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TO

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Thank you for the invitation to be your guest speaker today. And thank you also for your generous introduction, both for what you were kind enough to say about me and for what you were discreet enough to omit.

In giving a speech, I am acutely aware that time is not the same for the speaker as for the audience. To the speaker, it is too, too brief for what he has to say. For the audience, it is sometimes a grim foretaste of eternity. The all-embracing speech suffers from both longitude and platitude.

Nevertheless, speech is the basic method of communication among human beings--unless we take at face value the advice of the distinguished Canadian physician, Sir William Osler, who once said, "Look wise, say nothing and grunt. Speech was given to conceal thought." And, indeed, at times silence is golden.

Rotarians realize the need for communication. Perhaps as your speaker today, I can take some comfort from the fact that in the 157 countries in the world in which Rotary is represented other speakers are going through the same ordeal as I am today. Yours is truly an international movement, based on communication between people of all races, religions and languages.

"Without communication," the well-known Canadian writer, Harry Boyle, has said, "there is no society, whether it is a hive of bees, a troop of Boy Scouts, a bar association or a nation." One could add also a Rotary Club or an engineering association.

Being a somewhat cautious breed--the type of people who look both ways before crossing a one-way street--engineers traditionally have been somewhat reluctant communicators. But there is an area in which we have a responsibility to speak out when we have something to say and some qualifications to do so. Specifically, what I want to talk to you about today is technology and the engineer's role, not as a spokesman for technology, but as an applier and interpreter.

APEO was granted self-governing powers by the Ontario government 60 years ago in order that, as the act regulating our profession says, "the public interest might be served and protected." Our Code of Ethics specifically states, "A professional engineer shall regard his duty to the public welfare as paramount."

It is a basic tenet of our profession that engineering is for people. Engineers, traditionally, have been community and nation builders. Engineering in all its forms has played a central role in the growth of Canada. You have but to look around you to see ample evidence of that.

It is a basic principle of economic theory today that technical progress is an essential ingredient of economic progress. Indeed, just recently Secretary of State Donald Johnston noted that "technology-based industry is the spearhead of economic renewal." At a time of economic recession, we look to technology to bring about the recovery so necessary to maintain our position as an industrial trading nation. We regard technology as an instrument of economic wellbeing.

However, there is the other side of the coin. The modern world has become increasingly dependent on technological systems of such growing complexity that even engineers themselves, who are at the heart of it all, are at times shocked by the rapid rate of change. If we who are working with the new technologies are hard pressed to assimilate change, if we can suffer burn-out, how can we expect the public not to be uneasy about the effects of technological change? As a profession, we would be less than honest if we ignored the social impact.

I want to deal today with two applications of technology about which there is some public uneasiness and concern, namely, the microelectronic revolution and the space age.

Microelectronics, computers and data communications are all technologies we associate with the wave of the future--a future that holds great promise if we can find a way to overcome the transition from the present depressed state of our economy.

The microprocessor, the computer on a chip, which is the basis of the new technology, however, has created a disequilibrium in our society. The same thing happened two centuries ago when the steam engine's introduction marked the start of the industrial revolution and again at the turn of this century with the accelerated employment of electrical energy and the piston engine at the time when Canada's industries were starting to develop.

These two events, however, were spread over two centuries, giving society time to adapt to change. The new microelectronic revolution, in which the chip is king, is barely a decade old. We still have to learn to live with it.

The chip has the potential of creating a rennaissance no less significant than the introduction of electricity at the turn of the century, and at a scale that would rival the industrial revolution. It will alter our way of life. It already has invaded our lives. The chip can be found everywhere--in every room of your house, in the office and factory--everywhere. Home computers soon will be as commonplace as television sets and dishwashers. Computing to work rather than commuting to work may be closer than we think.

It has been estimated that between now and 1990 there will be a one-thousandfold increase in distributed computing power per Ontario household, up to about a million bits per household.

Not surprisingly, Time Magazine saw fit to substitute its traditional Man of the Year with a Machine of the Year on its cover since in its view no human candidate symbolized the past year as significantly as the computer.

A Time inside story outlines the role the computer plays in medicine. One model, Caducaeus, knows some 4,000 symptoms of more than 500 diseases. It sees patterns in what patients report and can then suggest a diagnosis.

Comments the Time article: "The process may sound dehumanized, but in one hospital where the computer specializes in peptic ulcers, a survey of patients showed that they found the machine 'more friendly, polite, relaxing and comprehensible' than the average physician." So much for bedside manner.

What are the implications of this chip revolution for the individual and the engineer? Microelectronics is creating structural changes to our employment patterns. A recent series of Globe and Mail articles on the chip refers to these displaced persons as "techno-peasants".

It has been said the toughest decision a purchasing agent may face is when he is about to buy the machine designed to replace him. Computers can solve all kinds of problems except the unemployment problems they create.

One of the human consequences of the current economic slump is that companies are laying off workers whose jobs may not reappear when recovery takes place.

Hitherto we have looked to the service industries to provide employment for those displaced in primary and secondary manufacturing. But service industries in the future are going to be profoundly affected as word processors, electric filing and other information systems take over in the workplace. Some jobs are going to become redundant. The automated office and the automated factory are facts of life.

However, there are strong positive potentials as well. The chip can and will contribute to our productivity as an industrial and exporting nation. Thus, while the chip is creating unemployment principally in the service sector, it should be contributing to our overall output sufficiently to re-absorb appropriately trained workers in all segments of the economy.

Moreover, all the evidence is not in about worker displacement. There is a shortage of reliable information. There are those who hold that if we had growth in the economy, unemployment from technology would dissipate as in the past. Technological change is unfortunately taking place at a time of recession and its job-creating potential cannot be properly assessed.

Furthermore, the new technology can liberate workers from a lot of drudgery and routine work. It can increase individual responsibility, provide quality control, monitor safety, bring up-to-date information to the workplace. It has unlimited potential.

There is a message too for engineers. The chip is invading all walks of engineering--and on an international scale. It will have an impact on virtually all new products of the 1980s, and even on the design process itself. The development of sophisticated software has made possible the automation of the draftsman's task as well as the engineer's.

Through CAD/CAM and robotics technology, we are entering the era of the fully automated factory. So rapid is the pace of technological change, obsolescence can quickly overtake us. The half-life of an engineering curriculum today has been estimated as about five years, that is to say, half the course material will be obsolete in five years.

In my opinion, the profession needs to recognize this revolution, embrace microelectronics to the fullest extent, using the systems approach, and inculcate the necessary knowledge and awareness among our budding engineers during the formation process.

In this connection I must express concern at the crisis that is developing in Ontario engineering schools. University funding has failed to keep pace with inflation so that the operating budget per engineering student in Ontario is now $1,100 less than the average for engineering students in the rest of Canada. The shortfall has, understandably, been met by reducing spending on equipment in order to have sufficient budget to retain key faculty members. As a consequence, equipment budgets have now fallen to 20 to 30 per cent of what is desirable.

If the situation is allowed to continue, the resources available to our engineering schools will dwindle to the point where we will no longer be able to deliver the quality programs now being provided to Ontario engineering students. At a time when microelectronics must play a role in bringing our society into the brave new world of the 1990s and beyond, it is critically essential that we redress the imbalance now developing in engineering education. We all have a responsibility--industry, government, the universities and the profession. APEO is prepared to help in any meaningful way it can to assure continuing high quality in engineering education.

If technology-based industry is the spearhead of economic renewal, then we must make the fullest and most effective use of the new, all-pervasive technologies. Canada has the opportunity to be a world leader in this field. The future is already here, but we have a lot of catching up to do. And, as I have tried to emphasize, we cannot ignore the human dimension.

Another area of high technology of tremendous importance to Canada's future is space technology. Engineering has played a major role in Canada's entry into the global high technology marketplace which is now contributing to achieving a positive balance of payments in manufactured goods.

Here again, while technological change has not been as rapid as in the microelectronic revolution, it has indeed been spectacular. Just 25 years ago the Soviet Union launched Sputnik 1. As an aside, I recall standing on the roof at de Havilland at Malton helping to track Sputnik's orbits over Canada. Incidentally, Canada was the third nation in the world to design and place a satellite in earth orbit -- Alouette 1, 20 years ago.

Among the outstanding achievements associated with the Alouette 1 launch was the development of a unique sounder antenna system, STEM, which has proved to be a great export dollar earner. More than 1,000 satellites have been placed in orbit carrying STEMs. The ISIS program followed.

Canada was the first nation to have a domestic satellite in orbit -- the first ANIK. And, of course, fresh in all our minds, is the Canadian contribution to the success of the U.S. space shuttle Columbia. The Canadarm, developed by Spar Aerospace Ltd., ranks among our space industry's great success stories.

I would like to refer briefly to two space technology projects of immense importance to future northern development. These are Radarsat and Mobilesat, joint industry-federal government programs.

Many advantages have already accrued from Canada's space program and, as I have outlined, there are further benefits to come. Our industry has acquired design expertise, development and manufacturing capability. We have gained international recognition in many areas of satellite and earth station technology. We are among the few nations in the world with the capacity to design and build complete satellite systems. There has been a considerable industrial spinoff from our space program and a mushrooming of new industries to take advantage of these opportunities.

To my mind, investment of public funds in space technology is a sound investment. What is more, it can be truly said that by putting our money into space technology, our dollars will never go as far.

It is time to draw these remarks to a close. I have tried to highlight the role of high technology in our economic and social life from the perspective of a profession intimately involved in it. Engineers are the catalysts from which new technologies emerge. If we sincerely believe that engineering is for people, we must take a lead in adapting these developments to the need of human beings so that we can all be the beneficiaries. In that way, technology will be our servant, not our master.

If we can do so, I believe we can face the future with, as Mark Twain said, the quiet confidence of a Christian with four aces in his hand.

Thank you once again for your invitation.