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SOCIAL IMPLICATIONS OF NUCLEAR POWER

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Session Chairman: Seville Chapman, Scientific Staff, New York State Assembly, Albany, New York.

Panel: Carl J. Hocevar, Andrew C. Kadak, Chester R. Richmond, Arthur Tamplin.

Dr. CHAPMAN: As moderator of this session, I want to start by making a few comments. If the three most important problems facing the world are war, food, and energy, all are related to tonight's discussion. Nuclear power and nuclear warfare clearly have something in common. Nuclear energy and the fertilizer that's necessary to produce food clearly have something in common. And energy itself is what makes the wheels of industry go round and provides our jobs--and keeps our houses and hotels too warm.

This is a very important topic; it is also a very broad one. Just to identify some of the immediate interest that attaches to it... I have here Assembly Bill 7104 introduced last week by Assemblyman Haley which is called the Safe Energy Act (State of New York Legislature). In effect, although not in so many words, the bill calls for a nuclear moratorium in the state of New York.... Here's something from the National Conference of State Legislatures. The first headline is "Vermont Requires Legislative Review of Nuclear Plants" and the next headline is "Petroleum Resource Depletion"....Here is another item from the National Conference of State Legislatures about a series of meetings at Oak Ridge next week on nuclear power as it affects state legislatures...Here's an editorial from the New York Times one or two days ago referring to the Federal Circuit Court of Appeals' decision on a nuclear power plant in the state of Indiana....One of our other societies --I say this having been a long time member of IEEE--is going, two weeks from today, to have an energy round table involving senators and others....Well, this one is now almost two weeks old: "Fire Raises the Issue of Safe Reactors With Respect to the Tennessee Valley Fire in a Nuclear Power Plant"....And the last item I have--it's not quite the right headline--but it says: "Jobless is the Highest in Thirteen Years." As I say, that's out of date because it's now the highest in thirty-three years. Certainly there is an impact on jobs if you have brownouts and blackouts and so on....So the issue of nuclear power is pretty critical.

The format of tonight's discussion will be that the four panelists will each speak for ten to fifteen minutes. After that, for a few minutes, the panelists will have at each other. Then the discussion will be opened to participants from the audience. Of course everyone speaks for himself--not for any organization with which he might be affiliated.

Someone has asked that the moderator give some evidence of objectivity, which may be difficult, but I want to say a few words on this point, especially in view of Mr. Benjamin's comment about the New York State Assembly Scientific Staff being a kind of pioneer staff in dealing with public policy. Yes, we were the first day-to-day staff. There are at this moment eleven states that have some sort of mechanism involving either the legislature alone or the legislature and the governor. The total number of people involved is about a dozen. New York has in

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the Assembly a staff of six people counting two secretaries. There are some initiatives in other states. But the point is that we as engineers have had relatively little impact on the policy making branches of government and I think we can use a lot more. Well, in dealing with legislators, I regard it and they regard it as my obligation not to take a position of advocacy, but to explain the consequences of alternatives. They make the decisions.

They have their values. My objective is to explain the facts as simply as possible.

It seems to me that today there are four major possible courses of action in regard to energy. They are: conservation, which is certainly an imperative; coal; nuclear; and, to some extent, solar energy. There are other courses. Perhaps a fifth one.... some people have said that the choices are coal, nuclear, and bundling. Oil production in this country has been going down for five years and natural gas peaked out last year, so we really have something of a problem. A news item in the New York Times Sunday said that within five or ten years the OPEC countries would have enough dollars to buy all the stocks on the New York Stock Exchange. Well, coal certainly has its environmental hazards and its health hazards. Nuclear fission certainly has its waste disposal problem and there are its safety problems. Solar energy for supplementary heat is available today, but for electricity it is some time off.

Before the meeting, none of the panelists seemed to be anxious to speak at length about the breeder reactor. I would therefore like to ask the panelists to say a sentence or two about it and if that's all they want to say--fine.

Well, I think it's time for me to introduce the first speaker, Dr. Andrew Kadak, a nuclear engineer with a Ph.D. from the Massachusetts Institute of Technology. Dr. Kadak has worked for a number of well known engineering firms, but he is more concerned at the present time with a group called the Energy Research Group, which feels strongly that increased public participation in the energy issue is essential. Dr. Kadak is one of the authors of the book "The Nuclear Debate: A Call to Reason." Dr. Kadak, if you would begin the discussion...

Dr. KADAK: Thank you very much.

Our society is a troubled society. It is a society in which:

1. We see consumer advocates recommending high price energy alternatives.

2. We see environmentalists campaign to stop a present energy alternative which has the smallest environmental impact.

3. We see individuals who are concerned over public health and safety come to justify and equate the one hundred to two hundred deaths due to emphysema, lung cancer as a result of operation of fossil power plants to the less than one death as a result of nuclear power plant operation.

4. We see individuals equating actual accidents such as oil spills, tanker collisions, refinery fires, dam breaks to hypothetical accidents whose probablity of occurring and consequences are equal to that of being struck by a meteor.

5. We see individuals highly critical of the safety of nuclear power which after 2,000 reactor-years of operation has injured no one in the public sector.

6. We see economists trying to ignore the evidence that clearly shows the cost of electricity paid by the consumer going down as a result of the operation of nuclear power plants.

7. We see seemingly competent technical people suggesting that the implementation of a new technology, a future energy source, will not suffer the same difficulties of development that current energy sources have suffered. All they say it takes is money and success is assured. We hear these same people say that nuclear waste disposal problems are insolvable.

8. We see knowledgeable people in both industry and government who can provide such needed leadership strangely silent.

9. We see opponents of nuclear power support legislation that makes the nuclear alternative even more economically favorable.

10. We see the nuclear debate as a competition between how many Nobel laureates you can get to sign your petition.

11. We see people being told to conserve energy. For that effort, they pay higher electric bills.

12. But worst of all, we see energy policy being made by an uninformed congress who gets most of its technical information from newspapers and television escapades of sensationalism.

It seems to me that the crisis we as a country are in is not one of energy but one of identity. This country has experienced difficult times over the past ten years. We have lost trust in our institutions which have led us into many of the controversies of the decade. "The Social Implications of Nuclear Power", the subject of the seminar, ought to be renamed "Therapy for the American Public". If we successfully survive this energy debate we shall be well on our way to social and economic recovery.

It's about time we face reality; accept the fact that we need energy and act responsibly. The Ford Foundation Energy Policy Project suggests that even with zero energy growth our energy needs by 2000 will increase by 33%. How will we supply it?

Ralph Nader notwithstanding, oil and natural gas are in short supply, too expensive and are simply too precious to burn. Solar energy, wind, tides, fusion perhaps, but not for the 1980's. Most of these suffer from an insufficiently developed technology and large-scale commercial feasibility has not yet been demonstrated. Our goals ought to be the development of renewable energy resources, but let's be realistic. For most of these to have any significant impact, we will first have to wait until the turn of the century even with vigorous development programs.

So what are we left with...coal and nuclear power. Let us compare for the sake of argument coal, oil and nuclear power on the basis of safety, plant availability, cost of power, and environmental impact.

The most extensive existing report on nuclear safety was issued last fall by Professor Norman Rasmussen of the Massachusetts Institute of Technology. His report predicts that the chance of 1,000 deaths as a result of a nuclear power plant accident is equivalent to the chance of 1,000 deaths as a result of a meteor impact. If we were to compare man-made hazards to the risk of a nuclear power plant accident, we would see that the risk of a nuclear power plant is 10,000 times less than the risk associated with the worst type of other man-made technology. If we examine the risks due to normal operation, it is clear that coal offers the most risk to the general public.

What about the environmental impact of coal, oil and nuclear power? The Council of Environmental Quality report indicates that coal has the most severe impact on our environment. Nuclear power and oil are essentially equivalent in their environmental impact.

There is always the question raised about waste disposal. Once, again, we have to make the comparison between coal, oil and nuclear power. Each coal plant produces roughly 200,000 tons of waste per year. Now you compare that to the roughly one ton of waste per year from a nuclear plant. If we are going to extrapolate this to a nationwide average, you would see that somehow we have to discard roughly 30,000,000 tons of waste per year from coal burning facilities and on the order of fifty to sixty tons of waste per year from the nuclear power industry. There are techniques available today which can handle the much more manageable problem of radioactive waste storage.

Let us examine what it costs to produce power via these alternatives. Present estimates of the cost of power in 1980 show that the nuclear option is roughly 50% cheaper than oil and 35% cheaper than coal. As a matter of fact, if we just look at the fuel adjustment alone, a typical New England family saves roughly $120.00 per year by the operation of these nuclear power plants. A classic example of how nuclear power can save the consumers money is demonstrated in the State of Vermont where 50% of their electrical capacity is generated by nuclear power. In 1973, their costs were 26 mils per kilowatt hour. In 1974, they were 20. So far, in 1975, their costs are 17 mils per kilowatt hour because of the operation of nuclear power plants.

We hear much about statistics on availability and capacity factors for nuclear power plants. We hear very little about the availability and capacity factors of coal-fired units. If we were to look at the statistics and compare similar sized power plants, we would find that the nuclear availability is roughly 75%, whereas the fossil availability is approximately 71%.

A reasonable conclusion is that at the turn of the twenty-first century, we will be generating between 70% and 80% of our electricity with coal and nuclear power. Most of this percentage will undoubtedly be nuclear. We will be doing this because of a concern for the economic and social welfare of the country and not in spite of that concern.

If we face a danger in the development of alternative sources of energy, it is from a reluctance to act responsibly rather than from a lack of a solution. Speaking last year before an American Nuclear Society Meeting, Representative Chet Holifield of California put it this way:

"We have among us energy philosophers and social critics who wish that coal was not dirty and plutonium was not dangerous. They dream of energy Utopias in which the power we need will be nice and clean, without limit, and available to all. Where will that power come from? Maybe from the sun, from hot rocks in the earth, by harnessing the winds and the tides, or by forcing atoms to come together rather than to break apart."

"We have a challenge, a challenge that affects our survival and freedom and dignity of our people. We need to be strong in our resolution, firm in our purpose. Otherwise, the nation will be racked by sterile controversy and reduced to corrosive immobility. And the energy pundits will suffocate us with their options."

Thank you very much.

Dr. CHAPMAN: Thank you Dr. Kadak.

Now we are to hear from Dr. Arthur Tamplin. I cannot anticipate his remarks but I suspect that they will be along somewhat different lines. Dr. Tamplin has a Ph.D. in biophysics from the University of California at Berkeley. He was with the Rand Corporation for a while and with the Lawrence Radiation Lab. for thirteen years. Recently, he has become affiliated with the Natural Resources Defense Council in Washington, D.C., and he also serves with the Environmental Center in Sweden. Dr. Tamplin has a long record of interest in and contributions to the fields of biophysics and nuclear power. Dr. Tamplin....

Dr. TAMPLIN: Thank you.

The social implications of nuclear power are very broad. You can't discuss nuclear power in a vacuum, and in considering the social implications of nuclear power I think that society has to first ask the question: "Why more power?" The United States has 6% of the world's population and we consume some 36% of the nonrenewable energy resources of the world. We also consume about the same percentage of the world's depletable natural resources. Our population growth is down to something like 1% a year....the driving force behind the so-called need for more energy in this country is generally stated to be the gross national product, and the gross national product somehow or other is supposedly related to jobs and the standard of living in this country. But if you look at the situation over the past several years, our gross national product has increased, our energy consumption has increased, and we've seen along with that the strange phenomenon of an increase in the inflationary spiral while the ranks of the unemployed are growing. There's no evidence from our recent history that the consumption of more energy is going to do anything but increase the spread between rich and poor, and increase the total number of poor. I was at an AAAS Meeting a couple years ago when an economist said, "You know, when I look at the economy and look at all the electrical energy that everybody's talking about and the fact that this electrical energy is going to solve the problems of poverty, the only conclusion that I can come to is that they're going to use that electrical energy to electrocute the poor." And to a considerable extent I think that's the case.

One of the other social implications involves the manpower associated with nuclear power. You've probably heard about Dr. Weinberg's article in Science, in which he indicated that nuclear power will put strains upon our institutions which they are quite unaccustomed to. He indicated also that to live safely with nuclear power you need a cadre of very high expertise to oversee this industry. He indicated that you need meticulous attention to detail at every step in the design, construction and operation of nuclear power. Now one might imagine that at the outset a glamorous industry could attract individuals of very high expertise. But if you look down the line, with the rapid expansion of the industry and when the glamorous aspects have sort of turned into the commonplace operations of an established industry, you wonder what kind of people you're going to have operating that industry. And if you look at the nuclear power industry today and ask "Is there a meticulous attention to detail?" you see things like tritium showing up in the drinking water at Broomfield, Colorado....the fact that two power plants were halfway completed and another one was under construction before the Atomic Energy Commission learned that they were being built over an earthquake fault. You can go through a litany of this kind of thing that does not represent the meticulous attention to detail that is required, particularly as you look down the line to where you're going to have four or five hundred of these reactors. And the hope that this problem will be solved by carrying on as we have with industries which are far less complicated represents, I think, a serious problem.

There are the moral and ethical considerations associated with radioactive waste from nuclear power plants. It's easy to conceive of being able to build concrete mausoleums to store this radioactive waste in, but is that the kind of thing that a society should do--impose that burden on a large number of future generations? This material has to be isolated for something approaching a thousand years. It's something unique in the history of man....our social institutions haven't existed with that kind of longevity in the past.

Another implication associated with nuclear power involves the plutonium. Plutonium, of course, is something that has to be isolated for hundreds of thousands of years--certainly it's longer than the recorded history of mankind. But in addition to that, plutonium is the material from which atomic bombs can be made. With the wide spread of nuclear power throughout the world, we're seeing an increase in the number of countries that are joining the nuclear club. The recent explosion in India is an example. The fact that the Israelis have some 50 kilograms of plutonium makes one wonder what the international implications of that will be in the future. But not only will it be national groups... subnational and terrorist groups will also be able to do this. Without elaborate technology you can make a bomb that gives off a pretty big bang...this is a bomb, not a nuclear weapon that we're talking about. Now, the response which our governments are making to this problem of the diversion of plutonium into the manufacture of illicit bombs is to increase security. I've heard the argument: "Well, there are a lot of people in the government who have security clearances and therefore it must be all right." I've spent some 20 years of my life with either a "Q" or a top secret clearance. That doesn't mean that it's right or that a society should have that situation very broadly extended. The security clearance doesn't just affect the individual who is cleared...they collect dossiers on his friends and on his family. I think it's a very serious question as to how much more governmental investigation into the lives of private citizens a free society can tolerate. This isn't just an idle question. At the Kerr-McGee facility in Crescent, Oklahoma, they had a series of events with plutonium spills, plutonium appearing off site...and there developed there what you might call a social common mode failure. Karen Silkwood was killed on her way to a conference with an attorney and a New York Times reporter. And since the sequence of events were juxtaposed, the question arises: Was that a common mode failure or was it just an unfortunate coincidence that she was killed on her way? Well, anyway, they eventually closed down the Crescent facility to investigate the problems and they requested that the employees take a lie detector test. Now you can imagine the consequences for the employee who would choose not to take that particular test, and certainly it's an individual's right in a free society to refuse such a thing. But they conducted the tests and afterwards the union talked to these employees and made a list of the questions that they could remember having been asked. Some of the questions were: "Have you talked to the press? Are you a member of the union? Do you know Steve Wadga?"...he's one of the attorneys for the Oil, Chemical, and Atomic Workers Union. "Have you stolen anything from Kerr-McGee or do you know anyone who has? Do you take or use narcotics? Do you know anyone who takes or uses narcotics? Have you ever done anything detrimental to Kerr-McGee? Have you ever talked to Youngheim, Bromley, Wadga, or Bernheim?"...a couple of those people I know are anti-nuclear critics. "If so, what did they ask you and what did you tell them? Have you been or are you involved with any anti-Kerr-McGee or anti-nuclear activities?"...you know that in Texas the State Police were collecting dossiers on anybody who was anti-nuclear. "Did you ever talk to Karen Silkwood? Have you ever done anything that you could be blackmailed for?"...I imagine everybody said yes. "Have you ever had an affair with an employee at this plant? Have you ever removed nuclear material from the plant?" Well, I think that if we are beginning to put into the commercial sector of society hundreds of tons of material which requires employees to be subjected to this kind of interrogation, then we had better work very rapidly towards alternatives to this form of energy. Our social institutions just will not survive the requirements of the semi-crystalline society which nuclear power and plutonium will cause.

Thank you.

Dr. CHAPMAN: Thank you, Dr. Tamplin.

Turning to my right...we have Dr. Chester Richmond, who is Associate Director for Biomedical and Environmental Sciences at what I call the Oak Ridge National Laboratory, but which I learn has been renamed the Holifield National Laboratory. Dr. Richmond has a Ph.D. in biology. He has been at Los Alamos for, I suspect, more years than he cares to enumerate here. His last position there was Alternate Health Division Leader. Among his distinguished awards was the E. O. Lawrence Medal in 1974. He is a member of a number of professional societies and is a council member of the National Council on Radiation Protection and Measurement. He has published a large number of papers in the field of radiobiology and many of these have been on plutonium. Dr. Richmond...

Dr. RICHMOND: Thank you.

I think it's current knowledge among people in your discipline that science and technology are somewhat in disfavor today. I'm reminded of a recent statement by Buckminster Fuller that more technology, not less, is needed by mankind today. He went on to point out that we are not facing an energy crisis or a pollution crisis but an ignorance crisis. We've already heard comments this evening about the stability of social institutions. I might add at the outset that many people firmly believe that if we don't solve our energy problems prior to the ice ages, which aren't that many years away, there won't be any social institutions.

It's very difficult to talk about the social implications of one technology, that is nuclear energy, without addressing problems associated with other technologies. We're really talking about energy generation. It's already been pointed out that the near term options are conservation, coal, and nuclear energy. Over the longer term there are other alternatives, but the lead times to develop these are quite long. And let me assure you of one thing, as one who's been personally involved in problems related to biology and the environment: The closer we get to implementing these alternatives, the more aware the public will become of some of their attendant health and environmental problems. One example: It's easy to put a solar heater on your house--it's been done for years. But if you're talking about powering a city ...running hospitals, social institutions...and you start talking about beaming down concentrated rays of energy in laser beams, I can assure you that people are going to say "Don't miss" and "Don't wipe out my town." The closer you get to a technology, the more aware you become of the potential problems. But when one considers the complete cycle from resource through utilization and disposal, it's very clear that some cost must be borne by society in terms of the effects of the energy producing technology on man and his environment. We must consider these collective effects in a rational, unbiased manner within the ever present framework of political and economic reality. We cannot escape this. Perhaps one example might suffice: The countries which own much of the world's oil reserves know that they aren't going to last forever, and they too are looking at options--including nuclear.

The breeder reactor was mentioned earlier. This is not a new technology. The Phenix reactor in France is now supplying electricity, commercially. The breeder reactors are being pursued in other countries including England and Russia. There are problems with any technology and the challenge is to solve these to the best of our ability.

I'd like to mention a few things about coal and nuclear right at the outset. We've already heard that there isn't a great deal of mass involved in the fuel of a nuclear reactor. If we compare the fuel requirements of a 1000 megawatt electrical (Mwe) coal plant with a 1000 megawatt electrical nuclear reactor, several things become apparent. In the case of the coal fired station the fuel is outside the system; in the case of the nuclear plant the fuel is contained within the system. Now this might seem to be a minor point at first but you should think about this. A 1000 megawatt electrical plant requires about 3 million tons of coal each year. This compares to about 54 thousand tons of uranium ore to operate a 1000 megawatt nuclear electrical plant for one year. We are asked about what we're going to do with the nuclear "ashes." I think the public must address itself to the question of what are we doing or what should we be doing with the ashes from the coal fired plants--especially when we have large thousand megawatt electrical plants. The coal plants will be an environmental problem. We have the fly ash problem. We have the oxides of nitrogen, the sulfur compounds. We have materials that are known carcinogens. Society has already elected to live with those kinds of health stresses and health problems. Now, I think what people have to do is step back and look at each energy resource and consider what impact it causes on the environment beginning with mining, for example. Then they have to consider the transportation problems. They have to consider the public health problems: Black lung from coal and lung cancer among the uranium miners (much of it related to the early days in the deep mines). My point is that if anyone tells you that you're not going to pay a price to produce electrical energy, don't believe them. We know you are going to pay a price. It's a matter of establishing what that price is going to be. Nothing of value is gained for nothing. As one of our most prominent ecologists, Barry Commoner, said in developing his four laws of ecology...."There's no such thing as a free lunch."

What I'd really like to talk to you about is that there exists right now a lot of misinformation concerning the public health effects of plutonium and actinide elements on man. Much of this information is not consistent with the actual record. There have been many charges made about increased incidence of cardiovascular disease and cancer--and almost anything else you can think of--in areas where nuclear reactors are located. When such charges are made, the news media often respond in such a way that each allegation is widely publicized and very often presented as being factual. These charges have been investigated by various organizations including the Departments of Health in several states and the U.S. Environmental Protection Agency. None of these charges has ever been substantiated...None! And in many cases the investigations have strongly suggested that poor reasoning or analyses were used as part of the original arguments. The record also shows that, to date, no nuclear power plant has ever experienced an accident that resulted in measurable damage or injury to the public. I find it particularly interesting that little publicity is given to the studies conducted to see whether or not the charges or allegations are fact or fancy. The following short article was tucked away on a page of the Knoxville News-Sentinal of April 5, 1975, along with some movie advertisements: "The Argonne National Laboratory in Illinois reports that radiation from the nuclear power plant at Charlevoix, Michigan cannot be blamed for the area's unusual number of infant deaths. The laboratory, which specializes in atomic research, said radioactivity released from the Big Rock Point plant was insignificant. Dr. Gerald Drake of Petoskey, Michigan in 1973 blamed the plant for the higher rate of infant deaths from leukemia, cancer, and congenital defects." I continue to wonder why the speculative material often makes headlines, whereas the research results are often relegated to obscurity with the X and R rated movies. I'm not trying to determine a stand or advocacy here for nuclear versus coal or coal versus nuclear. I think the important issue is that the public be made

aware of the fact that there are costs against environment and societal health for any means of producing energy. And I don't think that enough people have been made aware of the potential and real health effects associated with nonnuclear power generation.

I'd like to say a word about human health and plutonium. We all know that plutonium is a toxic material like many other materials. But it does not follow that any exposure to plutonium necessarily equals death. This has been planted in everyone's mind, and I think it's important to clarify this point. There is a large body of information available, some of the most relevant coming from people who worked on the Manhattan Project in 1944-45 building the first nuclear weapons. These people worked under rather primitive conditions by today's standards; the exposure levels were quite high--factors of 10 above the current allowable occupational levels. They've been studied rigorously for 30 years and, without going into details--this is all published information, none of these individuals has developed any cancer or any undesirable biological effects which can be attributed to plutonium. The other point I'd like to make is that very often you read articles related to the movement of plutonium through the cities. I find it difficult at times to appreciate the lack of perspective. No one wants to distribute potentially toxic materials around, but there are methods of reducing the probability of release as you transport these materials. We often lose sight of the fact that eight tons of plutonium were released during the era of atmospheric weapons tests. Plutonium is still being produced by countries who are still testing nuclear weapons in the atmosphere. Most of that plutonium has come back down to the earth. Mankind has not been wiped out. There have been no huge perturbations in the vital statistics data. There have been estimates made of the amount of plutonium coming from current nuclear weapons tests, and this far exceeds the projected releases from routine operation of nuclear power plants. So one of the problems I have personally is when someone sits down and says, "Gee, one ounce of plutonium will cause 30 million cancer deaths." Now it's one thing to tell people the material is toxic; but it is another to do numerology and game playing in a way that misrepresents the potential problem.

One other issue which has received much attention during recent years is that of the so-called "hot particle" problem. We've been told by groups of individuals--they've petitioned the Atomic Energy Commission and the Environmental Protection Agency--to lower the standards for plutonium because of the theoretical possibility that, if plutonium is particulate, it will be much, much more hazardous--by factors of 100,000 according to the theory. Well, that issue has been very seriously looked into by people in this country and by the Medical Research Council in the United Kingdom and none of the studies to date can substantiate these claims. The Biophysical Society's Group for Public Information, the National Council on Radiation Protection and Measurements, and the National Academy of Sciences are all looking into this question. These issues are important, but I want to point out that the hot particle problem has been looked at very critically and cannot be substantiated according to data obtained from experimental animals and man.

I think I'll close with that...my time is about up.

Dr. CHAPMAN: Thank you, Dr. Richmond. Our final speaker is Mr. Carl J. Hocevar. Mr. Hocevar for a while was with the aerospace industry at Boeing in Seattle. For seven and a half years he was with the Thermal Reactor Safety Division at Aerojet Nuclear's Idaho Falls facility, which is part of the Idaho National Engineering Laboratory. While there, he worked on computer prediction and techniques related to the emergency core cooling system in the reactor licensing process. Rather more recently he has moved to the Union of Concerned Scientists, and his principal interest is in reactor safety analysis. Mr. Hocevar...

Mr. HOCEVAR: Thank you.

I think that one of the social implications that we have to consider is really the role that the engineer must play. We cannot look upon ourselves merely as the technocrats who make everything right. There are several types of problems involved in any technology. One is the purely technical aspect. Another is the people problem. And I don't think they can be separated. You can design something but, if an operator makes an error, all the best design in the world can be overridden. This factor has to be considered very seriously in the design of any technology and, in particular, in the design of a nuclear reactor--considering the possible consequences of an accident.

Now it was mentioned previously, and I'll agree, that there are impacts associated with any form of energy. We're going to have to recognize and the public has to be made aware that there are impacts from anything...coal, nuclear power, solar...whatever you have. The question is: What are the relative amounts of impact? For example, is there such a thing as a maximum credible accident at a coal plant or a solar plant or a wind plant? You might be able to dream one up but it surely would be a lot less catastrophic that associated with a nuclear power plant. If we're going to rely on nuclear power, we have to guarantee to the best of our ability that these reactors are going to be safe.

I feel that the public has not been made sufficiently aware of what's been going on and that, even among technical people, we're really not aware of what is going on in the nuclear industry or of the safety work that's going on in the AEC, now the NRC, and the laboratories. I have been involved in the emergency core cooling system design and it's been my experience that at the present time we just plain don't know whether these reactors are safely designed or not. I'd like to explore briefly the history of our licensing policy as related to the emergency core cooling system. The emergency core cooling system is a safety feature which would mitigate or prevent the release of radioactive material should there be a maximum credible accident or rupture of a large pipe in the cooling system. Most of the early reactors were not equipped with any emergency core cooling system. These systems were added during the mid-1960's, when the reactors started growing in size. They were, in general, add-on features...more or less like the add-on features in automobiles. When you add something on you don't necessarily come up with the best design, and that is the situation we have with the nuclear power plants.

But, okay, we've got these safety systems--how do we know if they will work or not? There are two ways to approach this problem. One would be to build the reactor and test the safety systems under actual accident conditions--deliberately subject the reactor to an accident and see if the safety systems work in all the different types of accidents. This obviously gets to be quite expensive. It becomes very difficult to do when you have a lot of different designs and different size reactors. You would have to go to a standard design, which eliminates the competition factor to a large extent. The alternative approach, and the one that is being pursued by the licensing people, is to design the safety systems on the basis of computer analysis. You make the best estimates you can to come up with a computer model which simulates the physical phenomenon that would occur during an accident. What is the status of these computer models? Well, the basic models that we had in the mid-1960's were quite crude ...we had not at that time put a lot of emphasis on them and they weren't very sophisticated. To compensate for this we made what we considered conservative assumptions. One has to ask: What is a conservative assumption if you don't know the real answer? There are some obvious things you can do and there are a lot of other very questionable things. The phenomena that could occur during an accident are extremely complex and one can't say that a given assumption is going to be conservative under all conditions. That type of situation is a little disturbing to me.

Recognizing the fact that there was a problem with the design, the AEC has continued to do advanced development work and over the years a lot of time, a lot of effort, and a lot of manpower has gone into developing more sophisticated techniques. The point is that we have been developing the safety analysis methods at the same time we're building a large number of reactors. And we still haven't got to the point of having safety analysis methods that we can necessarily rely on. Several years ago the AEC held a major rule-making hearing called the Emergency Core Cooling System Hearing to try to speed up the licensing process. There had been more and more interventions and, if they could handle the emergency core cooling system question in a rule-making format, they could eliminate that part of the problem from each individual licensing proceeding. The important thing that was brought out during the ECCS hearings is that there were many areas in which we did not really understand what was going on. There was a lot of disagreement within the technical community. There were a lot of people within the AEC and the AEC contractors, the laboratories at Oak Ridge and at Aerojet, that were in disagreement with many features of the evaluation models. Nevertheless we are continuing to go ahead. We have a series of experimental programs that have been developed to try to aid in the computer code prediction techniques. When you have a computer model, you have to test it against some sort of experimental data to determine whether it actually gives you a reasonable answer. The analytical predictions that have been compared against the experimental data so far have not been very encouraging...some of the phenomena we can predict, some we can't. I think that the public has a right to know where we stand in regard to the safety of these reactors. Do we really have the guarantees that they are safe? And if they aren't, what are the possible consequences going to be?

I think even the AEC and the reactor industry have retreated from the hard line position that there will never be any accidents associated with nuclear power. This was the hard line maintained for many years, and I think they finally recognized the fact that they had oversold it. They are now switching and saying "Okay, there are going to be problems...you'd better be prepared for them when they come." I think they recognize the fact that the public is becoming more and more sophisticated and more of the information is getting out to the public and they can no longer just brush it aside.

This whole thing ties into the more fundamental question of an overall energy policy for this country. We have one of sorts, and it's just "More, more, more." I think the engineering professions have a responsibility to develop not only the technology for producing power, but also alternatives in the use of the energy...can we use it more efficiently? There are a lot of people who have put forward proposals for the more efficient use of energy just to be turned aside. I think the engineering profession has to take a leading role in the conservation issue, and point out the fact that we can do a lot toward improving the lifestyles of our people without necessarily increasing energy consumption ad infinitum. We look at the amount of energy that people use in Europe...it is not nearly the amount that we use ...and nobody can say that they are living in the caves. It is not an all or nothing situation. We have a large amount of waste at the present time. We have the time to proceed more slowly and try to get the answers, for example, on the nuclear issue... the safety problems, the waste disposal problems, the transportation problems, the question of low level radiation effects, whatever one's concerns are...we have the time to look into this in more detail.

We also have the time to develop alternative sources of energy ...solar energy, for example, for space heating and hot water heating and even air-conditioning is available at the present time. We haven't put the emphasis on this but I think we could go a lot faster if there was a subsidy in areas like solar energy, as opposed to the tremendous subsidies that have been given to the nuclear industry. There has been very little money spent, for example, on clean coal technology--cleaning up the air. We can cut down on pollution to a large extent, even with the presently available technology...precipitators and scrubber systems. The mining problems...yes, we have a black lung problem but, if the Coal Safety Act were implemented, that could be cut down to almost nothing. The non-fatal accident statistics in the mining industry vary widely and it's a function of how much money you spend on safety. The U.S. Steel and Bethlehem Steel mining operations have nonfatal accident rates that are comparable to what exists in a college academic community. Others have much poorer records because they don't spend the money. The British have about one fourth the fatality rate that we have because they pay a lot more attention to safety. We can develop the gasification technology at a faster rate--we don't necessarily have to burn it as we do now. So there are a lot of things we can do with coal technology.

But I think the real key to this whole thing is to cut back and use the energy in a much more rational manner than we have in the past. That will give us time to look into the alternatives and to solve the problems before we go helter skelter ahead.

LETTERS●●●

Dear Editor:

...I received in the mail in my position as counselor to the student branch of the IEEE at Virginia Western a copy of Issue #9 of March 1975. Two things struck my eye causing me to write a short comment to you. These deal with both your editorial and the reply to the letters to the editor section.

You may note that the editor, in his reply to the letters received, mentioned that it is unfortunate that the readers responded to the inaccuracy on the burning of coal rather than writing on their concerns of the social implications of technology. Unfortunately, I personally believe that members have been writing to you but you have taken it upon yourself not to publish their letters. This is a very hard accusation I am making, Mr. Klig, and if I am wrong, I apologize.

Commenting on your editorial titled "Secret," what exactly does it cost the IEEE to allow these special privileges for these various secret sessions that you seem to be discussing in your editorial? It is quite irrelevant, as you put it, the necessity of holding classified meetings, but it is also irrelevant about all your comments about the IEEE publishing a journal of classified documents and so forth. You, also, are going off on a wild irrelevant tangent. My personal concern is, as an IEEE member, what does it cost me in money for the sponsors of WINCON and EASCON to hold these particular classified sessions? If the cost is insignificant, then I am all for allowing them to continue...

Hoping that you will forgive the harshness in my words and appreciate that I am attempting to set forth a position rather rapidly and in short form in a small letter, I remain

Sincerely,
Martin Levine

Dear Editor:

I agree with your editorial "SECRET!". Unfortunately the direction that the Board of IEEE is taking that you object to is consistent with a number of other events that are destroying the transnational technical qualities of IEEE and transforming it into a nationalistic and political body. As a Canadian engineer who wishes to work closely with my US neighbours in the Power Industry, I regard this as not only unfortunate but indeed calamitous when one considers the energy problems on this continent and throughout the world.

Sincerely,
Robert T.H. Alden

Dear Editor:

I have enjoyed reading Issue #9 of the Newsletter and would like to receive future issues regularly.

I have two comments to make concerning items contained in this issue. (1) Rather than a wide-open invitation to sponsor or co-sponsor classified sessions, as contemplated in "SECRET", let us encourage the Board to make this a matter of local option for decisions by the officers of the various meetings involved. I believe them to be responsible persons. The official stance of a professional organization should be to discourage such restrictive practices, but no one is in doubt about this "international" organization being primarily American. Members join with this understanding. In simple terms -- they must not be misled. I applaud the action to match policy and practice. Local option would accomplish this while retaining the policy to discourage selective meetings.

The idea of a separate engineering "association," as suggested by Marvin Moss is, I feel, a useful suggestion. I see no need to bring it under the "wing" of IEEE. The interests of each are certainly valid -- but substantially unrelated, and to confuse them would unnecessarily burden those involved in each activity. I would like to hear more about the process of decision-making in such an organization.

Thank you again for an interesting Newsletter.

Sincerely,
D.R. MacQuivey

Dear Editor:

I agree fully with your editorial of March 1975 on the subject of restricted sessions. I suggest that all such sessions be organized without the sponsorship of IEEE.

Sincerely,
Jack Sklansky

Dear Editor:

I read with great interest your editorial regarding "secret" sessions.

In addition to what appeared to be your very valid objections to such sessions, I would think such a policy should be avoided for one basic reason: most persons have joined or retained their IEEE membership in anticipation of keeping their technical skills up to date.

If IEEE adopts a policy of sponsoring classified sessions, memberships will drop, and it will become increasingly difficult to recruit engineering students as members. Of course, if IEEE is not concerned with a potential loss of membership, then perhaps our concern is unwarranted.

Sincerely,
Richard A. Golden

THE EDITOR REPLIES: At the meeting of April 9-10, 1975 the IEEE Board of Directors overwhelmingly approved cosponsorship of classified sessions. The meeting minute states "Director Briskman pointed out that...the Department of Defense has been prohibited from sponsoring classified conferences." The minute further states "...the desire expressed in the proposed revision is not to inhibit but rather to enhance the flow of information". All this leaves IEEE in the unique position of restricting access to some IEEE functions in the name of information flow enhancement, when said functions can no longer involve the Department initially responsible for the restrictions.

A letter to IEEE President Stern on this matter and his response are reprinted below.

Dear Mr. Stern:

It is with reluctance that I urge the IEEE to retain its present ban on sponsorship of classified meetings. The reluctance stems from the fact that such a change has been proposed by a good friend, who has, in his different roles within the AES Society over the years, been instrumental in my being appointed to some society duties.

It is ironic that one of these appointments, the General Chairmanship of EASCON, 1972, has given me additional experience to back-up by long-held opinion that the IEEE need not, and should not, sponsor meetings closed to some of its members.

The proposal states that the IEEE may sponsor or cosponsor classified meetings; but that the IEEE shall not be involved in any way with the publishing or with the costs of publishing classified information; and further that the classified meetings shall be budgeted to be individually self-sustaining.

The first question that arises on reading the restrictions that follow the statement permitting sponsorship is, "what then does 'sponsorship' mean?" What is the IEEE doing for a classified event if it is financially independent and the publisher of its secret papers? It appears that the IEEE would only be lending its name and perhaps the time of the organizers who would then be making arrangements for both the open and the closed sessions.

But why should the IEEE lend its name to some event which is "financially independent, has separate registration fees and financial records," and to which attendance is controlled by some other, non-IEEE, organization in conformance with "appropriate national regulations?" Why should it be called an IEEE event, when in fact it isn't or needn't be? Is it thought that more people will attend if it bears the prestigious name of our Institute?

What has precipitated this situation? Why is it being proposed that the IEEE "sponsor" classified events? The answer is simple: the Department of Defense has recently decided that it will no longer sponsor or cosponsor such events. Well, if the very agency that all this exchange of classified information, and education of engineers is supposed to help, won't sponsor these events, why should the IEEE rush in to do good for an uncooperative, abdicating beneficiary? If the Department of Defense wants engineers to be knowledgeable in its areas of interest, then let it continue to sponsor or cosponsor the seminars, conferences and meetings that it has until now.

Let me cite a recent incident in the Washington, D.C. area that illustrates the damage that can result to members if classified meetings are permitted. Some months ago (in violation of the current policy), the Section Newsletter announced that two Chapter Meetings were scheduled for locations, one of which required U.S. citizenship for admission, and the other of which required security clearance.* Aside from the insult to IEEE members who were barred from those two meetings, yet whose dues helped pay for setting them up, was the fact that non-U.S. members, or un-cleared members, got one less meeting from the IEEE than other members did: they were short-changed: there was no "alternative" or "concurrent" meeting scheduled. That is a likely outcome if any classified meetings are permitted within the IEEE umbrella. Today, the camel's nose, tomorrow the camel.

But let me tell you about EASCON'72: One of the reasons I was asked to be its General Chairman is that I had written a letter that appeared some years ago in Spectrum criticizing WINCON for running classified sessions and co-mingling funds. A member of the EASCON Board said, "OK, if you think you can run a conference without holding classified sessions, go ahead and try it."

EASCON'72 had unclassified sessions open to all and concurrent classified sessions held at a nearby but separate location sponsored by a non-profit research organization. Registration was separate, funds were separate, and a bus transported people between the sites. There was one Program Chairman for the unclassified sessions and another for the classified sessions.

Funds were solicited by the organizers for both EASCON and the classified sessions. Donors indicated whether they wanted their contribution to go into the general funds of EASCON, or to be earmarked specifically for the classified sessions.

Now even these arrangements might not be deemed completely "clean" by those who would like to see no involvement whatever by the IEEE in closed sessions, since some of the EASCON committee people also worked on arrangements for the classified conference. But I think EASCON'72 was organized and held in accord with the letter and spirit of the rules in effect then and now. So it can be done. Thus, no change in IEEE policy is necessary to permit the holding of separate classified sessions coordinated with, in close proximity to, and at the same time as,

*Author's note. This policy would have barred a past president of the IEEE, Mr. Tanner, a Canadian citizen, from attending, as well as all the non-U.S. citizen Directors of the Institute.

open sessions. A change can only lead to more abuses and worse discriminations between members.

If the IEEE permits sponsorship of classified events, some IEEE members will be discriminated against and will suffer. As a matter of principle, the IEEE should not be a party to such discrimination.

Sincerely,
Richard G. Gould
Chairman,
Satellite Systems Committee, AES

Dear Mr. Gould:

Thank you for your thoughtful and detailed letter of April 28, dealing with the relationship of IEEE to classified activities.

While I have a great deal of understanding for your viewpoint (which is apparently shared by quite a few people), the Board of Directors, in its recent April Meeting, came to the conclusion that a modified Policy Statement 9.7 more nearly satisfies the needs of many of our members.

Thank you for bringing your views to my attention. The subject of classified sessions within IEEE is an interesting one and certainly touches on principle. However, the Board of Directors felt that in a tradeoff which invloves "desirable principle" versus "maximum freedom for the largest number of members", the latter consideration should be given preference.

Sincerely,
Arthur P. Stern
IEEE President

Dear Editor:

In the March issue of your Newsletter you indicated that comments from members are invited on the Consumers Reports article on BART. I had previously read the article in Consumers Reports and paid little further attention to it since it was obviously a very superficial discussion of the history of BART and its problems. However, your request for comments is a different matter and I feel compelled to respond to some of the statements in the condensed version.

The article strongly suggests that BART merely replaced an existing inter-urban rail system formerly known as the Key system. This is a great distortion of fact. The Key system was really nothing more than a streetcar service operating entirely on the city streets of the East Bay. The average scheduled speed of the Key system was 9 mph -- totally inadequate for the needs of the Bay Area. Furthermore, the tracks in the streets made it impossible to adequately maintain streets and it was essential to get them either underground or overhead. It was also urgent that streetcar tracks on Market Street in San Francisco be placed underground as a part of a general plan to upgrade the quality of San Francisco's most important avenue.

It is completely inaccurate to say that the BART controls were designed from scratch and ignored technical developments within the rail industry. I only wish that the BART controls did follow some aerospace technology. They might have done better. The suggestion that the aerospace industry promoted BART is nonsense. The whole concept of BART and the general plan were developed long before aerospace became a common term in our vocabulary.

The suggestion that BART was imposed on the Bay Area by the business community is likewise false, although the business community did participate heavily in support of the bond issue. An analysis of the vote for the BART bond issue precinct by precinct is very revealing as to who wanted BART and who didn't. The strongest support by far came from residents of San Francisco who knew they would not be served directly by BART. A primary objective which produced strong support for BART came from those who were most interested in reducing the number of automobiles, regardless of origin, inundating downtown San Francisco. The Consumers Reports transit expert makes the assumption that the people of the San Francisco Bay Area didn't know what they wanted or what they were getting. I can certainly challenge that assumption.

In summary, I would say that the article in Consumers Reports is contrived and is not based on any real understanding of the history of BART. On one thing we can agree: the electrical engineering on BART is poor and the size of the maintenance crew could be cut in half if the quality of the engineering were what it should be.

Sincerely yours,
John C. Beckett
Chairman, Metropolitan Transportation Comm.

Dear Editor:

I note in the March issue of the CSIT Newsletter your comment, "It is unfortunate that reader response appears limited to the detection of errors in short items when there are larger issues of concern in the area of social implications of technology."

I should like to point out that one of the larger issues of concern is the availability of energy. One of the important considerations in that large issue is whether or not strip mining of coal will be done. The decision concerning this will probably be made by non-technical people, relying upon factual information from the engineering profession.

It seems to me that an important activity of any professional publication is to provide accurate facts, to refute inaccurate "facts", and, above all, to avoid propagating inaccuracies.

If inaccuracies are propagated, especially by a publication presumably speaking for an engineering profession, we can be assured that the decisions made by non-technical people on the larger issues of concern will be improperly made.

Yours truly,
Hal Rice

Dear Editor:

The editorial direction which has been pursued by the IEEE CSIT "Newsletter" has greatly disturbed me from the outset.

At the risk of belaboring the obvious, let me quote from Article I, Section 1 of the current IEEE Constitution: "The IEEE shall not engage in collective bargaining on such matters as salaries, wages, benefits, and working conditions, customarily dealt with by labor unions." It would seem to me that implicit in this requirement is a prohibition against the expenditure of Institute funds for the support of such activities.

Yet, the March 1975 issue of this "Newsletter" includes an article by Marvin Moss which is a good exposition of the desirability of a general labor contract between a building trades union and a contractor group.

Mr. Moss's eight points include one which would prohibit members from accepting employment from anyone except contractor parties to the working condition agreement. It provides for hiring hall employment of engineering members. It uses the standard union contract method of administration of fringe benefits, and provision is included for the payment of overtime just as with journeymen craftsmen.

I believe there are still a large number of members of IEEE today who like myself feel that the requirements and privileges of professional practice make any such labor union agreements highly undesirable.

I again reiterate my feeling that Institute funds spent in further promotion of a philosophy such as this may well be spent in violation of the IEEE Constitution.

Sincerely,
Richard S. Miner

THE EDITOR REPLIES: The majority of electrical engineers and electronic engineers are without license or certification, and work for an employer. They generally are employed in groups, are usually obliged to seek other employment within five years of their first employment, are not covered by tax or pension laws for the self-employed, have no portable fringe benefits, and often find their careers severely curtailed or terminated within twenty years of graduation from a BEE program. If the "requirements and priveleges" of such "professional practice" preclude contamination by any form of employee association, this is the engineer's perogative. However, engineers are entitled to consider all sides of the issue. It was clearly stated that articles dealing with a variety of views on this question would be considered for publication--none have, as yet, arrived. The reader is invited to expand his views in a form suitable for publication. As to the IEEE constitution, while it has been bent on occasion (by barring, for example, some IEEE members from certain IEEE sponsored meetings), it has not been broken to the point where controversial concepts must be filtered out in the name of professionalism.

Dear Editor:

I am very much concerned about the plight of Enrique Kirberg, civil engineer, professor of engineering, and, during the years 1968-73, President (Rector) of the Universidad Tecnica del Estado in Santiago, Chile. On September 12, 1973, the day after the military coup d'etat, Enrique Kirberg was arrested by the military junta. Eighteen months later he was transferred to a criminal penitentiary--three prisoners to a one-man cell, inedible food, the only toilet facilities a hole in the middle of the prison yard--this to a man sixty years old. The United Nations Commission on Human Rights has cabled the Chilean junta, expressing "particular concern for the protection of persons whose lives are reported to be in imminent danger. These include... Enrique Kirberg (et al.)...whose names have been cited as presently in the greatest danger for reasons of health or the conditions of their detention." Professor Kirberg is being held on a charge of "income-tax evasion" but his real crime appears to be his university's sympathetic stance toward the democratically elected Allende government.

Elected in 1968 by faculty and students to head the Universidad Tecnica and re-elected in 1972, he directed the reorganization and modernization of the university, which grew during his rectorship from 8,000 to 30,000 students. He instituted post-graduate programs in the basic sciences to upgrade the level of instruction. He initiated "short careers" in specialized technical areas to meet national shortages of trained technicians and give access to the university to sectors of Chilean society previously ignored. He personally arranged for working agreements with various national industries to bring the universities more in line with national needs.

A member of the Communist Party, Professor Kirberg excluded no political group in his drive to improve his university. For example, he actively promoted, funded, and expanded a graduate program in mathematics in cooperation with U.S. mathematicians and the Ford Foundation, and steadfastly defended the program against opposition from sectors of the political left.

I urge anyone wishing to help bring pressure on the Chilean authorities concerning this case to send a politely worded letter of concern about the situation of Enrique Kirberg to:

General Augusto Pinochet Ugarte
Jefe Supremo del Estado
Edificio Diego Portales
Santiago, Chile

(Airmail to Chile is 21¢ per 1/2 ounce)

Humanitarian considerations transcend political ideology. I hope that all engineers will make effective their concern for the fate of a dedicated member of our profession.

Frank Kotasek Jr.

THE EDITOR REPLIES: There are a number of groups including the U.N. Commission on Human Rights and Amnesty International, which are concerned about the fate of political prisoners in Chile. From these sources, it appears that there are well over two dozen documented cases of political imprisonment of Chilean engineers and scientists. It might be well if IEEE were to reiterate its Resolution on Basic Human Rights of Engineers and Scientists (Spectrum, November 1973, p. 58) in the light of events in Chile. It is self defeating however, when the plight of a member of the academic elite is focused upon, while others less

conspicuous (and indeed the issue of political imprisonment) are ignored. The IEEE Resolution follows:

Resolution on basic human rights of engineers and scientists. Adopted by the IEEE Board of Directors, September 11-12, 1973.

The Board of Directors of the Institute of Electrical and Electronics Engineers, an organization of approximately 160,000 electrical engineers all over the world, is keenly interested in the welfare of engineers and scientists everywhere.

This Board views with great concern the infringement on basic freedoms wherever they occur, particularly when engineers and scientists are singled out as the victims because of their profession.

This Board regrets that many engineers and scientists and their families have been denied their right to emigrate in violation of recognized international practices,* often solely because of their their professional qualifications in science and engineering.

These practices seriously endanger the spirit of transnational friendship and cooperation on which the operation of this Institute is based. The Board of Directors of the Institute of Electrical and Electronics Engineers appeals to its sister organizations, and to the National Academies of Science and Engineering or similar institutions in every country, to join in support of equal human rights for engineers and scientists.

* The International Covenant on Civil and Political Rights, U.N. Document A/RES/2200 (XXI), adopted by the United Nation's General Assembly on December 16, 1966, states in Part III, Article 12, Paragraph 2: "Everyone shall be free to leave any country, including his own."

AGE DISCRIMINATION PATTERNS IN ENGINEERING EMPLOYMENT

by R. Rivers

Age discrimination is illegal and is covered by the "Age Discrimination in Employment Act of 1967". This act calls for criminal penalties for second offenses. It specifically restricts coverage of the act to ages between 40 and 65 and covers Union and Employment Agencies as well as Employers. The number of cases involving Age Discrimination is increasing, and there have been some recent significant damage awards under the law. This paper discusses some evidence that indicates a significant problem in the Electrical and Electronic Industries. It also shows evidence that the Aerospace Industry considered by some as age selective is not in fact responsible for any significant age discrimination.

It is unreasonable to expect an individual to prepare for a career in engineering at his own expense if that investment in time, energy and money does not pay off. The investment must be returned in the average career lifetime if the supply of people is to be maintained. The Electronic Equipment Manufacturing Industry does not have above average salaries that would rationalize the 16 year average career lifetime. It also does not have any significant funded early retirement benefits. A significant deterioration in Lifetime Career Prospects has occurred since 1966. This, when known by entering E.E. students, will eventually result in a reduction of the supply.

There is some effort to rationalize the continued excess output of engineers by reorienting the goals of an engineering education. It is said to be a good background for life. In fact however, an engineering education is a good background for engineering, not for life. If a liberal arts education were combined with an engineering education, that would be a good background for life. In fact, there are many engineers that have both, because they started with engineering and followed through with a liberal education on their own time. The existence of age discrimination is made possible by the excess output of the educational system. If new people were not available, employers would see that the usefulness of their current employees was maintained.

Figure 1 shows the age distribution of BS or higher degree holders employed as Engineers in the Electronic Equipment Industry. The distributions are obtained from the 1974 EMC salary survey. Three curves are shown - one for supervisors, one for non-supervisors, and one for the total. The left hand scale represents percentage of the total classified population in each of the years from BS degree dates shown on the bottom scale. This salary survey gave data for individual years for the first nine years (0-8). After that it aggregated data in three-year intervals, then a five year interval and then for all over 35 years from graduation. The over 35 years bracket was averaged over eight years; thus the three, five, and eight year plateau s in the data do not represent real plateau s but merely average population percentages over the three, five, or eight year intervals.

In interpreting this graph it can only be concluded that marked age discrimination is prevalent. One can argue that this characteristic is due to a large rate of expansion and that during expansion, the only available engineers are recent graduates. After considering all the possible reasons one can only conclude that

regardless of the reasons the employment pattern of the Electronic Equipment Industry exhibits massive age discrimination.

Moreover, this age distribution is not normal for all industry. Figure 2, gives the percentages of the employed engineers in all industry from the same 1974 EMC salary survey. It is noteworthy that a significant peak for the 1948-1950 graduating years corresponding to relatively large number (about 50K) of Post War II Engineering graduates. Referring back to Figure 1, it can be seen that the peak has been all but eliminated. In addition, in Figure 1, we see evidence of an extended plateau of 40 year old engineers. The 40 year old plateau appears suspiciously as though a quota system is operating.

There are some industries that do not discriminate against older engineers. Figure 3, which shows age distribution of engineers in aerospace employment, illustrates what might be classified as a seniority oriented age distribution that has been suppressed on the low seniority level by five years of adverse business conditions. From this distribution it can be categorically stated that the aerospace industry hasn't discriminated against older engineers.

Figure 4 is a plot of Engineering Employment vs. Age for all activities and all BS or high degree graduates from the EMC 1960 and 1962 salary surveys. The objective of plotting this was to determine the peak to valley ratios of employed engineers at that time to compare it with the peak to valley ratio of the same group of people in the 1974 salary survey. The peak years used were an average of 1948, 1949, and 1950, and the valley years used were 1954, 1955, and 1956. The peak to valley ratio for the 1960 survey was 1.38. The peak to valley ratio for the 1962 is 1.35. The peak to valley ratio for the 1974 survey was 1.41. The conclusion is that in fact there has been no overall engineering employment differential discrimination between these groups over a 14 year period.

Refer now to Figure 5 which shows the age distribution for the Communications Industry. This age distribution does not show significant age discrimination in either direction.

Figure 6 is a combination of data taken from the 1974 salary survey and quantified on the basis of the EMC assumption of 840 thousand employed BS degree or higher engineers in 1974.

Above this curve is shown the number of engineering graduates available from each class. In recent years this quantity indicates regular BS Engineer graduates plus the bachelor of engineering technology four year graduates. There appear to be three regions of significance:

1. In the period from 1970 and after, there has been a large and growing gap between the number of graduates in the age group and the number of engineers employed in the age group.

2. Referring back to the period of 1948-1950 we see a similar large gap between the number of graduates and the number employed.

3. We can only conclude that these large gaps indicate a substantially increased initial rejection of engineering graduates that are never available for subsequent employment as engineers. This rejection gap existed in 1948-1950, 1970-1973 and somewhat in 1960-1962.

Further evidence of differences in our own industries is shown in Figures 7 and 8. Figure 7 shows the Electrical Equipment employer age distribution. There appears to be retention of the peak output years of 1948-1950. This is a non-age discriminatory characteristic and is markedly different from that of Electronic Equipment Industry shows in Figure 1. Figure 8 is a plot of the age distributions as of 1966 in the Electronic Equipment Industry. Note that the peak population of the classes of 1949-1951 are still employed. It is estimated that there were 3800 of each years (1949-1951) still in electronics at that time. Referring back to Figure 1, it is estimated that only 1530 engineers per year are still employed by Electronic Equipment Employers from the classes of 1948-1950. This corresponds to a rejection of 60% of that age group in eight years time.

Conclusions:

1. The Electronic Equipment Industry shows a substantial discriminatory bias against older engineers. The half-life is equal to 16 years.

2. The Aerospace Industry shows a seniority type of bias to the benefit of older engineers.

3. The overall engineering employment environment shows a high level of retention of older engineers.

4. The overall engineer employment environment shows a relatively non-age discriminatory employment distribution.

5. The overall engineering employment shows an initial permanent rejection of significant numbers of graduates during high output and low demand years.

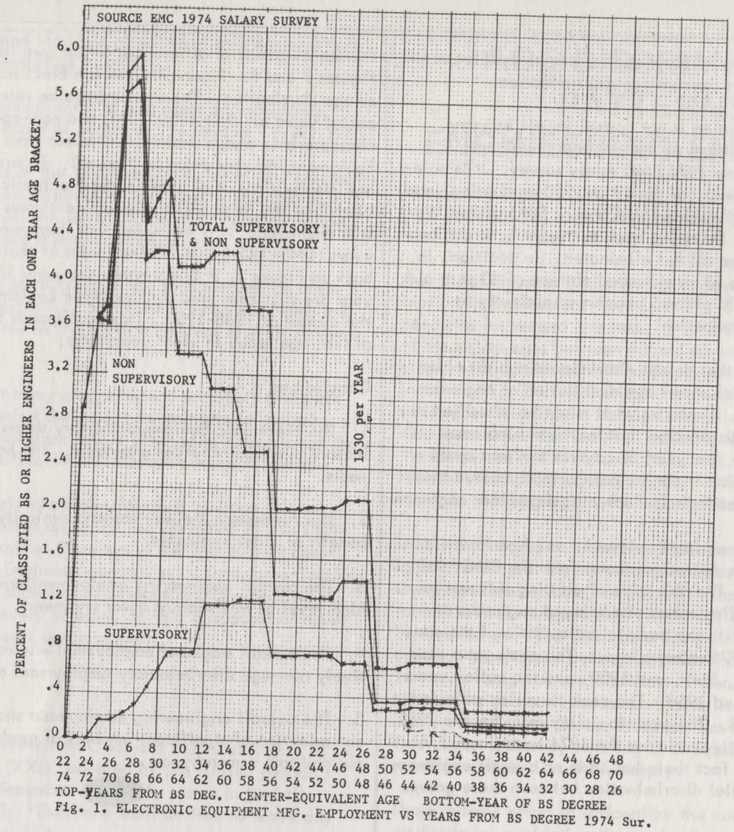

Fig. 1. ELECTRONIC EQUIPMENT MFG. EMPLOYMENT VS YEARS FROM BS DEGREE 1974 Sur.

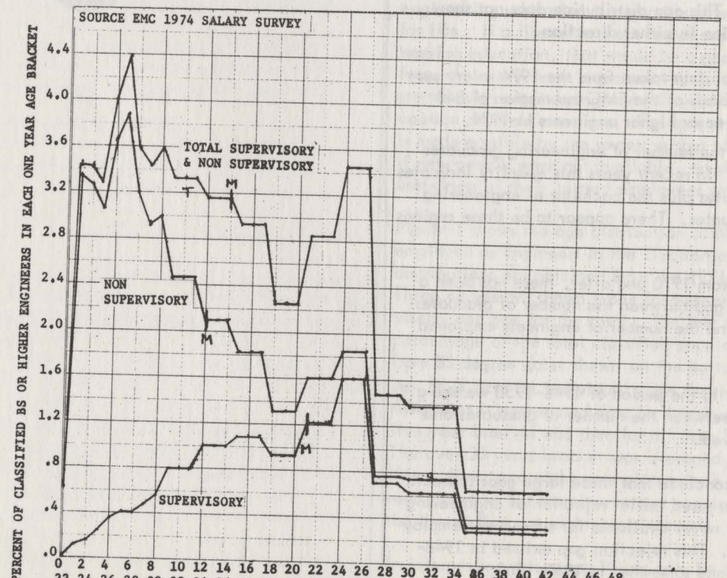

Fig. 2. ALL INDUSTRY ENGINEERING EMPLOYMENT vs YEARS FROM BS DEGREE 1974 Sur.

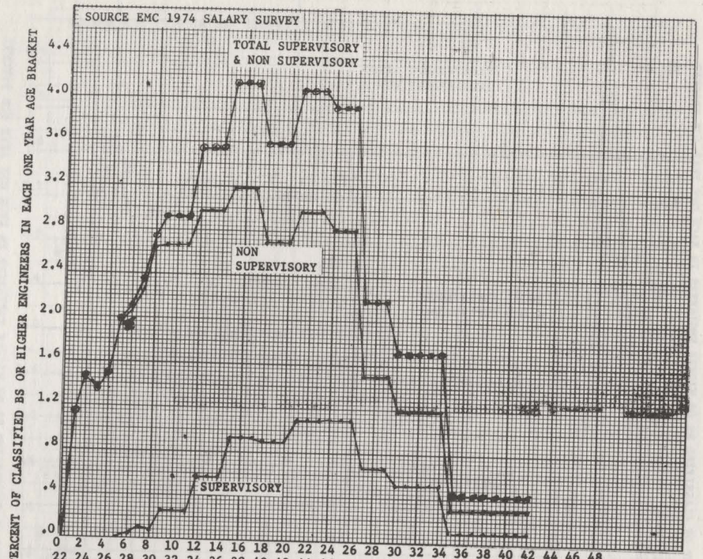

Fig. 3. AEROSPACE ENGINEERING EMPLOYMENT vs YEARS FROM BS DEGREE 1974 Sur.

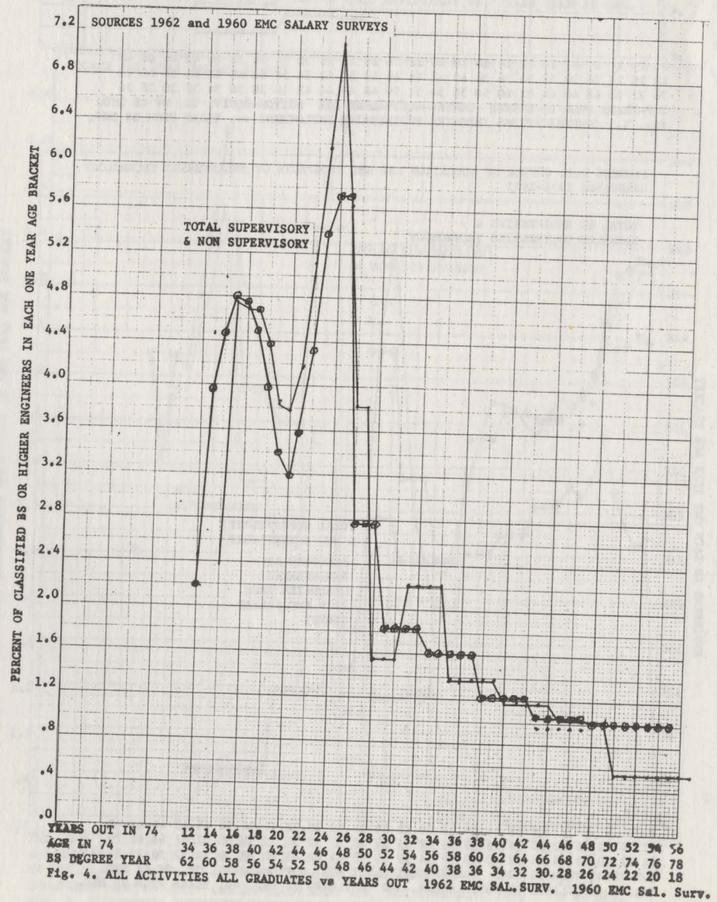

Fig. 4. ALL ACTIVITIES ALL GRADUATES vs YEARS OUT 1962 EMC SAL. SURV. 1960 EMC Sal. Surv.

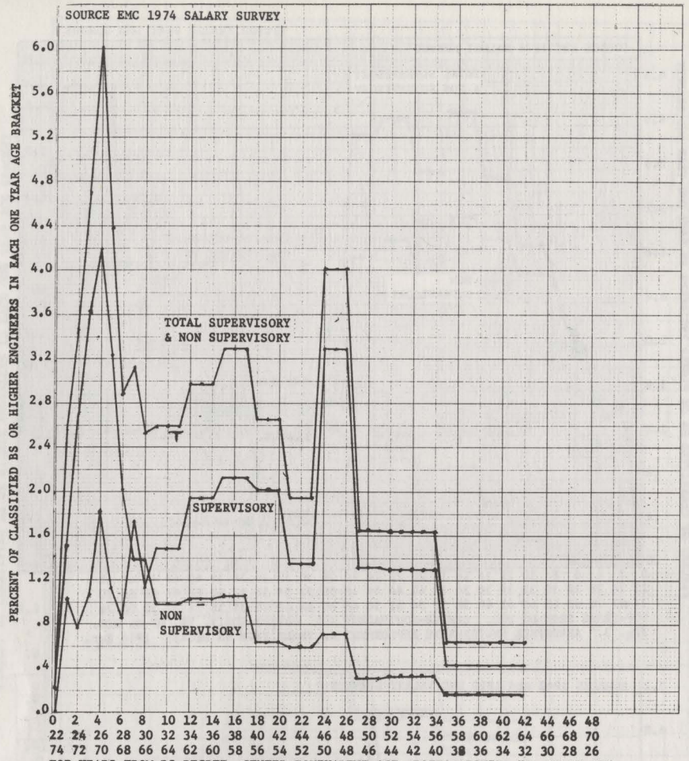

Fig. 5. COMMUNICATIONS INDUSTRY ENGINEERING EMPLOYMENT vs. YEARS FROM BS DEG.

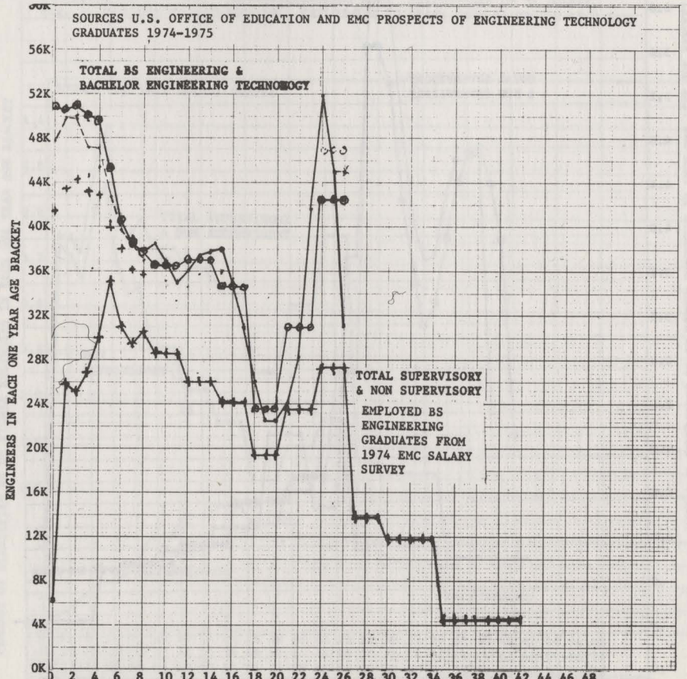

Fig. 6 AVAILABLE BS ENG. GRADS. AND EMPLOYED BS ENG. vs. YEARS FROM BS DEG.

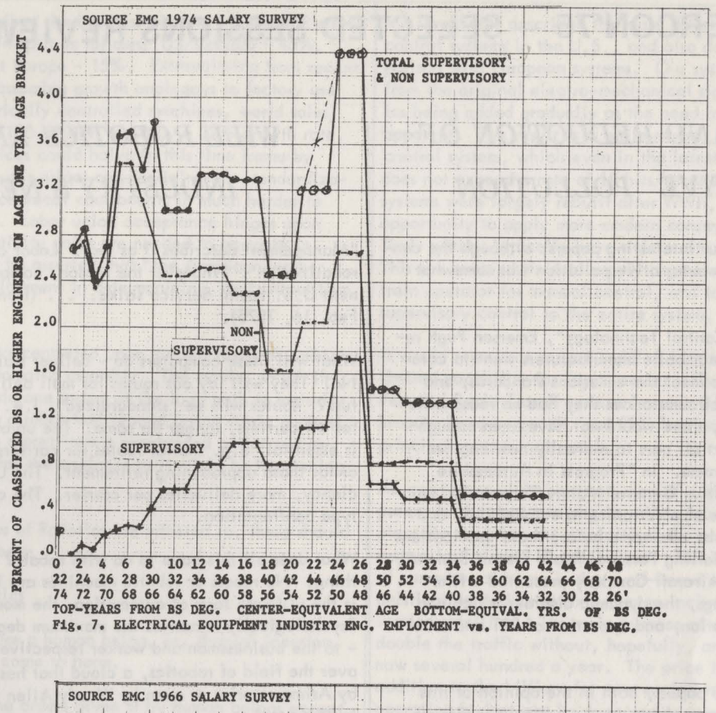

Fig. 7. ELECTRICAL EQUIPMENT INDUSTRY ENG. EMPLOYMENT vs. YEARS FROM BS DEG.

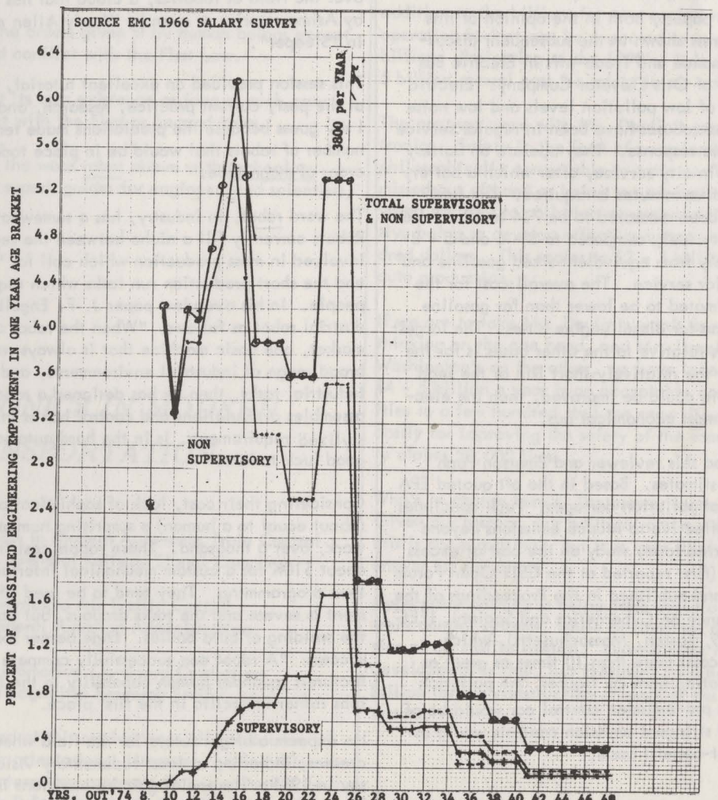

Fig. 8. ELECTRONIC EQUIPMENT INDUSTRY EMPLOYMENT vs. YEARS FROM BS DEG. 1966 SURV.

INTERCON'75 – SELECTED SESSIONS REVIEWS

CONTROL AND REDUCTION OF AUTOMOTIVE POLLUTION

The session consisted of four interesting papers, although the connection of some of them to automotive pollution was somewhat tenuous.

In "Automotive Emission Control Technology", Emerson Pugh reviewed the reasons why automobile manufacturers went to catalytic converters in order to meet the emissions standards, and concluded that under the circumstances they had no reasonable alternative. For example, there would not have been enough tooling capacity to convert all cars to radically new engines within the required time frame. In "Progress in Automobile Electronics", the authors from General Motors Corporation cataloged possible applications of electronics in automobiles, and some of the difficulties to be overcome before those applications can be realized. In "Modelling Personal Rapid Transit System", Julian Reitman of United Aircraft Company presented a film showing, among other things, the dynamic displays which can help in the design, evaluation, and operation of PRT and other transportation systems.

The most significant of the papers, both in the opinion of this reviewer and from the interest shown in the subsequent discussion, was "Overall Performance and Trade-offs in Electric Bus Usage", by Robert Borisoff of Otis Elevator Company. Electric buses have the advantages of low pollution levels and low noise emission. A number of Electrobuses have been in regular service and have received faborable response. They operate on battery power for about four hours in city service, after which a battery exchange taking less than five minutes is required. The fuel milage for these buses has been measured to be 7.4 to 13.5 miles per gallon of electric utility fuel, compared to 3 - 6 and 5 - 8 miles per gallon respectively from equivalent sized gasoline and diesel engine buses in similar service. The overall cost for the Electrobus service was estimated to be lower than for gasoline engine buses but higher than for diesel engine buses. The largest cost item for the Electrobus relative to the other buses is for the cost of the battery, due to the relatively short life of the lead acid battery. If battery life could be improved, then the electric bus could become the most economical bus.

During the discussion period this reviewer and Emerson Pugh argued pollution damage estimates. Based in the oft quoted EPA figures for the dollar cost of pollution damages, Pugh concludes that it would not be cost effective to reduce emissions beyond 1978 requirements. I referred to my study on the cost of excess mortality due to pollution (first reported at the CSIT Open Forum at the 1973 INTERCON, and published in the Proceedings of the 1973 International Conference on Cybernetics and Society, IEEE SMC Society, November 5, Boston, Massachusetts), which yielded pollution damage costs more than 10 times as great as the EPA figures. Extrapolating from my figures, the pollution damages over the life of a pre-emission control car would be of the order of $10,000, and stringent emission controls would indeed be justified on a cost-benefit basis.

G. Rabow

WILL ROBOTICS ANSWER INDUSTRY'S NEEDS

"Management describes it as fear. Labor calls it the 'threat of robotization'. Whatever the reason, computers could cause the next U.S. Postal Service strike. ..."(from Computerworld, Feb. 16, 1975).

What will these computers do - deliver mail, sort it, sell stamps? No! They will lay out routes for mail delivery. Why all the fuss? Routes will be "standardized", i.e. made the same effort for all carriers, longer for some. The union claims that flexibility is essential, e.g. shorter routes for carriers coming off an illness or for those approaching retirement. The USPS wants more efficiency, more deliveries per carrier. The classic automation-type confrontation.

What does all this have to do with robots? Nothing, yet everything! No robots or robotic machines are involved, but a robot is the ultimate form of automation, the most anthropomorphic. Psychologically it carries the maximum degree of benefit or threat - to the businessman and worker respectively. So a cloud hangs over the field of robotics, a cloud that has not been dispelled by Asimov stories or even by Woody Allen making like a robot in "Sleeper".

This session provided an excellent tutorial, incorporating a look at the past, current practice, research, and a guess at the future. I say guess because the predictions made ten years ago about the number of robots that would be in place today were high by an order of magnitude.

The word robot, in industry, has a somewhat fuzzy definition. Robots currently fill a niche between the repetitive custom tasks involved in mass production which call for "hard automation" and the short production run tasks which require the flexibility of people. In his overview paper J. F. Engelberger defined an industrial robot as follows: "When the robot designer puts on the market, one basic machine that is always recognizable in a broad range of industrial environments, and at a broad range of industrial tasks, then he has designed a robot; the designer who assembles articulations and control boxes into systems to meet stylized requirements, is in the hard automation business and good luck to him!"

Considering their cost, lack of sophistication, and reliability (about equal to a human) a surprising number of robots are at work, over a thousand. These robots cost from $20K-50K, with about $10K for a custom mechanical interface to a particular task, then programming. They tend to be used where the work environment is severe and the tasks arduous, but not complex, such as the welding of auto bodies. Engelberger explains their limited success: "A robot can successfully compete only because manufacturers squander human capability in the factory, making the jobs rather imbecilic in the first place."

He expects a bright future for the field when sophistication increases, including at least rudimentary vision and tactile sensing, say in 1985. The social gain he envisions is increased productivity, and thus more leisure time in the form of say, a shorter work week.

Maurice Zeldman described the business picture - about $32 million in sales during 1974 split as follows: US/Canada - 45%, Japan - 40%, and West Europe - 15%. Extrapolating from recent history (six years) and assuming growth analogous to factory use of computers and numerically controlled machines, world sales are expected to reach $180 million in 1980, a 32% growth rate. He claims that robot prices could halve in this time frame by standardization. Computer prices are declining but standardization with respect to mechanical components in much harder to achieve, yet necessary. Labor union acceptance hinges upon recognition that productivity gains are needed to compete in world markets. Further he asserted that "the American worker is not interested in employment in dehumanizing, dull, repetitive, or hazardous jobs."

The final three papers concentrated upon current research, which primarily deals with automated assembly. The movies which illustrated these talks made one aware of the long path to maturity in this field. Watching a robot feel around (using strain guages), locate, and finally grip a part from a pre-loaded pallet was as agonizingly frustrating for the engineer as it might be heartening to the humanist.

As long as Asimov's Laws of Robotics are adhered to, there should be little to fear from robots:

The Three Laws of Robotics

1. A robot may not injure a human being, or, through inaction, allow a human being to come to harm.

2. A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.

3. A robot must protect its own existence as long as such protection does not conflict with the First or Second Laws.

Now imagine replacing the word robot above with technology. The first two laws make superb guides for engineers and scientists, don't they?

A. D. Robbi

ELECTRONICS IN MODERN TRANSPORTATION

Papers:

1. The Role of Electronics in Modern Automatic Train Control
   John E. Freehafer, General Railway Signal Company

2. Application of Electronics to Air Traffic Control
   David R. Israel, Federal Aviation Administration

3. Microprocessors as Automotive On-Board Controllers
   S. S. Devlin, Ford Scientific Research Staff

The three papers presented at this session were all, of course, strictly technical in their orientation, However, behind this uniformity, there were interesting contrasts that illuminated the social implications of the R & D policies being pursued in each of these major branches of our transportation system.

Mr. Freehafer described the main development thrust in train control systems in the U.S., and also drew an interesting comparison with European systems. Our systems have evolved slowly from the original electro-mechanical signaling devices, electronics being added gradually as the need for better control became apparent. The result is a quite modest information handling and control system, which even in the latest designs such as BART, does not exceed a rate of 18 bits/second. In contrast, European systems were largely rebuilt after WWII, and this presented an opportunity to apply more modern concepts and techniques. Their systems typically have a data rate of 1800 bits/second. This has enabled them to supply a greater variety of data to the train operator for manual control, and to apply more sophisticated supervisory control to the entire system.

It would seem that we are saddled with train control systems of limited capability for improvement. Only in the various proposed Personal Rapid Transit systems has our thinking extended to a broader band approach, and PRT does not appear to answer our principal mass transit needs.

An even more vivid contrast, one of a different kind, was apparent in the next two papers. Mr. Israel described the FAA's plans for doubling the capacity of the nation's air traffic control system in the next 10 to 20 years. This requires the development of numerous airborne and ground-based equipments of great sophistication and complexity, even including the use of communication satellites. The main purpose of all this is to handle double the traffic without, hopefully, any increase in fatalities, now several hundred a year. The price tag is substantial. In addition to the billions for new equipment, the FAA's annual operating budget can be expected to expand from its present $2 billion. Projecting to the 1990's, it is quite easy to see a $4 - 5 billion annual cost for safety in air travel.

The contrast came with Mr. Devlin's paper on automotive electronics. Safety in the form of an automobile control system philosophically comparable to train or aircraft systems was dismissed out of hand as being too expensive. The paper was devoted entirely to pollution control and fuel economy, the objective being to develop effective systems costing only a few hundred dollars. This scales to $2 - 3 billion a year for our annual auto production.

If we are to take Mr. Devlin's words as representative of Detroit's thinking on the one hand, and Mr. Israel's as representative of Washington's on the other, we have indeed a curious situation: $4 - 5 billion a year is an acceptable cost for holding air fatalities to a few hundred, but the same figure is thought to be too costly for improving the safety of the road system, which annually claims 50,000 lives.

Who's in charge here? The answer seems to be "no one". Given our history, our political and our economic philosophies, this is not surprising. But it is very likely not a good enough answer for the future.

Apparently nothing is being done about our limited capability train control systems, while billions are planned for the expansion of air traffic control. Expenditures for road traffic control development is tiny, but President Ford has just released $8 billion for the construction of more of the present inadequate system.

Is this not an area where the IEEE could help fill the void, first by formulating overall transportation policy recommendations and then by seeking to advise Congress and the Administration? Certainly it would be in our own interest, as well as the national well-being, and with the establishment of an IEEE Washington office, we have already taken the first tentative steps in that direction. One thing is clear: If we are concerned about the social implications of the technology we develop, we must learn to be effective at the policy making level.

R. Crosby

OPEN FORUM ON THE SOCIETY-TECHNOLOGY INTERFACE

IEEE members were invited by Session Organizer R. J. Bogumil to address issues by case studies and debate. Session Chairman J. S. Kaufman opened the session on Monday afternoon, 7 April, with a brief recapitulation of CSIT's origin and developing activities. CSIT functions through Working Groups of which the most active are those covering: Ethics, Energy and Environment, Education, National Security, and Systems Engineering.

The Ethics Working Group and the USAC Ethics and Employment Guidelines Committee were the source for IEEE's professional Code of Ethics and Employment Practices Guidelines. The element of ethics was directly or inherently present in most portions of the session.

The Chairman of the Working Group on Systems Engineering read a proposed position paper - "Systems Engineering and Its Application to Societal Problems." Considering the origin of the term "systems engineering", in the fields of electro-mechanical and electronic communication systems, G. W. Gillman, questioned its extension to include the environment or other phenomena for which we have no specific expertise. Further, Larry Bacon questioned the extension to social or governmental matters. Other discussants ranged over areas of biological problems, psychological profiling, law enforcement and criminal justice systems, mobilization in disasters, the economy, and the weather - all in relation to the paper's definition of the objectives of systems engineering.

Besides giving the characteristics of systems engineering which make it applicable to societal problems, the paper cited some of the difficulties to be overcome and suggested what members of IEEE, other engineers and related professionals, educators, government officials and members of the public can do to help bring systems engineering to bear on societal problems.

Questioned about how the engineer knows the societal goal, Rabow said that the systems engineer is the servant of the decision maker, the body politic, basically the voter; and further, that systems engineering must not be a benevolent dictatorship, considering that the values of society may often be inconsistent.

"The Mystery of the Electric Vehicle" is beginning to be answered according to Cyrus Adler (Consulting Engineer, New York, N.Y.) who first noted that at the turn of the century 80% of the horseless carriages were electric. However, disinterest matched the continual boom in gasoline autos. Practical use died when parts for the electric truck fleet that the express company deployed in New York City for 40 years became unavailable. On the basis of a gallon of crude oil, the electric vehicle is over 80% efficient compared to the gas auto at 10-12%. Of late the U.S. Postal Service has tested electric vehicles, found them very useful and economical for limited mileage in stop-and-start route operations. USPS is ordering 350 such vehicles. With major improvements in recent years being made in other countries, the speaker said that developments by Japanese automakers are two or three years ahead of others.

Larry Bacon covered social implications of several electrical noise control problems on which IEEE committees are at work. There is traveling noise from diesel locomotives with great SCR banks that induce spikes into relatively well shielded telephone cables. There is fixed noise from factories using increasing numbers of SCR banks. Concern for safety is prompting urgent grounding studies. This is presently difficult because of the use of plastic pipe which provides no grounding network away from dwellings. Also the death hazard in the growing thousands of cable television hook-ups is becoming significant. These and other problems are being studied by subcommittees and new standards and practices will soon be reported.

The February issue of Spectrum, page 65, was cited by R. J. Bogumil who noted feeling by some CSIT and other members that a lack of communication within IEEE about the Code of Ethics caused unnecessary surprises in publication but that there is provision for on-going modification. One area of general concern was modes of enforcement. Session Chairman Kaufman read from a news release about the aggreements in the BART case, discussed the late treatment, or suppression of coverage, by some professional organizations in California, and concluded that in the wake of BART there were signs of hope for enforcement of ethics in situations involving engineers with public safety particularly..

Speaking generally to a "Federal Energy Policy," Dr. Morris Levitt (of Queens College and the Fusion Energy Foundation), gave a review of the fission energy program, its dangers and costs perhaps including a collapse of the biosphere. Then he asked engineers to roll up their sleeves and go to work to apply engineering, science and technology to a program which he deems feasible despite the general public onslaught on technology - fusion! Concerns were expressed that controlled thermonuclear fusion might prove too illusive but solar energy could be a better choice and that energy may be only one of a hundred areas for systems engineering attention.

Paul Irish from the American Committee on Africa discussed, through an example (the card identification system in South Africa), how computers and technology have been put to work to maintain apartheid there. The international implications of this were elaborated through the steps of a national policy being circumvented by corporate policy carried out through overseas subsidiaries.

NEWS, NOTES, AND COMMENT

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Technological applications and innovations result from human actions. As such, they demand political, social, economic, ecological and above all moral evaluation. No technology is morally "neutral."

Human beings, both as individuals and as members or agents of social institutions, bear the sole responsibility for abuses of technology. Invocation of supposedly unflexible laws of technological inertia and technological transformation is an evasion of moral and political responsibility.

From the Mount Carmel Declaration on Technology and Moral Responsibility - December 1974.

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SOLAR ENERGY DIRECTORY

The Solar Energy Directory, sponsored in part by a grant from NSF, concerns the research and development of solar energy. Produced by the Environmental Action of Colorado, University of Colorado, the 650-page directory includes information on manufacturers of solar equipment; government agencies, academic institutions, industries, small businesses, and individuals involved in solar energy research and development; descriptions of current solar projects; and an annotated bibliography of pertinent literature. Copies may be ordered at $20 each from the Environmental Action of Colorado, 1100 14th Street, Denver, Colorado 80202. Make check payable to Solar Energy Directory.

From the NSF Bulletin - April 1975.

▶

A Seminar in Technology Assessment will be offered by the University of Michigan - July 28 - August 1, 1975

Managers, engineers, and other decision-makers are required with increasing frequency to prepare economic, social, and environmental impact statements before projects are implemented. This course presents the systematic analyses required for technology assessment by means of a set of workshop sessions and examples of T/A. For further information, contact:

Dr. R. CHEN
The University of Michigan
Ann Arbor, Michigan 48105

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NATIONAL POLICY AND PRIORITIES FOR SCIENCE AND TECHNOLOGY ACT

On January 15, 1975, Senator Kennedy reintroduced S 32, the National Policy and Priorities for Science and Technology Act of 1975. Co-sponsored by twenty-seven senators, this legislation was unanimously passed by the Senate last October but was not acted on by the House of Representatives prior to adjournment.

S32 established a White House Council of Advisers on Science and Technology, provides for a comprehensive study of organization for science and technology, establishes a federal coordinating Committee for Science and Technology, and provides assistance to states for the establishment of state offices of science and technology.

Details of the legislation may be found in the Congressional Record, vol. 121, No. 2, January 15, 1975. Further hearings on S 32 will be held during the 94th Congress; Senator Kennedy, Chairman of the Special Subcommittee on the National Science Foundation of the Senate Committee on Labor and Public Policy, wishes to receive comments for inclusion in the hearing record and for consideration as deliberations get underway in the Senate.

From the Newsletter of the Harvard University Program on Public Conceptions of Science.

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NRC ENDORSES ANSI STANDARD ON RADIOACTIVE EFFLUENT MONITORING

The Nuclear Regulatory Commission (NRC) has reviewed and endorsed American National Standard N13.10-1974, Specification and Performance of On-Site Instrumentation for Continuously Monitoring Radioactivity in Effluents. The NRC advises that it considers the document applicable to the regulatory process and intends to prepare a regulatory guide covering its endorsement.

Installed instrumentation is used to measure the quality and rate of release of radionuclides issued from nuclear facilities into the environment. Such monitoring furnishes documentation for scientific and legal purposes. ANSI N13.10-1974 provides recommendations for the selection of instrumentation specific to the continuous monitoring and quantification of radioactivity in effluents released into the environment.

The standard applies to continuous monitors that measure normal releases, detect inadvertent releases, show general trends, and annunciate radiation levels that have exceeded predetermined levels. It further specifies detection capabilities, physical and operating limits, reliability and calibration requirements, and minimum performance requirements for effluent monitoring instrumentation.

Published by IEEE, ANSI N13.10-1974 may be purchased for $5.00 per copy,,postpaid, from the American National Standards Institute, 1430 Broadway, New York, N. Y. 10018.

A compendium of abstracts, "Current Literature on Science of Science" is published bimonthly by the Indian Council of Scientific and Industrial Research. Articles from a number of well known and lesser known periodicals are abstracted. Developments in India are emphasized. For further information contact A. Rahman, Council of Scientific and Industrial Research, New Delhi, India 11001.

An extensive bibliography on Science, Technology and Public Policy is available at no cost from Prof. Dennis Livingston, Department of History and Political Science, Rensselaer Polytechnic Institute, Troy, New York 12181.

TECHNOLOGY AND CULTURE, the journal of the Society for the History of Technology is published quarterly by the University of Chicago Press. It is devoted to studies of the interaction between technological achievements and the cultures in which they are introduced and used. Now in its sixteenth year, the journal offers a range of views on diverse topics: sociology and philosophy of technology; technology and jobs; the history of technological devices and processes; agriculture and tools; etc. Annual rates are $20 for institutions and $15 for individuals. For further information contact: Journals Dept., University of Chicago Press, 5801 Ellis Avenue, Chicago, Ill. 60637.

ACM COUNCIL ADOPTS POSITION ON USE OF UNIVERSAL IDENTIFIERS

A resolution regarding the use of universal identifiers was adopted by the ACM Council (Association of Computing Machinery) at its meeting November 14, 1974. The resolution reads as follows:

Whereas:
1. The existence of a universal identifier (UID) makes it possible to match and combine records about individuals;
2. This matching, which is usually not economically or technically feasible with manual data processing methods, is relatively simple and inexpensive with the use of computerized data banks that are able to communicate with each other;
3. In many circumstances this computerized matching simplifies technical problems and offers benefits both to individuals and to society;
4. However, despite some current efforts, present safeguards (technical, organizational, and legislative) are inadequate to prevent unacceptable abuses of the right to personal privacy that the combination of an UID and the use of computers makes possible;
5. The Social Security Number is rapidly becoming a de facto UID;
6. Members of the ACM, being intimately aware of the scope of potential misuse of computers, are concerned that this potential misuse be prevented;

Therefore:
The Council of the ACM states its concern over the absence of legislative safeguards against the misuse of universal identifiers, including the Social Security Number, and urges the prompt generation and passage of such legislation.

From the ACM News - April 1975

CALENDAR

THIRD INTERSOCIETY CONFERENCE ON TRANSPORTATION, July 14-18, 1975, Atlanta, Georgia. For further information: L. P. Green, Office of the Secretary (TST7), U.S. Department of Transportation, 400 Seventh St. SW, Washington, DC 20590.

September 8-13, 1975 - 4th International Conference of Women Engineers and Scientists, Cracow, Poland. For further information: Society of Women Engineers, 345 East 47th Street, New York, N. Y. 10017.

September 1975 - Control Mechanisms in Bio- and Eco-Systems, Leipzig, GDR. For further information: Wissenschaftlich-Techniche Gesellschaft für Mess and Automatigrungstechnik in Kidt, Clara-Lejkin Str. 115/117, 108 Berlin, GDR.

NTC'75, December 1-3, 1975 - (Theme: Communications - Nucleus of a Nation), New Orleans, LA. For further information: I. N. Howell Jr., South Central Bell Telephone Co., P. O. Box 771, Birmingham, AL. 35201.

July 1-3, 1975 - 1975 WORKSHOP ON SOCIETAL SYSTEMS, MODELING, AND SIMULATION with application to world food and energy requirements. For further information contact: Office of Continuing Education, School of Engineering, Univ. of Kentucky, Lexington, KY 40506.

August 24-30, 1975 - 6th TRIENNIAL WORLD CONGRESS - INTERNATIONAL FEDERATION OF AUTOMATIC CONTROL, Boston, MA. The Plenary Session, as well as sessions on Nuclear Power Plants, National Support of Advanced Developments in Computers and Industrial Automation, Social Effects of Automation, Urban, Regional, and National Planning, Medical and Health Care Systems, and Environmental Systems, may be of interest to CSIT Newsletter readers. For further information contact: Instrument Society of America, Philip Meade, 400 Stanwix St., Pittsburgh, PA. 15222.

September 14-19, 1975 - International Conference on Environmental Sensing and Assessment, a joint program combining the 3rd Joint Conference on Sensing Environmental Pollutants and an International Symposium on Environmental Monitoring. For further information contact: IEEE-TAB, 345 E. 47th Street, New York, NY 10017.

November 3-5, 1975 - First International Conference on Conversion of Refuse to Energy at Montreux, Switzerland. Sponsors include:

American Society of Mechanical Engineers
American Institute of Chemical Engineers
World Environment & Resources Council
Swiss Society for Protection of Environment
Swiss Society of Engineers & Architects
U.S. Environment & Resources Council
American Meterological Society
American Phylopathological Society
Institute of Electrical & Electronics Engineers
Institute of Environmental Sciences
Society of Exploration Geophysicists

Experiences and solutions to problems with refuse-energy and fuel derivation plants:

Plant design and accessories
Plant siting and permits
Refuse continuity assurance and plant loading
Materials recovery
Residue disposal and uses
Corrosion
Conversion of sewage sludge
Economical electric generation
Social and environmental considerations
New methods for conversion of refuse to energy
Local government and citizen involvement
Energy consumption patterns
Financing and economics

Additional information needed? Write to: Walter K. MacAdam P. E., Chairman, U.S. Program Subcommittee, Suite 500, 299 Park Ave., N.Y., N.Y. 10017 (212) 832-2200.

September 22-25, 1975 - First Combined IEEE Conference on Engineering in the Ocean Environment and Annual Meeting of the Marine Technology Society at San Diego, CA. For further information contact: Ocean 75, Marine Physical Laboratory, Scripps Institution of Oceanography, San Diego, CA. 92132.

November 1975 - International Congress of Scientists on the Human Environment in Tokyo, Japan. For further information contact: Dr. Yuichi Ochi, Science Council of Japan, 22-34, Roppongi 7 Chome, Minato-ku, Tokyo, 106, Japan.

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EDUCATION

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