

Speech File

~~Canadian Council~~

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U of Waterloo President
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THE ENGINEER IN THE YEAR 2000

I am delighted and honoured to have been invited to speak to you this evening - particularly so for over the past three years I was asked to be the speaker on this occasion. On each of the previous times I had other commitments which prevented me from coming so that by now I surely thought I had worn out my welcome even before showing up! (This event usually occurs at the same time as the semi-annual meeting of the Canadian Council of Professional Engineers with which I have had a role to play, but this year I got CCPE to change their dates! I am particularly pleased to be asked to speak at the University of Waterloo - because one of my two sons who are engineers graduated from Waterloo, and my daughter is presently studying geography at this university.

At the Association of Professional Engineers of Ontario over the past decade, we have been almost totally pre-occupied by the events leading up to the passage of our new Act into law. Now that the new Act is through and the dust has almost settled, we have been turning our attention to the future and where the profession is going to go over the remainder of this and the next decade. Tonight I'd like to let you in on how our thinking has progressed, and how the career of the individual engineer might evolve in future.

We began by asking ourselves the following six questions:

- What will be the likely social forces that will affect our profession in the year 2000?
- What will be the likely economic environment in the year 2000 that will impact the profession?
- Are there any relevant political factors?
- Where is technology leading, and how will it affect the life of the individual engineer?
- How will the workplace for engineers alter by the year 2000?

and finally:

- What should we be doing now to prepare for the year 2000?

Social Forces

- there will be less government in our lives
- society will be increasingly conscious of quality-of-life factors; that is more leisure time, safety and security, environmental awareness.
- the quality of leisure will assume more importance including intellectual pursuits, hobbies, travel, physical fitness and diet.
- there should be a strengthening of the consumer movement made possible by improved computer and communications technology, and by more leisure time.

- permanent jobs will be harder to find and harder to lose.
- part-time employment will rise, and there will probably be less employee loyalty to the employer.
- commercial and leisure travel will continue to grow and become even more a way of life, despite better communications.
- nuclear energy will become more accepted.

These social trends, if true, portend well for the engineer for they call for increasingly sophisticated and imaginative technology which takes into account the human and social factors that often have been neglected in the past.

Economic Environment

- productivity will be higher; that is the ratio of dollar value added to salaries will grow.
- international competition will intensify, particularly from the third world.
- Canadian resource industries are likely to have staged a comeback.
- manufacturing becomes a white-collar industry with increased use of robotics.
- the domestic marketplace will be less influenced by government, but there will be no less protectionism at home and abroad.

- the US will continue to be our major trading partner, but the Pacific rim will gain in importance.
 - banking and sources of capital will be increasingly international, particularly from the orient (Hong Kong).
 - there will be a larger number of small businesses, fewer large ones with growth focussed on small business.
- Engineering is a dominant factor in the performance of this country's economy - it determines our economic health, our ability to compete, and even our ability to survive. The socio-economic factors influencing our profession in the year 2000 suggest that engineers will be working in smaller units under intensely competitive circumstances and will need to know as much about the management of technology as about its creation.

Political Factors

- there are likely to be only four government terms between now and the year 2000 (elections in '88, '92, '96 and '00).
- the Conservatives could still be in power nationally and provincially.
- bonds with the US will strengthen, those with Europe will weaken.
- international tensions between East and West will continue, and be carried into outer space.
- Canada will increase its military commitment to NATO, NORAD and civil defence.

Thus I believe we will see a pendulum swing to the right over the next decade or so with little likelihood of a reversal gaining momentum before the end of the century.

Technology Trends

- it will be no news to this audience that computers will totally permeate our lives at work and at home; artificial intelligence systems will begin to replace some paraprofessional (and even professional) work functions.
- I believe space will continue to dominate the new frontier and be used as a laboratory, factory and even become a source of resources. Serious planning for mining the moon and other celestial bodies will have commenced by the year 2000, Canada will be launching its own spacecraft.
- engineering will penetrate further into the medical profession and other professions based on the life sciences.
- biology will rank equally with physics and chemistry as an underlying science for engineering, and will become a mandatory subject for engineers.

The technological trends only cover a few areas, but suggest an every-broadening span of coverage with the related need for increased technical specialization for those who create and manage in these new frontiers.

Workplace for Engineers

- the computer will dominate the workplace
- more of the manual work will be done by paraprofessionals

- engineers will be involved with more high-level decisions earlier in their careers.
- as part of a smaller unit, the engineer will be expected to understand business, accounting and finance more fully than his predecessors.
- those that remain technically focussed will have increasingly narrow fields to master and maintain currency.
- the workplace will become more in keeping with the engineer's needs for maximum productivity - flex time, work-at-home, privacy and quiet, computer time and storage capacity - BUT -
- there will be greater expectations for output and performance; performance measurement will be more objective.
- those that measure up will advance more rapidly, those that do not will be relegated to more junior, technical and even paraprofessional responsibilities.
- the work environment will be even more like a pressure cooker, implying physical and mental strains that need to be dealt with - thus more attention to mental and physical fitness.
- quality of life vs career progression will be an increasingly important tradeoff for the individual engineer.
- some of those that choose a management path will need therapy to overcome "workaholic" syndromes.

Some of you here may be asking the question "so what's new".

The point I am trying to make is that intensive competition, smaller work units, higher demands for performance and productivity will accelerate the maturation process and place higher stresses on the engineer at an earlier time in his or her career.

I'd now like to address the sixth and final question I posed earlier - What should we be doing now to prepare for the year 2000?

The rapid acceleration of technology and the importance of obtaining a working knowledge of subject areas not covered in school suggest the need for an early dedication and resolve to a lifetime of continuing learning. There are many ways to accomplish this - formal university courses, home study, the use of video cassettes, technical society activities, conferences and symposia to name a few. I believe the profession must renew its attempts to create some form of incentive to encourage continuing learning among its members.

The year 2000 scenario I have suggested leads me to conclude that the majority of engineers will become more concerned with the management of technology rather than with the creation of technology. This is not to suggest that engineers will not be innovators - on the contrary, those that are so gifted will be the technological leaders of the future. However, the great bulk of engineering graduates - those that choose engineering as a career - will find their careers lead earlier and more rapidly into management. Thus the whole character of the profession will gradually change.

Many engineering schools have recognized this shift and have joined forces with the business schools - often at the post degree level, but some also at the undergraduate level. There also is a growing trend to bring universities, particularly those with engineering schools like Waterloo, closer to business and industry and vice versa. Indeed, Waterloo has made greater strides than most if not all other Canadian universities in this regard, starting with the co-op program, but also with industry moving right on to the campus, and companies being spawned on campus.

Turning for a moment to the profession, recent changes to the Professional Engineers Act involved a re-definition of what constitutes the practice of engineering. The new definition avoids the long list of activities found in the previous Act. Instead it describes engineering as "any act of designing, composing, evaluating, advising, reporting, directing or supervising wherein the safeguarding of life, health, property or the public welfare is concerned and that requires the application of engineering principles". However, the Act allows non-registered persons to do acts of engineering provided a professional engineer assumes responsibilities for such acts. Thus fewer engineers need to become registered, and employers will not require P.Eng's to fill many jobs that were formerly reserved for

registered engineers. Thus we have concluded that in the not-too-distant future we may have too many P.Eng's, too few Engineers, and APEO membership numbers may well decline.

Before I stop, I would like to say a few words about jobs, and about a strategy for survival in the job market. I suggested earlier that permanent jobs will be harder to find and harder to lose. Wrongful dismissal penalties have become stiffer and more plentiful, so that employers are becoming less and less prepared to make permanent commitments - at least in the larger industries with deep pockets. The greatest number of new engineering jobs will arise from the smaller and often new enterprises whose formation will be encouraged by an array of incentive programs that are likely to emerge from the new gang in Ottawa. The greatest rewards will go to those who have exhibited an entrepreneurial spirit and started their own businesses. Thus one key strategy is to create your own job - start a business!

A more general strategy, however, has to do with keeping open as many options as possible. The dynamic job markets of the future are impossible to forecast, but one factor is common to one's marketability - the development and maintenance of generic skills. For engineers these skills

have been traditionally technical, with computer literacy being a more recent obligatory skill. However, in future as a November, 1983 survey of 102 manufacturing firms by Ontario's IDEA Corporation showed, generic skills need to cover what they call boundary-spanning capabilities where engineers need a basic understanding and appreciation of marketing, sales, operations, finance and an ability to communicate internally and externally.

The strategy is clear enough; maintain maximum flexibility, develop these boundary-spanning skills and be prepared for a lifetime of continuing learning. The very best of luck to you all!

November 15, 1984

Philip A. Lapp, P.Eng.

a famous anecdote

I am reminded of a story attributable to Theodore Von Karman, one of the fathers of aeronautical engineering. It involved a balloonist who was caught up in a storm and was carried some distance through the clouds to where he became totally lost. When the storm subsided, he came out of the mists and found himself hovering over a person standing on the ground. He leaned out of the basket and shouted to the person - "would you kindly tell me where I am". After a long pause, the person responded "you are now directly above me". The balloonist responded "you must be a mathematician", whereupon the person on the ground asked "how did you know". The balloonist said *for three reasons;* "because you paused a long time before answering my question; the answer you gave me was precisely correct; and the information you conveyed to me was totally useless!"