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Microelectronics, computers and data communications are all technologies we associate with the wave of the future - but the future is already here and we have not yet caught up with it. The silicon chip, common to each of these technologies and many more, has invaded our lives. The chip surrounds us. It is in every room of our house, in the office and factory - everywhere. Large segments of our population are being thrust into the future without the knowledge or ability to accept and work with it. Engineers are expected to be on the leading edge of the future by our very training. Thus we should be able to assimilate this change - but are we ready ?

Technology is part of society because it has developed in response to perceived human needs. It is applied within

society and has become as much an expression of human culture as science, art and social organization. Most technology develops in equilibrium with the other human forms of expression. Microelectronics is an exception - it evolved in relative isolation, mainly within the defence and space industries, and has gained an advance on society.

In different ways this happened two centuries ago with the invention of the steam engine, marking the beginning of the industrial revolution. It occurred again at the turn of the present century with the harnessing of electricity and the piston engine, coinciding with the dawning of Canada's industrial development.

In each case, there were major permanent structural changes in employment patterns resulting from the improved efficiences brought about by these inventions. As Canada industrialized, employment shifted initially from the resource to the manufacturing industries, and then over the past 20 years, from the manufacturing to the service sector. The microelectronic chip in the form of computers, word

processors and data communications, now is displacing workers in the service sector. Many office workers laid off during the current recession may never be re-hired in their old jobs when recovery gains momentum.

In the past, workers whose jobs have been lost through such structural changes in employment were re-employed after suitable re-training in different occupations. These new jobs appeared as a result of the change and economic growth flowing from the improved productivity. There is no automatic assurance that the same recovery of jobs will occur in Canada following the current discontinuity. Here is where the engineering profession has a responsibility.

Section 2(a) of our Code of Ethics states that:

"A professional engineer shall regard his duty
to the public welfare as paramount"

Engineers are the agents of change and generators of wealth. It is the engineer who must harness the chip to the benefit

of Canadians. As a nation we cannot afford to fall behind in the international race to employ this new technology; nor can we fail to match the productivity increases achieved by our international competitors.

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 particularly on the design process itself - for example, the rapid evolution of CAD/CAM and robotics technology. Microelectronics thus will impact far more than the electronics and communications industries as such. Robots increase productivity in manufacturing, and computers in the service sector. The Swiss watch industry virtually disappeared with the introduction of the digital watch, and the textile industry is being revolutionized by the introduction of chip-controlled laser cutters and other robots.

If engineering is to perform its duty to the public welfare,it must be prepared to embrace microelectronics to the fullest extent, and inculcate the necessary knowledge

and awareness among our budding engineers in their formative years. Interestingly, silicon systems and software (the language of microelectronics) have been part of the engineering curriculum for some time. While it perhaps should receive more emphasis in the non-electrical branches of our profession, most young graduate engineers take to the computer and related technologies as totally as the older generation did to the slide rule.

Resistance to the more widespread use of the chip is more likely to exist among the middle and older age range of our profession which did not grow up with the computer. What's more, I have detected a surprisingly widespread fear of computers among many of our senior engineers in key decision-making positions. To some extent, the rapid spread of home computers among this strata of our profession should soon allay some of the anxiety that presently exists.

Earlier I asked whether or not we as a profession are ready to assimilate the change created by the chip. It is my view that we are not. While some of our industries - those in

the high-tech category are capitalizing on the market trends in microelectronics, other more traditional industries may be too slow in adapting. It is encumbent on the professional engineer, in line with his duty to the public welfare, to be aware of the implications of the new technology and employ it in ways to maximize our economic advantage. To do otherwise would be a disservice to our province and country.