducing everybody's security; he may oppose them because they will diminish resources available for social needs at home and abroad: and he may oppose them as an unwarranted dissipation of natural resources. Depending on his situation, he can express his opposition by political action, by advising against acceptance of contracts involving military technology projects, or simply by refusing to lend his talents to the carrying out of the projects. I have already mentioned that the judgment of the engineer in such matters may be affected both by his view of the role of his country in the world, and the nature of the military technology considered. This applies in particular to the distinction between defensive and offensive weapons. Thus weapons which, applied to the Swiss armed forces, can be regarded as defensive, could equally clearly be regarded as offensive weapons when applied to the United States armed forces engaged in aggressive actions in many parts of the world.

There is still another more general view of military technology which the engineer and indeed any citizen can take. It is that military violence is a basically ineffective and unacceptable method of resolving conflicts so that military hardware becomes irrelevant. What we then need is the development of other methods of meeting attack and opposition, such as non-violent resistance developed most effectively in recent times by Gandhi and Martin Luther King. These do not eliminate risk and danger, which appear inherent in life. On the otherhand, they are not as destructive of human personality as the methods used most commonly to settle differences and thus deserve much more consideration than they have had. We can at least conceive of a stable peace following conflicts resolved by nonviolent methods, whereas the peace or stalemate achieved through military technology such as the condition of mutual deterrence, is basically unstable and provides at best a breathing space for devising better ways for people to coexist. It is encouraging that at least one country, to my knowledge, is making a study of the use of non-violent methods of national defense.

DR. DAVIDON

I think it is impossible to discuss the relationship of technology with just the military without examining the inter-relationship between the military and the non-military parts of our society. They are very closely intertwined, and we would present a false picture by implying that the military is a thing onto itself. I also think that it is important that we not just discuss the situation in general, as it would apply at all times and all places. There are specific features about the United States in 1973 that need to of us in this room and our engineering societies as our activities relate, not just to the military, but to the U.S. Government and U.S. corporate policies.

I think that we are entering an increasingly serious crisis. One can try to estimate the extent of that crisis by looking at features of the society around us, including the causes and effects of fluctuations in unemployment and resulting job insecurity that faces the engineering profession. We can also look at the crisis in terms of the quality of life of the society as a whole; not those things that are specific to technology, but in which technology plays an important role. We can look at quality of life from the vantage point of a teacher at a small college in terms of the growing cynicism and disillusionment, of a lack of any real sense of identity with the future, which is increasingly present among young people in our society; a sense of very much focusing on the present and private life, looking at people in government as a bunch of crooks. That kind of an attitude, which has been quite prevalent in our society, I think is now infecting those pockets which in the past had resisted that general malaise.

I want to focus particularly on the role of technology in concentrating power in the world; the role of technology, both in this country and other countries, of giving to small groups of people immense power and of increasing the gulf between the "haves" and the "have nots". It has this effect in various ways. One is by creating capital intensive forms of both production and warfare. Capital intensive production means that if a group of people has access to sufficient material, sufficient technical and scientific knowledge, and sufficient skills, they can produce a variety of things without much use of human labor. This enables relatively small numbers of people not only to produce a great deal, but also to make decisions as to what is to be produced and how it is to be produced. That kind of an operation concentrates power--whoever has those resources is going to make those decisions. We have a comparable phenomenon in the case of warfare; I am pleased to see some literature on the table concerning automated warfare. It means that small groups of people in those societies which have access to advanced technology use those means to try to control the lives of large groups of people, to control entire nations.

There are other ways technology leads to concentration of power in our society. We can look at our global communication systems, where relatively small groups of people make decisions concerning what kind of communication networks exist, the use of certain communication systems for primarily one-way flow of communication; to enable, again, small groups of people to decide what is the environment surrounding the great majority of the people for most of the time. This concentration of power results from many factors, and one particular aspect of it is the role of technologists--of engineers, of scientists, and of technicians--in encouraging this development. To examine that, we have to look for some of the causes for this concentration of power. I don't think that this is an automatic consequence of technology. I think we can get an easily identifiable aspect of what is happening by looking at some of the things that are happening within the government. We see a situation where the Executive branches of government have been consistently usurpring powers that had been more widely diffused, using a variety of means which technology has provided, in order to consolidate its power; making available to the decisionmaking process what it needs, and seeing to it that those facilities are not available to other groups within the government. It is achieved by the limitation of information. It is achieved by the ways in which monies are appropriated within science and technology and other areas. It is achieved by the kinds of appointments that are made, what

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courages. It is achieved through the "club" which is held over individuals within the Executive structure; for example, when a Fitzgerald comes out with an independent statement concerning how money should be used within the Air Force, he finds himself kicked out of a job. There are a variety of techniques by which the Executive branch of government has concentrated its power, but I by no means want to imply that somehow all the problems lie with that particular group of people. I can cite similar examples with regard to multi-national corporations, and the ways in which multi-national corporations use science and technology as part of a consolidated effort to try to maintain and to increase their power. The people who engage in this don't have horns on their heads; many of them are fine, decent individuals, who recognize many of the problems and would like to improve the situation, or who find themselves struggling in a very complicated, interwoven mesh. I think one loses the ability to understand the structural causes, the institutional causes for this concentration of power if one looks at it as the result of individuals who somehow are power-hungry and grasping. Most of the people involved in this process are not primarily interested in cannibalizing the rest of society, but, nevertheless, the effect can be the cannibalizing of the rest of society.

We might picture the military as sort of a defensive instrument of a constructive, democratic society, trying to protect this society from the ravages of totalitarian states. This is a false picture of the military that I think ought to be brought to the surface and really challenged. Most of us are looking for ways to challenge totalitarian militaristic societies, wherever they exist in the world. To deny the existence of dictatorships and the destruction of human life in various parts of the world is a grave mistake. The military fails to deal with this. Our military has kept in power a few dictatorships to the tune of some $20 billion or more over the past year. It has engaged in intervention in Guatamala, in Iran, and in the Dominican Republic, to protect some specific interests of certain people in the United States. To call that "defense" is as misleading as it was to call the German military under Hitler "the Wehrmacht"--the defense force. The major activities of the U. S. military over the past few decades has not been defense of the country as a whole, but to protect and extend the power of certain small groups within the country. Obviously, many of the individuals in the military see their purpose as one of really trying to correct the injustices; they are unhappy about this general getting fired, they would like to see no invasion of the Dominican Republic, etc. But the structure--not just the military structure, but the political and economic structure with which it is tied--do not function that way. Those kinds of reforms are not encouraged, don't grow, even though there are people who feel that way.

I think it is important in that kind of context to ask some questions as to where we fit in. What do scientists, engineers, and technicians do in that kind of context? I just want to conclude by quickly running down some of our options. One of them has to do with the conditions of our work, our job situation--not only the shoice of jobs, but the circumstances of our jobs. Do we have sufficient security in our jobs so we can speak honestly, engage in discussions, test ideas with the people around us, people with whom we work, our families, our friends, and our community; or are we concerned that if we speak honestly, our future in our particular job situation will be jeopardized? What role can our engineering societies play in trying to protect those individuals whose jobs are made insecure because of their efforts to call the shots as they see them? We should ask questions such as: Who is making the decisions? Who profits will last for a few years, maybe another decade, but has no real tie with any kind of long-range future?

Another area of choice for scientists and engineers is the extent of our teaching activity, and teaching is something that is done in a variety of different contexts in our society. There is a very real need--if one is to try to build the situation where more people have power, where power is not highly concentrated in the hands of small numbers of people--for us to reach out, to make people feel at home in their surroundings, to make people feel that they are not caught up in such a complicated mesh that all they can do is retreat into their own private lives. That kind of education can occur in many different ways: it can occur from adult education classes; from discussions and programs on television; from participating in activities in our high schools; community groups of various kinds; displays in the local library. Try to create a climate in which people don't feel that technology and political power are all so out of hand, so far beyond their understanding, that they are just helpless. Engineers and scientists have a particular role to play in that kind of waking up of a population as to what its potential might be if it can overcome the obstacles.

We have real choices to make concerning our organizations. What role does our organization play in trying to face this crisis? Some organizations try very hard to cushion concerns in this direction by providing innocuous outlets for them. We have a little session and people can see that we have all gotten together on matters of concern--as long as it does not create any danger, as long as it does not threaten the large corporations that finance the multivaried activities of IEEE, as long as one does not seriously question or create agitation which diverts people whose talent may be needed by the military. They create a conscience-salving technique so people can feel concerned once or twice a year, maybe once every three or four months, so they can better go about their daily business. That is one kind of role organizations can play. I think it is important to realize the dangers of that role so as to prevent it from happening. There are other kinds of organizations, such as the Committee for Social Responsibility in Engineering, which, I suspect many of you know, has been organizing activities related to this INTERCON convention. They also put out a magazine called "SPARK," with articles about what groups of enigneers in different places have been doing. There are other organizations that are not just for engineers. There is a project around Honeywell Corporation, and there are projects at General Electric Compnay, in which people try to face the specific situations in which they find themselves and do something about them.

There are choices that we can make not only about our jobs, about our teaching activities, about our organizational involvements, but also in the area of direct action. There are various kinds of direct action. A group at Bell Labs, protesting the corporation effort to get people--both research and non-research people--to buy war bonds. Tony Russo, an engineer, and

Daniel Ellsberg, whose background is in mathematical economics-their scientific and engineering background gave them access to information which they felt was important to make public. Direct action at the plants of the Dow Chemical Corporation in Midland, Michigan a few years ago--where a large collection of magnetic tapes, on which information about various kinds of nerve gases had been stored, were simply erased at one time. At the American Machine and Foundry plant in York, Pennsylvania, hundreds of bomb casings were made unusable by methods involving a certain amount of technology. There are a variety of kinds of direct action, as well as teaching activity, organiza-

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tional groupings, and our choice of jobs, that I think have to be considered when we talk about our interaction with military technology.

MR. CORY:

The previous speakers have presented a wide range of topics and covered many of the points I had planned to make. I would like to first put you in my place, if I can, and then make a few points that I don't think were adequately covered. The speakers were chosen in the light of engineering content of modern warfare and its consequences. I am not quite sure what the organizers of this panel thought my viewpoint was, or why I should be on the panel. I accepted that invitation so that a representative, this may have been their thought, of the IEEE Board of Directors would be on the panel.

I basically feel that an individual should always endeavor to work constructively for solutions to whatever problems and circumstances he finds himself in. This means that we must take the developments of science, and we must use them to accomplish the goals of our society and the organizations that we work in, or to improve our environment or our own personal surroundings. For this purpose, I don't think it matters whether it was developed by military research or by efforts to find cures for cancer. Some say that there is good and bad research, that research aimed at finding ways of killing people is bad. All I can say to that is science cannot be contained: by this I mean that if a principle is discovered, someone will find a way to employ that principle, and most of the time that employment will not be along the lines for which it was originally intended.

I am idealistic enough to believe that we should work to eliminate war, but I am practical enough to recognize that war is here with us every day, every moment of our lives. It is something that we are very intimately involved with. Disease is war between organisms; crime is war between individuals, or between individuals and our social institutions. I realize that most of us talk about war as an application of the military arm of power and that one or more nations tries to utilize it generally to achieve their own goals. Of course, there are several other forms of power: economic, political, natural resources, people, materials, geographic location, and, of course, technology. I think that most of us get rather personally involved in discussions of this kind. Many people state that they are not as concerned with the ethics and morals of the people who work with the development of technology, as they are concerned with who is actually controlling the use of that technology. Let me say that I am thankful that we do live in a free society, despite what we heard from one speaker today. The fact that we can hold meetings of this type, where we can individually express our viewpoints and discuss them, is proof of the freedom of our society. Now, I would like to get on to the open discussion which I consider to be the real interesting part of this workshop.

Thank you.

NEWS, NOTES AND COMMENTS

Update on BART

Despite optimistic predictions by BART's management, trains are still not running under San Fracisco Bay. Cutting down commuter auto traffic between San Francisco and the East Bay area was of course the principal motivation for construction of the system.

But the automatic train control (ATC) system on which BART relies for safe operation is still not functioning properly. Limited service is being provided on 3 East Bay lines and, since early November, into San Francisco from Daly City (West Bay). But trains must be dispatched from each station by platform guards who first phone ahead to verify that the track is clear.

Testimony in October before the California Senate Public Utilities and Corporations (PUC) Committee indicated that no solution is in sight. Although ordered by the Public Utilities Commission in February to comply with the recommendations of the Lovell-Oliver-Brobeck report, progress along these lines has been minimal, according to Legislative Analyst A. A. Post.

BART apparently relied on wheel scrubbers and stainless steel beading to correct the "undetected train" problem, but tests in September indicated that, as many had predicted, this is not an adequate solution. The PUC will not authorize use of the trans-bay tunnel until the ATC system can be shown to be reliable.

Meanwhile, the three engineers fired by BART in 1972 for having called attention to the incompetent manner in which BART was handling the ATC development (as well as other evidence of poor engineering management) continue to press their law suit against BART. Depositions have been taken, but no trial date has been set.

Several Readers, responding to the BART article in the September Newsletter, have suggested that some form of support be organized for the BART engineers. Those wishing to help in any way, or who have suggestions (for publication or otherwise) are urged to write the Editor.

*See CSIT Newsletter, Sept. 1973, pp. 6-8.

Continued on page 19...

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SOUTHEASTCON '74 (April 29 - May 1, 1974)

Special sessions are being planned for the 1974 Region 3 Conference and Exhibit in the general area of professional activities. Projected topics include:

Professionalism

Ethical Standards in Industry

Engineering Management

Pensions and Fringe Benefits

Salary Compensation

Manpower Regulation

Equal Employment Opportunities

Combating Obsolescence

Government and Legislative Matters

Social Responsibility of Engineers

Technological Impact, Responsibilities and Liability

The conference will be held at the Dutch Inn at Lake Buena Vista, Orlando, Fl. Further information may be obtained from the conference chairman Claude E. Jones, Mail Point 417, Martin Marietta Corporation, P.O. Box 5837, Orlando, Fl. 32805

INTERCON'74

THE TECHNICAL PROGRAM COMMITTEE OF THE MARCH 1974 IEEE INTERNATIONAL CONVENTION HAS INVITED CSIT AND EQC (IEEE ENVIRONMENTAL QUALITY COMMITTEE) JOINTLY TO ORGANIZE THE MONDAY EVENING "HIGHLIGHT" SESSION ON MARCH 25

THE TOPIC WILL BE: "AFFLUENCE AND EFFLUENCE"

Must affluence produce undue effluence? Does a rich society have to be a wasteful society? Is unnecessary waste caused mostly by lack of forethought or do some of our unstated valued produce the problems? Moderator - Ed Davis

These and other provocative questions will be explored by the panel:

1. Dr. Albert J. Fritsch - Waste in Product Manufacture Co-Director - Center for Science in the Public Interest
2. Peter Passell (To be announced) - Economics of Recycling
3. Dr. Victor Paschkis - Waste of Human Resources Founder - Society for Social Responsibility in Science and, Professor Emeritus Mechanical Engineering Columbia University
4. Dr. Seville Chapman - Energy Waste Director - Assembly Scientific Staff New York State Assembly

CABLE TELEVISION

Sixty Engineers in the North Jersey Section met with 22* municipal officials from ten townships to discuss the questions: CABLE TELEVISION: WHAT CAN IT OFFER? DO YOU NEED IT? The occasion was a special Section meeting which lasted 3 1/2 hours on the evening of October 24, 1973. Before the extensive question period, four panelists spoke for 15-20 minutes each. They were:

Mr. Hubert J. Schlafly,
Vice-President for Technological Development
TelePrompTer Corp., New York, N. Y.

Mayor Thomas E. Ford,
Mayor of Leonia, New Jersey and Program Officer,
Alfred P. Sloan Foundation

Mr. Robert Powell,
Research Associate, Center for the Analysis of Public Issues
Princeton, New Jersey

Mr. Arnold Sparr,
Director of Communications Materials
Public School System, Hicksville, New York

The disucssion was moderated by the Secretary of CSIT. The Section Officers and Executive Committee arranged for publicity and the use of the ITT Auditorium, Nutley, New Jersey.

The purpose of the meeting was well served: municipal officials who were currently making decisions on CATV franchise awards were provided an opportunity to meet with and question engineers who lived in their communities; the engineers were presented with an opportunity to confront their professional responsibility to explain to non-engineers some technical aspects of their work and to recognize some social implications. As a consequence, there may be greater local interaction between engineers serving in an advisory role and their elected officials who must often make decisions based on inadequate understanding of the technical and social implications.

*Over 200 letters of invitation were sent; 10% response was observed.

Peter D. Edmonds

Editor's Note: Readers are invited to contribute notes or papers to this Newsletter on CATV problems (and, hopefully, solutions) of interest to communities and engineers, e.g., involvement of CATV firms in the formation of CATV legislation, community CATV standards and specifications, alternatives to coaxial cable, joint use of CATV cable for computer links, etc.

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TELECOMMUNICATIONS AND SOCIETY

Preliminary plans are currently being formulated for a Special Issue of the IEEE Transactions on Communications devoted to Telecommunications and Society. The editor of this Special Issue will be Prof. Mischa Schwartz, Visiting Professor (1973-1974), Department of Electrical Engineering and Computer Science, Columbia University, New York, N. Y. 10027.

As currently envisioned papers will be both contributed and invited, covering topics in the following three areas:

1. Future uses of communications (CATV and wired-city concepts, domestic satellites, computer-communication networks, urban communications, etc.), and some of the possible benefits due to enhanced communications;

2. Economic, social, political, regulatory aspects of communication systems of the future;

3. Policy implications arising from the considerations above.

Overseeing this Special Issue of the IEEE Transactions on Communications will be members of the newly-formed Committee on the Social Implications of Telecommunications of the IEEE Communications Society, working in close cooperation with the Working Group on Communications of CSIT. It is hoped to attract papers from engineers, social scientists, government officials, and others involved in the broad area of telecommunications and society.

Individuals interested in contributing papers are urged to send copies for review to Prof. Schwartz at the address given above. Individuals interested in serving on either one of the two groups mentioned above - the Communications Society Committee and the CSIT Working Group on Communications are also urged to contact Prof. Schwartz.

SPEAKERS'S OPPORTUNITY IEEE REGIONAL OUTSTANDING LECTURE TOURS

In 1972 a score of U.S. members gave lectures at IEEE section meetings in Europe and Japan when they were visiting these areas on business or vacation. The opportunity is still available for competent, audible and interesting speakers visiting any part of the world, who can advise IEEE headquarters approximately three months in advance of their travel plans, even if these are tentative. Do not delay until everything is definite; by then it maybe too late to assemble the audience.

The expenses of deviating from your itinerary to fulfill an IEEE speaking engagement are reimbursable from IEEE funds for this program. Intercontinental travel costs are not reimbursable.

If you are interested in serving in this speaking role, please contact Dr. Peter D. Edmonds, IEEE Headquarters, 345 East 47th Street, New York, N.Y. 10017 - Phone (212) 752-6800 Ext. 333 and advise him of your topic, probable itinerary and dates, and the name of a technical colleague who has heard you speak and could function as a peer reference. Your Group/Society Officers would be glad to receive an information copy of your initial letter.

CALL FOR BIBLIOGRAPHY SUGGESTIONS

The Working Group on the Bibliography, is assembling material to be published by the IEEE as a bibliography on the Social Implications of Technology. [1] The immediate need is for items for inclusion - will all interested members please submit any title or titles they feel would be valuable. No decision has been made on whether the bibliography should be annotated, and any suggestions as to format would be welcome.

Any members interested in working on this project are urged to communicate with:

TED WERNTZ
923 Walton Avenue
Bronx, New York 10452
(212) 537-2973

1. The AAAS Bibliography, "Science and Society," (1971) is a possible Working Model. $1.