THE MANITOBA

Professional Engineer

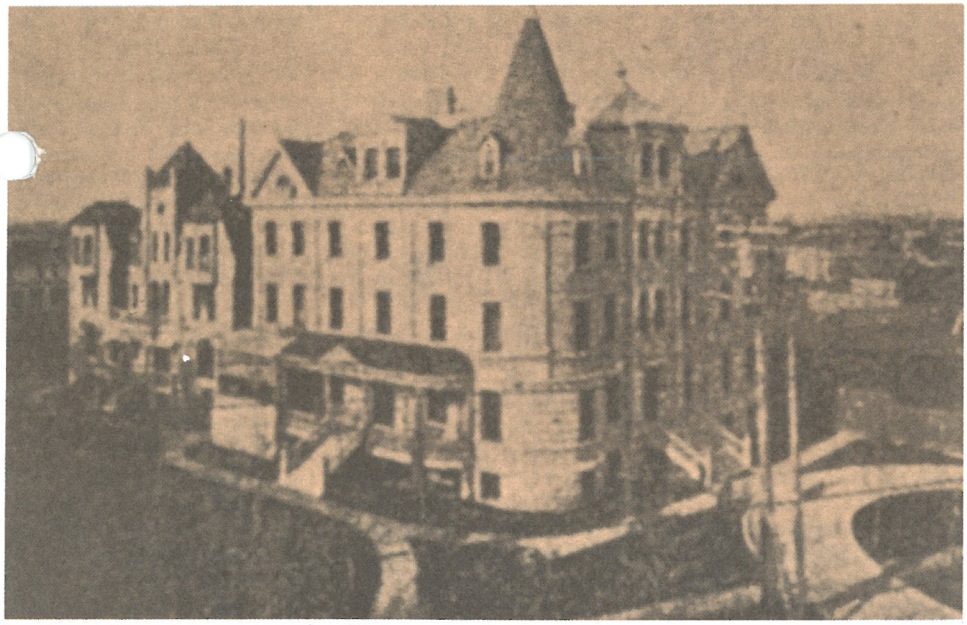
OF THE PROVINCE OF MANITOBA

August 1986

Educating Engineers for the Year 2000

Engineering education in Canada has come a long way since its inception in February of 1854, when King's College, later to become the University of New Brunswick, began the first formal instruction in professional engineering in Canada. Since then, more than 160 engineering programs have been established in a network of 31 educational institutions stretching from coast to coast; a network that has been described as among the best in the world.

As the groups of students prepare for the beginning or the continuation of their engineering education this month, it is timely to ask whether this education system has indeed come far enough. What changes, if any, are necessary in the system so that the engineer is appropriately trained for tomorrow. What training is being given today in areas where engineers are not presently involved, but where, in the future, they must be? These are questions which are not easily answered. The engineering education forum beginning on page 6 does not attempt to answer these questions. However, it is hoped that they will provoke thought on the subject and lead perhaps not to answers but to further discussion and understanding. □



The first classes in engineering in Manitoba were held in this building at Sherbrook Street and Portage Avenue in the autumn of 1907.

Our Numbers are Impressive

Engineering as a profession is largely a milestone of the twentieth century, even though engineering as an activity has been practised for centuries. Here in Canada, the 1871 census reports that there were only 70 individuals who listed their occupation as being "engineer".

Today, there are over 125,000 registered professional engineers. They are well integrated within the national economy; some 50 per cent work in industry, 20 per cent provide consulting services, 20 per cent are in the public sector, and the remaining 10 per cent are engaged in all walks of life. Some are also medical doctors, members of the clergy, accountants, and members of provincial legislatures or the federal Parliament. While the nature of engineering work tends to be very diverse, we know that 25 per cent of registered professional engineers are managers, 45 per cent supervise the production of material goods, 10 per cent are involved in research and development activities, and the balance have careers in many areas, including teaching, marketing and a host of other activities. Today, one in every one hundred individuals working in Canada is an engineer. □

The Employee Engineer

One of the interesting things about the Engineering profession is that most professional engineers are employees. In this respect it differs from professions such as law and medicine.

Some of the dilemmas faced by employee engineers are caused by a conflict between business ethics and engineering ethics. Public interest vs employer interest situations can give the engineer problems.

Consider a hypothetical but not too unrealistic example: Joe Mepa, P.Eng., works for the publicly owned electrical utility of his province, where he supervises a group of junior engineers. He reports to Jane Smith, M.B.A., C.A., who heads the load-forecasting department. Joe is also vice-president of the Professional Employees Association that negotiates with management on the pay and working conditions of the utility's professional engineers.

What is Joe Mepa? Is he a professional? an employee? a manager? a civil servant? a union member? All of these? Can he really be a professional if he "wears the other hats", too? What kinds of conflict can his various roles put him in? Are there changes in legislation or the practices of his professional organizations that could help him?

At the 1986 Annual General Meeting these sorts of questions will be addressed by Professor Jack Stevenson. He will lead and provoke discussion and dialogue on *"Professionalism and the Employee Engineer"*. He is active as a lecturer, a commentator, and a writer. He is a superb public speaker. You are encouraged to attend. □

Out of Sight . . . Out of Mind . . .

By Don Spangelo, P. Eng.

When the Publication Committee suggested that an article on employment in the engineering field would be appropriate in this issue, I was a natural choice to prepare it, since I had recently found permanent employment after several months without. Initially, the article was to focus on current statistics on the unemployment situation of professional and graduate engineers. After exhausting many possible sources, however, I found that accurate statistics just are not available. My article quickly took on the flavor of an editorial.

A number of organizations that were contacted could not provide useful statistics. The Unemployment Insurance Corporation has no records of new graduates since they are ineligible for benefits, of engineers whose benefits have expired, or of engineers who have chosen to work in other fields. Organizations such as the provincial Associations, C.C.P.E, the Technical Service Council, and the universities have all conducted surveys in the past to obtain employment information. At best, all that can be gleaned from these surveys are employment trends and not hard statistics.

After looking for work for several months, I have witnessed a relaxing of the job market in the last year. However, it is not very reassuring to realize that groups and organizations concerned with engineering in Canada do not seem to be aware of employment and statistics of engineers. It would have been benefitial to have had some type of help during my stint of unemployment. I can see why many professional engineers and graduates change direction and go into other fields.

If there were some type of supply and demand statistics, many could benefit by just knowing where they stand. This type of information could be useful to all engin currently employed or seeking employment. It would be useful to be able to pinpoint job possibilities and reduce time consuming prospecting. As well, making career change decisions could be supported by facts.

We would all benefit — but how can such a system be put into place? No one really knows all the problems or solutions. We will only come closer to having a working system by launching into one, as the Alberta Association has. They have recently approved a project proposed by their Career Development Continuing Education Committee to address supply and demand forecasting along with unemployment and training strategies.

The C.C.P.E. or provincial Associations may not be the right group to tackle this type of project, but I think the engineering profession would benefit by developing some type of support group with these concerns as a mandate.

My thanks to Bill McKay for his assistance in researching this topic. □

THE MANITOBA
Professional Engineer

August 1986

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CCPE Considers Changes for Entry to the Profession

By W. B. Mackenzie, P. Eng.

Three C.C.P.E. committees have been looking at different aspects of entry requirements to the profession. The overall objective is more uniformity of entrance requirements in the different provinces which, if implemented, would ease the existing problems related to mobility. At the present time registered engineers moving from one province to another are faced with procedures related to different entrance requirements. The time delay in conforming to these procedures can, in some cases, be serious.

One C.C.P.E. committee (the Evans Committee) has looked at the various duties and functions of its most important standing committee — the Canadian Accreditation Board (CAB). The primary function of CAB is to accredit Canadian engineering programs to ensure that they meet the educational standards acceptable for registration in the Canadian provinces and territories. Unrelated to the accreditation process, CAB also prepares and maintains a Uniform Syllabus of Examinations and evaulates foreign engineering programs.

After looking closely into the activities of CAB, the committee's major recommendation was to have CAB look after accreditation matters and to have a newly formed Canadian Engineering Examination Board look after the Uniform Syllabus and the assembly and dissemination of information relating to foreign engineering programs.

The report also recommends that CAB, if requested, arrange an informal visit to an unaccredited program to provide prior comment and advice to the institution with respect to the program. This should facilitate accreditation procedures prior to a formal accreditation visit to the institution.

Another C.C.P.E. committee (the Dupuis Committee) has looked at other aspects of entry to the profession such as work experience required, educational prerequisites to examination programs for graduates of non-accredited engineering programs, professional practice examinations and transfer of registration of engineers moving from province to province. The major recommendations of this committee were:

a) Engineers registered in one association for five years be exempted from the professional practice examination when applying for transfer to another association.

b) The minimum educational prerequisite for candidates applying for examinations be senior matriculation plus at least 3 years of engineering, science or technology courses.

c) The existing minimum work experience requirement of two years be unchanged.

The third C.C.P.E. committee (the Taylor Committee) looked at one aspect of entry to the profession — entry by an examination program. The method of entry is open to applicants who are not graduates of accredited engineering programs — mainly immigrants. This committee concluded that a necessary prerequisite to entry should be a bachelor's degree in engineering. They also recommended revamping the examination program no in use for candidates who are not gradua from accredited programs.

At the 1986 Annual General Meeting of C.C.P.E., the Board of Directors considered the final reports of the three committees. They were in favor of most of the recommen-

(continued on page 11)

Letters to the Editor

Thank you for forwarding to me the January/February 1986 copy of the Manitoba Professional Engineer. The new look and format is very professional and most welcome.

We are writing this letter with reference to the comment on page 10, which refers to an article from the B.C. Professional Engineer. First, we are not privy to the complete article, but take exception to the comment that the existing codes, namely California seismic and American Concrete codes ... "producted inadequate results in a major earthquake..."

The statement is totally unjustified and apparently was made with very little background on Earthquake Code requirements and/or the actual preparation and structural design where earthquake analysis is necessary.

Of primary importance, is the fact that modern earthquake codes are not written to sustain the greatest earthquake forces. Several years ago, the codes made an attempt to limit collapse for a Richter magnitude 7.0 earthquake at a distance of approximately 25 miles from the fault epicenter. Today's codes are intended to limit damage and, to hopefully, prevent total collapse. The September earthquake had a Richter magnitude of 8.1. The Richter magnitude is based upon a garithm scale, therefore, the Mexico City earthquake produced approximately 10 times greater forces than would apply even to our current codes.

From various documents made available for our review, we are informed many of the buildings that collapsed were constructed prior to 1960, and the structural engineering, construction methods and materials, etc. are not equal to the workmanship in the United States of America and Canada.

In the publication **"Mexico Earthquake"**, September 1985, published by the International Masonry Institute, the following comments are quoted.

"The relatively poor performance of some buildings in that earthquake could also have been due to other factors such as detailing, construction and materials quality, or noncompliance with codes."

The following exerpts are from a report dated January 1986, titled "The Mexico Earthquake of September 19 and 20, 1985. Past, Present and Future" prepared by Fernando Fossas Requena, who is a civil engineer, National University of Mexico.

"Though accelerations of 20% were the main cause of the damages, some structural defects and construction malpractice contributed to the damage. The most common collapses is explained in detail. Other earthquakes with different periods of vibration will produce the collapse of many buildings that suffered no damages during past quakes. What attitude should be adopted is the great question asked?

Conclusions are that the actions that have been taken are minimal, consensus of seismic resistant construction must be stimulated, flat plate construction must be seriously considered, construction supervision must be thorough, and the lessons of these quakes must not be forgotten.

The above paragraphs may be resumed in a malpractice of building construction in Mexico: the lack of an adequate, careful, permanent and highly responsible supervision of construction. The cost of this supervision, which the owners economize, and which builders elude, is highly compensated with the quality of a job made under a strict and responsible supervision. A good structural analysis and well detailed drawing are useless if construction is not carried out according to those drawings and to the related specifications."

We have prepared this letter to advise others:

1. Building Codes do not guarantee perfection.
2. Peculiar site circumstances will always continue to occur. The ability to recognize and prevent these circumstances from occurring in the future, is vital to the engineering profession.
3. Until the construction industry recognizes that engineering judgement, together with construction methods by capable contractors and field observation by the engineer of record is a necessity, accidents and failure will continue to occur.

In our opinion, the B.C. Professional Engineer article was premature in condeming existing current codes, which, to our knowledge has not been effectively tested in a recent seismic event.

Arnold Bookbinder, P. Eng.
Arnold Bookbinder & Associates
Canoga Park, California □

Our firm recently received an invoice for renewal of Engineer's Professional Liability insurance. The increase in premium cost was 45% from 1985 over to 1986. Had a similar increase occurred at the grocery store, there would for sure been a riot.

On follow up and questioning the insurance agency as to why this substantial increase was necessary, we were given the reason that the consortium of insurance companies world wide that insure us, had subscribed to insure and cover such clients as the disaster in Bhopal, India, and the Air India aircraft incident, amongst others.

Really; where is the logic in this scenario?

Had the Architects or Engineers of the Province of Manitoba had any input, control, or related responsibility for those disasters that occurred, then we would expect to pick up a proportionate share of the court awards that resulted in subsequent litigation.

The hard thing to swallow is that we had no input whatsoever into the clients that the insurance companies that insure us were taking on as clients. Should we then sit back and accept, and pay, for risks that were decided in the boardrooms of our insurers without any consultation whatsoever with the current policy holders?

There really is only one avenue for consulting engineers/architects to recover their now abhorrant costs of professional liability insurance; their clients, public and private. How long does anyone think that these clients will endure inflated fees as a result of the premium increases passed on to us by the insurance companies?

Professional liability insurance is purchased and paid for by responsible Architects and Engineers. There really is only one reason that this is done. If, in the conduct of our respective duties, we fail in error or omission on a particular project that results in a financial burden to a client, contractor, the Public at large, or any other party involved related to our works, then we woud expect a claim against an insurance policy in force. It should not be construed as a pot of gold for any lawyer looking for a client, and if massive awards continue in the courts, it will simply cease to exist.

We are aware that the Law Society of Manitoba recently divorced itself from the international professional liability insurance market, and no doubt with similar reason, to initiate their own in-house liability program for their members. It may soon be time for the Architects and Engineers of this province to proceed on a like course.

Douglas B. McMurray, P. Eng.
Electro Mechanical Technologies Ltd.
Winnipeg, Manitoba. □

As of July 1st, 1986, the following are no longer entitled to practice professional engineering in the Province of Manitoba due to non-payment of fees:

E. H. Balchen
M. R. Bayoumi
W. R. Bishop
H. I. Bonne
L. D. Brown
F. N. Butterfield
R. P. Corcoran
G. H. Dash
L. R. Dubreuil
J. Duerksen
D. R. Dyker
E. O. Foulkes
P. G. Gulak
M. T. Hughes
L. P. LeBlanc
R. C. McCombe
J. A. Mackenzie
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A. E. Meade
G. J. Merrett
D. G. Naylor
J. S. D. Parker
M. Singh
N. Y. N. Tam
G. R. Thompson
A. E. Versnick
T. Voutsinas
F. J. L. Waggoner

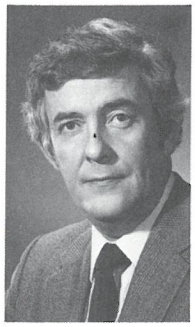
Resignations
(Effective June 30, 1986)

A. B. Buchanan
G. M. Cederwall
M. K. Dasgupta
A. E. Gibb
G. G. Harley
P. R. Moon
G. J. Mould
R. Noseworthy
S. Pavlovic

Communication Within Your Association Must

President's Message

E.W.J. Clarke, P.Eng.



In our formal engineering education at university, most of us to some extent encountered the humanities, including a course or courses in English (or "Technical Communications.")

Even without such a program of complementary studies, a university education in engineering is in little danger of being reduced to mere training for a trade. Engineering educators are acutely conscious of the need not only to teach engineering students how to accomplish technical tasks, but also to impart to those students a thorough understanding of the related scientific reasoning and principles, without which one would fail to grasp why the technical methods taught are valid and valuable.

However, though many of us have felt bruised by our encounters with the liberal arts, there is no doubt that without such courses, we would have received distinctly less adequate preparation for a productive and fulfilling professional career.

Recently, the Canadian Council of Professional Engineers has been focussing, to an even greater extent than normal, on educational affairs, and particularly on standards of admission to the profession. Consideration is being given to eliminating, or greatly modifying and restricting, the examination route into the profession for those who are not graduates of accredited engineering programs.

"In my term to date ... I have received from the members of this Association only one unsolicited letter..."

One of the seemingly minor points raised has been that those who enter the profession through a program of technical examinations may lack even the limited exposure to the humanities that engineers who graduate from accredited university programs have received.

This is a more important concern than it at first may appear to be.

I suspect that those who while at university were disdainful of the "Arts" courses inflicted upon them have in many cases since reconsidered.

In particular, as part of their subsequent continuing education, formal or informal, those who take pleasure in the exercise of their minds will have learned to place a great deal of emphasis on developing and enhancing their communication skills.

They will have come to realize that, without communication skills, an engineer's scope is limited. They will have learned that language skills are an essential part of logical thinking and structured reasoning. Without communication skills, how can they effectively coordinate the work of others? How can they continue to learn from the skills and experiences of others, or impart to others the benefits of their own skills and experience, unless they can comprehend and use language expertly? How can they persuade and convince decision makers of the merit and worth of their designs and proposals? How can they enter the ranks of those decision makers?

Elsewhere in this issue is an article based on a speech given by Dale M. Christensen at the 1986 Annual General Meeting of the Association of Professional Engineers of the Province of Saskatchewan. Mr. Christensen obviously takes pleasure in the exercise of his mind. His principal messages, to the effect that "human skills' are the most important factors for success in engineering and that communication is a vital component of almost all "human skills," are messages that many engineers have already heeded, and others should heed, in order to maintain and increase their professional effectiveness for the benefit of themselves and others.

Within the profession, and within and for the purposes of this professional association, we definitely need more active and effective communications.

To inform, to advise, to instruct, to request, and to comment: these are the purposes of communcation.

Council, our various committees and the Association staff have a duty to keep Association members informed on issues, decisions, and problems facing the profession.

Members on the other hand ought also to communicate, so as to facilitate informed decision-making, by advising the Association of their views and comments on issues affecting the profession. As a minimum, members should communicate with our Association by voting on by-law changes and by voting in the annual election of Councillors; and by attending and participating actively in our Annual General Meeting and in the special meetings called from time to time. And members should not hesitate to communicate with the Association to request such information, advice, and services as the Association can provide.

The need for communication within the Association is not, obviously, being entirely ignored. After all, you are reading this publication and this message. However, much more needs to be accomplished.

For example, as pointed out in an earlier issue, only about 25 per cent of the registered professional engineers in Manitoba vote in Council elections. This percentage does not compare favourably with the percentages achieved by other provincial engineering associations.

As another example, members-at-large seldom make suggestions to the Nominating Committee, and almost never to the Awards Committee. This vacuum of input makes the tasks of those committees more difficult.

'Letters to the Editor' of this publication are infrequent. Too often, they are simply comments on the publication itself. While helpful and perhaps encouraging to the Publication Committee, such observations fall short of what is really needed — thoughtful comments and reasoned input — the constructive sharing among professional engineers of ideas regarding professional affairs.

In my term to date as your President, I have received from the members of this Association only one unsolicited letter offering a member's thoughts and opinions.

In 1984, the Committee of Past Presidents presented a report to Council pursuant to a resolution adopted at the Association's 1983 Annual General Meeting.

Their report included approximately a dozen recommendations, which in the view of the Past Presidents, should be carried out or followed in order to address problems which had been perceived within the Association during the prior two years.

I mention the Past Presidents' Report because, in reviewing those recommendations recently to assess Council's progress in responding to them, I was struck by the fact that all, or virtually all, of those recommendations had to do very directly with means of improving various types of communication within the Association.

The final recommendation of the Past Presidents was "that Council ensure that important issues before it are presented in a clear and timely manner in the Bulletin."

While this recommendation may not have adequately reflected the independence of the Bulletin (now The Manitoba Professional Engineer), nevertheless, like the other recommendations, if considered carefully and objectively, it was a valuable reminder to Council.

The membership-at-large also needs that reminder. Communications are, by definition, two-way. Publishing information on professional issues is important. Meaningful feedback, whereby thoughtful viewpoints on those issues are put forward from a greater number of the Association's members, is as or more important.

The Association owes the Past Presidents Committee its thanks for their advice. It also owes its thanks to the newly renamed Publication Committee and to the Association staff for their considerable efforts, behind the scenes, to place regularly a first-class publication in the members' hands.

The members of the Association owe it to those I have mentioned, as well as to others and to themselves, to ensure that com-

Be Effective, Active and Two - Way . . .

unications within the Association are effective, active, and two-way.

Opinions on the revised format and content of *The Manitoba Professional Engineer* have been very favourable, but some criticism has surfaced to the effect that, too great an extent, the publication reprints articles which first appeared elsewhere.

In balance, after re-reading the June 1986 issue, I would reject this accusation. (If I were to assert otherwise, keeping in mind the editorial autonomy mentioned above, there might be no President's Message published in the August 1986 issue!)

But there is no doubt that *The Manitoba Professional Engineer* would benefit from a greater amount of "local content." This and other improvements in communication within the Association can only occur if more members take an active interest in communication within the Association, and only if those with the will and ability to communicate do so, by contributing articles and letters, and by writing (or, for that matter, phoning) the Councillor of their choice.

As Chairman of the Admissions Review Board, I greatly valued the informed and in-depth input of Charlie Bouskill regarding the evolution and proper role of this vital Association committee.

As President, faced with an inexorable publication deadline, I welcomed the advice, both written and oral, of Fred Jost regarding the issue of act enforcement.

These gentlemen have influenced Association affairs and have greatly aided Council and the Association over the years, through their willingness to take an interest in professional matters; to spend time researching and analysing fundamental issues; and to distil and submit their comments and advice.

They have certainly not been alone in so doing, but even more members should follow their example in order to make our Association better and more successful in its various aspects and operations. Active and effective communications throughout the Association are vital.

Let's hear from you! □

Council Reports

MAY 12, 1986 *By B. Brown, P. Eng.*

At which Council approves publication of the Safety Committee's findings on Glulaminated Structural Members.

With President E.W.J. Clarke, K. Buhr, W. R. Newton, W. D. Christie, L. A. Bateman, O. Hawaleshka, and E. A. Speers present, Council promptly began what was to be a record setting meeting. Minutes passed, financial statements, and registrations, licences, etc. were quickly reviewed and approved in anticipation of more substantial agenda items.

"Bourinot's" Rules vs "Robert's" Rules

Council's interest was aroused as the report of the Ad Hoc Committee on Rules of Order was brought "off the table" and discussed again. A motion was brought forward to incorporate Robert's Rules and cancel Bourinot's Rules. It was felt that Robert's Rules would allow for a more informal discussion during a meeting and therefore allow more flexibility. Upon acceptance of this motion by Council, steps would then be taken to have the general membership address the topic at the Annual General Meeting. It was unanimously carried that the new Rules of Order be incorporated.

Awards Committee Makes Recommendations

The Awards Committee proposed that Mr. Lloyd McGinnis be recommended by Council for the annual C.C.P.E. Gold Medal Award. The proposal was accepted by Council.

Salary Schedule Committee has New Chairman

With the resignation of Mr. Nick Fedorchuk from the Salary Schedule Committee, Council approved the appointment of Mr. Mal Symonds to that committee's chairmanship.

Council Decides to Publish Safety Committee's Findings

The final item addressed by Council was a submission by the Safety Committee. The topic again was glulaminated beams and the position Council should take in alerting the general membership as to the potential problem that may be encountered with structures incorporating this material. Council accepted the proposal as set out by the Safety Committee and has recommended that it be published for the information of the general membership.

The meeting adjourned at an unusually early time of 5:15 p.m., thereby setting a record. □

JUNE 9, 1986 *By W.G. McKay, P. Eng.*

t which Council finalizes the review of the Safety in Engineering Practice Committee report and adopts the recommendations.

With President Ted Clarke, Councillors Bill Newton, Ken Buhr, Bud Christie and lay member George Saunders present, the meeting began on a rather slow start as one more councillor was required to complete the quorum. While General Manager Mackenzie made some phone calls, Ted Clarke, on suggestion, selected several items of a non-contentious nature and following a discussion "pre-packaged" motions for later review.

With the arrival of Councillor Ted Speers, the meeting became legally constituted and business was immediately under way.

Agenda, previous council meeting minutes, financial statements, registrations, licences, transfers and one reinstatement were quickly reviewed and approved.

Several councillors required and expressed some concern on the general item of reinstatements. What if a reinstatement, not the current one, was being applied for after several months' lapse; what assurance did council have that the engineer being reinstated had not been practising engineering during that last period? There was no readily available solution; however, the administrative staff are aware of the council's concerns on such applications.

Practice and Ethics Committee

Two appointments to the Practice and Ethics Committee, William McDonald and Fred Jost, were approved.

Safety in Engineering Practice Committee

Councillor Bill Newton spoke to the report of the committee which, in essence, was seeking council approval of its general procedures of operation. After a close review of the various functions and the ultimate objective of passing to council their recommendations of safety in engineering, the council approved the proposed motion. This motion implies that the council, on the advice from the committee, will disseminate information to responsible authorities in various levels of government where the safety of the public may be involved.

As the Safety Committee now has a report in hand relating to the safety of glulaminated structures, Council then approved the further action of the Association, to advise various levels of government, possibly six in all, regarding the concerns on the safety of such glulaminated structures.

Dinner

The pizzas having arrived, a dinner break was declared and comments on recent visits to Expo 86 were the major topics of dinner conversation.

David McKall Scholarship Fund

The Chairman reviewed the earlier discussion of this scholarship which is in honour of the late David McKall, P. Eng. As the total contributions to date limit the application of this scholarship, it was resolved that it would be a one-time award to an electrical engineering student under the terms of reference for the other A.P.E.M. awards at the University of Manitoba. From the previous discussion, it was noted that there appears to be some delay in the implementation of the awards program at the university and Mr. Mackenzie and Councillor Laliberte are to resolve any problems as quickly as possible.

(continued on page 10)

Engineering Education . . . a Forum, Engineering Education . . . a Forum,

Undergraduates: Do They Need Five Years?

By John Bachmann, P. Eng.

As another academic year approaches it may be timely to ask how well our undergraduate schools are preparing the class of '90 for engineering careers in the 21st century.

The question must be answered in two parts. Firstly, despite budgetary restraints that threaten to gradually garrotte education and research in our engineering schools, these institutions are doing an admirable job. Great strides have been taken to incorporate recent technological developments into the methods and content of the undergraduate curricula. Most of us who have had even limited contact with today's undergraduates can attest that there has been no discernible compromise in the standards that engineering students must meet in order to graduate.

Yet, I wonder whether we've moved far enough to accommodate some of the significant changes impacting on the nature of today's and tomorrow's engineering work.

In engineering today, as in many other professions, technology has polarized the work environment. Computer hardware and software of ever increasing capability have distanced the decision-making engineer from the routine design and data collection functions. Technologists with the aid of potent software packages will handle routine design work of increasing sophistication. This incursion of expert systems into all engineering fields will accelerate rapidly and force the professional engineer more and more into the roles of manager or researcher. Those engineers not involved in research will find that they will become managers much earlier in their careers than their predecessors have in the past.

What skills will this new breed of engineer need to succeed? Certainly a sufficient mastery of his or her own technical field will continue to be an essential prerequisite. But there will also be more emphasis on the mastery of concepts and effective decision making and less on routine design and computational skills — a fact that is already fully recognized at the undergraduate level.

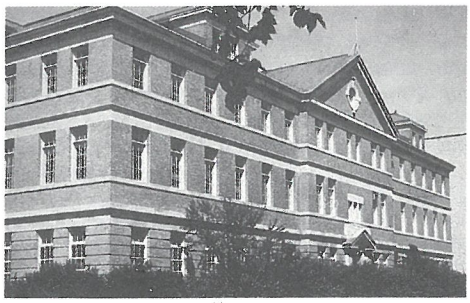
"...engineers, who have for the most part focussed on things technological, will increasingly find themselves interacting with the social, political, legal, and economic environments."

However, in addition to technical knowledge it will be increasingly important that tomorrow's engineer possess superior communication skills, at least adequate management skills, and a sense of his or her individual place as a professional in the overall scheme of things.

As managers, engineers more than ever are going to need to know how to guide and motivate their subordinates. They will have to sell their ideas to upper levels of management as well as to those external to their own organizations. To accomplish this they are going to have to speak and write clearly, concisely, and convincingly.

Tomorrow's engineers will be getting more involved in the planning, implementation and control functions of managment, whether these pertain to a minor project or to strategic planning for the organizations as a whole. Interpersonal skills will assume even greater importance.

As they discharge these managerial duties, engineers, who have for the most part focussed on things technological, will increasingly find themselves interacting with the social, political, legal, and economic environments. To do so effectively they must be at least familiar with the players in these environments, as well as their histories and motivations.



First home for Engineering at the University of Manitoba.

In the face of these changes in the nature of engineering work, should our undergraduate programs be modified to better prepare future graduates? And if so, how?

Any attempt to overhaul substantially the curriculum must start with the realization that additional non-technical courses can only be inserted into the current four-year program by removing technical courses. This is a problem because achieving an acceptable level of technical competence today requires more technical electives, not fewer.

The most obvious, but definitely not the most popular, answer to this dilemma would be to lengthen the undergraduate program to five years. I see this change as inevitable.

The first year of a revised five-year program would stress communication skills, both oral and written. It might include a few existing Arts courses such as psychology or political science as well as interdisciplinary offerings such as the history of technology. These courses would supplement the basic sciences such as physics and chemistry that form the base upon which subsequent technical electives build. Needless to say, an introductory computer science course that familiarizes the students with both mainframes and micros would be part of this first year.

"The most obvious, but definitely not the most popular, answer to this dilemma would be to lengthen the undergraduate program to five years."

During the remaining four years further non-technical electives in Arts as well as some in management studies should be interwoven with the technical courses. This will give engineering students a better appreciation of the external factors that will constrain, regulate or accelerate their work in technical areas.

Many will say that the five-year program will be too costly, especially in times, like the present, of great restraint. But I feel the long-term costs of not reacting will be far greater. The Japanese, Koreans, and Taiwanese will not hesitate to exploit our weaknesses.

Now is the time to revamp the undergraduate program. Not just to lengthen it, but to imbue the program with an interdisciplinary mindset; to pursue creative alternatives not only to program content, but also to program structure.

"Many will say that the five-year program will be too costly ... The long-term costs of not reacting will be far greater. The Japanese, Koreans, and Taiwanese will not hesitate to exploit our weaknesses."

One such change could be to create, with the cooperation of industry and government, a pre-admission apprenticeship program that would require new students to "work" a year in an engineering environment. Besides better preparing students for their years on campus such a program would no doubt decrease the number of students partially wasting a year of their lives as well as tens of thousands of dollars to discover that engineering is not for them.

Many other professional schools could benefit from such changes. Perhaps we engineers can lead the way. □

Engineering Education . . . a Forum, Engineering Education . . . a Forum,

Complementary Studies: Do They Work?

By Maurice Yunik, P. Eng.

There is presently substantial debate on increased or decreased content of complementary studies or non-technical electives in the undergraduate engineering program. I would like to point out at the outset that there are rational and sensible arguments on both sides of this debate that reflect my personal convictions, but I have taken up the task of presenting arguments on one side only in order to bring forward a point of view for further discussion.

The Canadian Accreditation Board (CAB) 1985 Report (pp. 20-21) includes in its program content the following statement which I shall quote in part:

"Complementary Studies — A minimum of one half year of studies in administration, arts, humanities and social sciences which appropriately complements the technical studies in the education of an engineer.

It is desirable that the course selection in complementary studies be such that the student is provided with introductory ability to apply economics and social science to the design and synthesis activity...

...students should participate in courses which deal with some of the central issues, methodologies and thought processes of the humanities and social sciences at a level which is meaningful and challenging.

...studies involving the impact of technology on society shall be included. Studies in engineering economics shall be included ... the program shall make provisions to develop adequately the student's ability to communicate.

In addition, care must be taken that engineering science subjects which have a close relationship with the complementary studies component — such as operation research, human engineering, transportation planning — not be included within this part of the curriculum."

"I would propose that the CAB drop the Complementary Studies component from its criteria and replace it with a component called 'Free Studies'."

When one examines the above statement, one is immediately confronted with the problem of how the above goals could be achieved within a half a year of study. There are so many components which make it impossible to do an adequate job in such a short time, particularly in view of the last part of the statement. If the Complementary Studies are increased, then the technical component of the curriculum is certain to be neglected.

If a curriculum designer is to try to meet these goals at the University, he has basically three choices:

a. The easiest approach is to allow students to take existing courses from other faculties in the University.

b. The second approach is to have special courses designed to meet the requirements, taught by specialists outside the faculty of engineering. Normally these kinds of courses are possible and are called service courses.

c. Finally, engineering faculty could be used to teach special courses to meet the CAB criteria.

Unfortunately, all three approaches do not work and I shall explain the reasons in turn:

a. Using existing university courses to cover such a broad scope of topics and ideas does not work. Since a half year is equivalent to about three courses, one can get an education either in breadth, by taking an assortment of introductory courses, or in depth, by taking a particular subject area and studying it to about the third year level, where finally the basic principles covered in early courses lead to some discussion about social issues.

b. If the second approach is taken, it is difficult to interest enough university staff to develop courses of particular importance to engineering. Professors in other faculties have to develop their careers through research and self-study in order to make a contribution to the university community and society at large. The impact of engineering technology on society is not an area in which a typical professor outside of engineering can develop a career. Such approaches have been tried, but generally the service courses are assigned to junior staff and dropped as soon as the staff member is able to get on to a main stream area in his own discipline, thus resulting in these courses failing to mature.

c. The last approach fails for similar reasons as the second. Most engineering professors must develop their technical areas for career advancement. With shrinking budgets in universities, engineering professors are pressured into securing more money through research grants and contracts. The pursuit of studying the impact of technology is not an area which can attract research funding except in a few isolated cases. Thus, the typical engineering professor has no time or interest in this area. One approach used has been to use senior staff close to retirement for the teaching of complementary studies. This generally does not work since the training and experience which such a person has acquired has not generally been in this area. If such a person takes on a task of this nature, he generally becomes isolated from the rest of his colleagues because of a lack of interaction caused by different interests. Furthermore, the university community frowns on staff who teach courses in which they have had little or no formal training.

Since the above three basic approaches do not work individually, some universities have tried different combinations of them. This, in general, has failed because it leads to a lack of any coherent approach to the study of complementary studies.

Another reason that the area of complementary studies has failed is because engineering students lack interest in courses which are not technical. With little or no encouragement from engineering professors, they see little use for these courses. It is interesting, however, that generally the demand for complementary studies comes from engineers with eight or more years of experience after graduation. This is because they have started in a management capacity and feel they now lack the skills for their new careers. Surely the answer for this problem is the availability of continuing education courses.



Sod turning for the first Engineering Building, University of Manitoba.

In view of the above arguments, I would propose that the CAB drop the Complementary Studies component from its criteria and replace it with a component called 'Free Studies', which would read as follows:

"Free Studies — A minimum of one half of one ytear of the engineering program be allocated to free study. This component of the curriculum should allow the student to select courses either within or outside of engineering, according to the interest of the student. Students should be encouraged to broaden their education by selecting courses outside of engineering."

By using the approach of Free Studies, the onus to broaden one's education would be placed on the student. This would allow students to pursue areas which are truly of interest to them. Courses in areas such as Art, Music, Physical Education, etc, would then be available to the engineering student. □

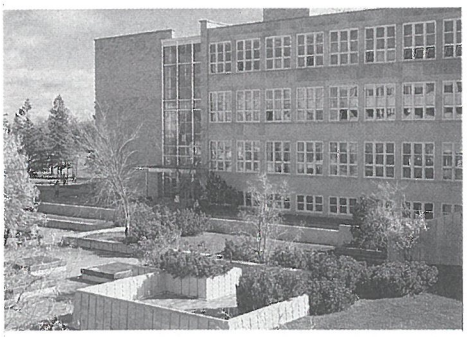
Engineering Education . . . a Forum, Engineering Education . . . a Forum,

Non-Technical Electives: Kultur for Engineers

By Vernon L. Dutton, P. Eng.

No matter how you spell it, attempting to infuse some culture into students of engineering by focussing them to take a group of "non-technical" electives is NOT the way to produce better engineers.

A few days ago, I happened to hear some young engineers, in the approximately ten-years-since-graduation group, briefly discussing the education of our "novitiates". One of them made the statement, which went unchallenged, that it was only because of their "non-technical electives" that one could differentiate between an engineering technologist and an engineer. To this I now say



1949 Engineering Building, University of Manitoba.

nonsense! The way to produce better engineers is to require more and better courses in the basic and applied sciences.

Allow me to comment on my own experience — lo, these many long years ago — with English for engineers. All I can remember from that long-ago course is studying Gulliver's Travels, and Erewhon and Erewhon Revisted (Erewhon, we were told, was Nowhere spelt backwards; perhaps it was this error in reversed spelling that turned me off Butler forever!) I am still able to recall many topics from those long-ago classes in physics, chemistry, calculus, and mechanics. With the horse still being a major source of power in those days, Swift's tale of Gulliver's visit to the land of the horses intrigued me. However, all I can remember today is that the horses called themselves Hoynhyms (or some such peculiar spelling as that). Heady stuff! As for Butler's two books — nothing! If it is true that, on our death-bed, everything that we have ever experienced flashes through our minds — a sort of grand, last-minute, memory dump before entering Valhalla as it were, I will finally find out what my professor of long ago was trying to teach me.

As I believe all engineers should, I acquired most of my "culture" after graduation. Young readers may be surprised to learn that I had lived over half my life before watching television. As a result, I had to discover the legitimate stage while in London, attend my first opera in Glasgow, find out about art galleries in Bristol and New York. Along the way, I studied Russian in some depth, dabbled in a bit of Persian, and now have my French more-or-less under control again. But it has all been a waste of time and effort as far as my performance as an engineer is concerned.

It is interesting that no employer, or client, has ever asked me about my non-technical qualifications. Perhaps they have assumed (and rightly, I believe) that a university graduate/professional engineer will have continued acquiring cultural "baggage" as the years have passed. What has interested them have been my "technical" abilities — what I have known about the characteristics of kiln-dried wood, or the impact velocity of an automobile as indicated by the measurements obtained by the police at the accident site, or the likely sequence of events that led to the collapse of the grain-storage structure. Not once did anyone concern himself about my ability to read and converse in Russian, or that I had had a season's ticket to the Royal Winnipeg Ballet for five years, or that I have seen Les Fourberies de Scaplin in French. Perhaps it has been my misfortune to have always had to deal with insensitive men — lawyers who have been unable to appreciate the true worth of an engineer, or other engineers who had obviously lost sight of the factors that really count in the education of an engineer!

Many years ago, a study was made by an American University (I believe it was Purdue; the study was reported by the American Society of Civil Engineers). The object of the survey was to find out how the graduates of their engineering faculty would change the undergraduate programme through which they had come. The important feature of this study was how the passage of time affected the view-point of the respondent. Graduates

"It is interesting that no employer, or client, has ever asked me about my non-technical qualifications."

in their first five years in industry felt that their studies had been deficient in technical content. In the next group, as the engineers came into their first managerial positions, they felt that they should have learned about how to work with others — elementary leadership training. Then came economics, technical writing, advanced decision-making, etc., until, finally, those engineers who had been in industry for at least 25 years stated that they should have been given more "cultural" courses — music and art-appreciation, foreign languages, and the like. This survey illustrates a major problem of feed-back in the planning of curricula; the men who are most influential in affecting changes to an engineer's basic training and are no longer engineers — they are managers.

An interesting example, concerning two young engineers-in-the-making, came to my attention recently. Michael is my son. He and his wife, Roshni, are studying engineering at Waterloo having first obtained degrees in Ecology and Zoology, respectively, at the University of Manitoba. This summer, they have been working with the National Research Council in Ottawa in the cleaning up of effluent from garbage dumps using reversed osmosis (RO). The fire in the pesticide-storage warehouse in Canning, Nova Scotia in late May, produced much contaminated water which the fire-fighters succeeded in impounding. Michael and Roshni were sent down to Canning to process this water with a portable RO unit. That Michael happens to have played upright bass in the University's Symphony Orchestra, a that Roshni is a fine singer and an a complished equestrian had no bearing on their work. The only thing that counted was their technical competence — their biochemistry and thermodynamics and physics.

The profession must always be concerned with the preparation of the current classes of undergraduates. However, the time may well have arrived for something more than tinkering with non-technical electives if the profession is to remain equal to the demands of the future. Has the time arrived for engineering to recognize the "hard core" aspect of engineering by having an Honour Degree? Should we "spall off" the management-bound students by creating a new Department of Engineering Management where non-technical electives may well have an important place? Where, or how, does the professional development of the engineer fit into the scheme of things?

In spite of the fact that our Association has bonspiels and golf tournaments but never a Poetry Day or an Art Gallery Evening, few members will deny the importance of continuing his/her personal growth in those non-technical activities that appeal to the individual. However, such development is for the engineer after graduation; while at the University, let us permit our students to on with their engineering by freeing th from the shackles of the non-technical electives. □

Engineering Education . . . a Forum, Engineering Education . . . a Forum,

Graduating Engineers in the Year 2000

By Dale M. Christensen

I was asked to discuss the "background and skills of the engineers we would expect to be hiring in the year 2000." I will focus on the question in a generic sense.

Engineers will continue to use the basic laws of fluid dynamics, thermodynamics, and physics. However, we can look for substantial changes in how we integrate these engineering and technical skills with economic and operating skills.

This integration of multi-disciplinary skills is indicative of a key need in the business world. Interestingly, this need to integrate skills has, to a large extent, resulted from our past success in disaggregating complex tasks into discrete manageable pieces. As a business society and as an engineering community, we have become incredibly efficient at analyzing and designing the smallest component of the most complex things. But is this precision and efficiency enough? Witness the recent tragedy with the space shuttle "Challenger." The entire space shuttle program and the NASA organization is a testament to the incredible accomplishments of the engineering community. And yet, it is now beginning to appear that this last space shuttle mission was doomed because of a simple communications break-down. While the Challenger tragedy was more dramatic than most, I'm sure we can all recall situations of 'engineering' excellence being negated by the failure of an equally important activity such as communications, marketing, operations or manufacturing.

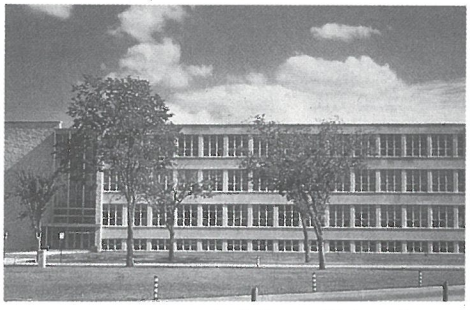
This situation might be described in terms of "efficiency" and "effectiveness" — "efficiency" meaning doing things right, and "effectiveness" meaning doing the right things. Traditionally, much of our engineering focus has been on efficiency, doing things well with precision, accurately, etc. It is my belief that as a profession, we will need to pay more attention to "doing the right things" — "effectiveness." In the oil business, and I suspect in virtually all other businesses, the "right things" are not defined unilaterally by specific disciplines or divisions. At the strategic planning level, the inputs of many functions (engineering, geology, operations, marketing, economics, etc.) are all required in order to determine the right activities/objectives for a corporation to pursue. At a project level, the right design must incorporate not only the input of design engineers, but also of purchases, manufacturers and operators.

So what are the skills that would allow our engineers to be more effective now and in the future?

First and foremost there are the so-called "human skills." They include communication skills, presentation skills, marketing skills, interpersonal skills, team skills, etc. These all share the common element of "being able to work effectively with others." Secondly I would include "decision-making" skills. These include creativity and innovation in determining alternative solutions to problems, risk analysis, ability to utilize corporate/personal values in decision making, etc., Finally, I would be remiss if I did not mention computer skills, although I believe they are less important than commonly thought.

Let me first deal briefly with the question of computers. There is no doubt that the lack of "computer literacy" has hampered many engineers, particularly those of us who graduated prior to the so called "computer revolution." Many of those graduates who continue to practise engineering have willingly (or in some cases unwillingly) managed to keep abreast of the rapid technological advancements in the computer business. However, many engineers who have become corporate supervisors or managers remain unaccomplished in this field. In many cases, they have not only hindered their own productivity potential, but have also hindered their staff's potential by resisting the introduction and wide-spread use of these powerful tools into their organization.

It is my belief that this problem will largely disappear over the next several years and will probably be absent by the year 2000 for a couple of key reasons. First, and foremost, the new generation of computers will very likely "talk our language" rather than having us talk theirs. In other words, computers will become so "friendly" as to virtually eliminate the interface problems of today. Secondly, many of today's computer-illiterate managers will retire over the next 15 years and will be replaced with "computer literates," thereby facilitating increasing acceptance and use of the computer's power.



1967 Engineering Building, University of Manitoba.

The second key skill that I suggest will take on greater importance is "decision making." In the past, many engineers focussed their efforts on "analysis" and passed on their findings and conclusions to others who were the "decision-makers." In the future, it is my belief that there will be an accelerating trend towards engineers making decisions while computers do the bulk of the analysis. This trend is being encouraged by several factors in most organizations today:

1. The growing computer power will permit more computer analysis and allow engineers to expand their responsibilities to encompass decision-making.
2. Within many large organizations, there is a move to assign project tasks rather than functional responsibilities. As such, project management and project decisions will increasingly consume the engineer's time.
3. Decision-making is being pushed down in many organizations as they recognize the many benefits of doing so (commitment, ownership, accountability, productivity).

What is "decision-making"? Decision-making can be described as the "selection of the preferred alternative from a range of possible options considering the probabilities of a variety of possible outcomes." Stated more simply, it is "considered choice." It is not accepting the first satisfactory solution, it is not doing what is easiest, it involves choice. In making decision 'choices,' engineers need to be schooled in the skills of decision-making.

Included in a basic decision-making process are the following components:

—knowing precisely what decision is being made
—knowing what outcome(s) we want (e.g., based on our values, objectives, goals and their relative priorities)
—the development of an appropriate number of alternatives (innovation/creativity, "brainstorming")
—consideration of all possible outcomes, good and bad, and an assessment of the probability of each
—careful consideration of the information requirements (and knowing when we have enough information)
—risk analysis
—willingness to make the decision

In reaching our decisions, it is important to seek the input and commitment of all those who will be affected in order to implement most decisions and to achieve the desired outcome.

A final 'decision-making' factor I wish to mention is "computer modelling." Computer-based decision models permit detailed "what-if" analyses of complex decision situations. A wide range of alternatives

(continued on page 10)

and outcomes can be examined in a short time-frame. Such "simulation" techniques will continue to gain ever widening applications in all elements of business. Operating, technical, economic, marketing, and strategic situations can all be modelled and widely applied. This trend will increasingly move engineers away from analytical work (number crunching) and into model development. This will, of course, require complete understanding of decision situations and how all factors affect each other. It will also allow more time to be spent on decision implementation and all the attendant "human" issues normally associated with putting decisions into action.

This brings me to the final and I believe most important skill that will be mandatory for successful engineers in the future: "human skills." As I mentioned earlier, these skills are all those things that will allow the various disciplines, including engineers, to work together effectively in a group environment.

Let me repeat some key "human skills" that I mentioned earlier:
—communication skills (verbal/written)
—presentation skills
—marketing skills
—interpersonal skills
—team skills
—non-authority leadership skills

There are probably two work environments where these skills are most needed: First as an engineer participates in or, as will often be the case, leads a project task team. Secondly, these skills become extremely important as the engineer takes on supervisory and management responsibilities. In both cases, he will very likely have responsibility for bringing a multi-disciplined approach to bear on corporate projects and problems. His success in these situations will be greatly determined by his abilities in the area of "human skills."

The ability to communicate effectively is a common and important thread in virtually every "human skill."

I would guess that when the word "communicate" is used, most of us think of talking. In other words, we think of sending messages.

Typically, we do not attach enough importance to receiving messages — that is, to listening or reading. Some material on communications I was recently reading, noted that a typical person "communicates" in the following proportions:

Writing	9%
Reading	14%
Speaking	32%
Listening	45%

The importance of listening is clear and yet it is one we pay the least attention to. While there are many barriers to effective listening, it is possible to teach "effective listening" to those for whom it is important, and I believe it is critically important for engineering project managers and supervisors.

The purpose of communication is "to share understanding." In other words, if as a reader or listener, there is some doubt about what a writer or speaker has said, the communication has not been completely effective.

Let me conclude by briefly examining who is responsible for teaching these "human skills." Obviously, it is shared by many — parents, educational institutions, and employers. As I was preparing my remarks, it occurred to me that the engineering graduates of the year 2000 are only 7 or 8 years old today. They are undoubtedly the sons and daughters of many of us. And thus, the first responsibility lies with us as parents.

As an employer, I am well aware of the considerable effort that corporations undertake to make their staff more effective in this area. Every year we run courses on effective presentations, effective supervision, writing skills, speed writing, motivational skills, etc., all in addition to the on-the-job coaching in these areas. I would estimate that perhaps 2/3 of training budgets in our industry are spent on teaching "human skills."

Between these two ends of the spectrum are the educational institutions, the elementary schools, the high schools, and the universities and technical schools. Focussing specifically on the university level, it is my belief that the Engineering College (and other technical colleges) need to devote more of their resources to teaching these human skills. It is too simplistic to suggest that high school graduates should possess all the human and communication skills thereby allowing universities to focus on other things.

The simple fact of the matter is that 17 or 18 year old university entrants do not ha enough "life experience" to grasp fully complexities of these skill areas. In fact, a lot of us are unable fully to master these skills in our working lifetime. We cannot afford to ignore our education in these important skills for four years while we become proficient at understanding physical behaviour. The understanding of human behaviour needs to be integrated with our technical knowledge if we are to fully achieve our collective engineering potential. I believe that this has been a deficiency for many years and the problem will continue to grow if it is not addressed.

I'm not sure what it is about engineering that seems to compound this deficiency but I sense that we come out of university somehow believing that people behave in accordance with some infallible and predictable law or principle. I suppose we spend so much time studying Newton's Law, Boyle's Law and Dalton's Law that we forget the importance of "Murphy's Law" especially where people are involved.

I hope I have provided some food for thought. □

This article was exerpted from a speech given by Mr. Christensen, who is Vice-President of Resource Development for Sask-Oil, to the Association of Professional Engineers of Saskatchewan 1986 Annu General Meeting.

Council Meetings *(continued from page 5)*

Engineering Centennial — Old Pinawa
The reporter having been involved in discussions and correspondence on this project, being the original hydro-electric installation on the Winnipeg River System, outlined briefly how the Provincial Department of Natural Resources under Derek Doyle, P. Eng., has developed a day-use park at the site. It was recognized that while the structure on site constitute heritage structures it is as well an engineering heritage structure which has potential for recognition as part of the Engineering Centennial program in Manitoba. Councillor Newton, because of his previous background in Natural Resources, has been appointed a committee of one to further report to Council.

Log of Experience
The Ad Hoc Committee on the Log of Experience has looked into the documentation required to comply with the "Log of Experience" as referred to in the Admissions Standards, which is primarily for applicants who are not working under direct supervision. Considerable material on ducumentation was put before Council; however, Registrar Mackenzie indicated that some amendments were under way, hence the matter was put on hold until a further council meeting.

Name Change — Bulletin Committee
Since the publication *"Manitoba Professional Engineer"* no longer carries a connotation of a bulletin, the reporter, when asked to speak to the matter, suggested that perhaps the committee should be known by a different name such as the "Publication Committee". Some concern was expressed that the name publication might assume to include all publications of A.P.E.M. However, the name would be kept in the singular state and Council approved the use of the name "Publication Committee".

Professional Development Committee
With Chairman John Bachmann leaving the city, Ernie Klein was proposed as new chairman and Barry MacBride as new vice-chairman, all of which Council approved.

By-Law Change
Arising from action taken recently by C.C.P.E. to change the name of the Canadian Accreditation Board, and as such the Board is referred to in the A.P.E.M. by-laws, a housekeeping motion was passed which would request a by-law change at the Annual General Meeting to recognize the new name. In addition, the necessary signatures for such a by-law change were gathered from th present.

And so, there being no further business, the meeting adjourned at 7:30 p.m. If the reporter is permitted a comment — a well-run meeting by President Clarke. □

From the Rough . . .



Line-up for the 19th hole.

By Len Ganetsky, P. Eng.

It was a warm June Winnipeg morning in St. Boniface and the professional engineers were at it again. The annual A.P.E.M. Golf Tournament took place on June 16th at the St. Boniface Golf Club with 136 golfers participating.

The weather cooperated fully; except for the backup at the first tee, the entire event went off without a hitch.

Ken Boitson took low gross honors with a score of 80; however, Ken is not an engineer so the Landon Trophy went to Bruce Elliott with the second low gross of 82. Third low gross went to C. Wiebe with 84 and fourth, fifth and sixth low gross went to Gord Marshall, S. Lees, and Bruce Clapham respectively, all with a score of 85.

John Bockstael took the Sullivan Cup with low net score of 61. Second low net went to Bob McKibbin with a score of 64. L. G. Holden and Gil Wiebe took third and fourth low net respectively with a score of 67. Fifth and sixth low net were tied at 68 and went to Murray Walker and Murray Dinwoodie respectively.

Ken Boitson also shot the low score for the low front nine with a score of 37. D. McCormac shot the low for the back nine with a 40.

Longest drive honors went to Robert Taylor. George Hrabowych almost took closest to the hole honors on both the front and back nine, but was robbed of this distinction by Tim Stratton who came even closer on the front nine.

In order to spread the collection of prizes throughout the skill levels, prizes were also given for other notable accomplishments.

Steve Chromy has the distinction of being the most honest golfer with a score of 186. Not far behind, Len Ganetsky took honors for the most 9's on a scorecard. The recognition for most 7's on a scorecard went to Ray Bodnar and Brian Mather was recognized for his achievement of a score of 13 on the high hidden hole.



Ted Clarke presents Sullivan Trophy to John Bockstael.

The staff at the St. Boniface Golf Club were very friendly and served a great meal. Compliments must also be made to the Sports Committee for organizing the event. Some discussion was raised about having next year's tournament back in the country and alternating year to year. Well, wherever it is held, I'm sure we all will be looking forward to another great tournament. □

Engineering Graduate Members

Registered in June and July 1986

A.A. Drobot
C. K. Gin
M. J. Mark
W. B. Todd

New Members Registered

During June and July 1986

E Y. Ahn, P. Eng.
R. B. Bittner, P. Eng.
D. V. Braun, P. Eng.
D. Breuer, P. Eng.
B. W. B. Chin, P. Eng.
R. D. Clement, P. Eng.
V. M. Corkery, P. Eng.
K. A. Dickson, P. Eng.
J. P. Ewasiuk, P. Eng.
W. Fast, P. Eng.
G. W. Ferguson, P. Eng.
R. R. Foreman, P. Eng.
D. R. Greer, P. Eng.
P. R. Grover, P. Eng.
L. G. Hanson, P. Eng.
L. S. Howard, P. Eng.
G. B. Jonson, P. Eng.
P. M. Kalyta, P. Eng.
L. Kozalk, P. Eng.
J. A. Kreml, P. Eng.
W. B. Kruger, P. Eng.
J. H. Kuehl, P. Eng.
K. C. Y. Leung, P. Eng.
D. J. Lindal, P. Eng.
H. S. Matharu, P. Eng.
J. S. McLeod, P. Eng.
M. A. Mular, P. Eng.
K. J. Murdock, P. Eng.
K. E. Nelson, P. Eng.
G. D. Newton, P. Eng.
A. M. Osman, P. Eng.
P. A. Palanuk, P. Eng.
S. M. Pellerin, P. Eng.
G. M. Regier, P. Eng.
A. K. Sachdev, P. Eng.
D. L. Sigurdson, P. Eng.
F. J. Silva, P. Eng.
R. H. Schmidtke, P. Eng.
K. M. Skaftfeld, P. Eng.
D. Sumner, P. Eng.
R. F. Taylor, P. Eng.
L. Tocko, P. Eng.
A. Toews, P. Eng.
J. L. Trembley, P. Eng.
L. M. Ubell, P. Eng.
H. J. Vielhaber, P. Eng.
S. J. Walsh, P. Eng.
D. M. Weiten, P. Eng.
M. Wierucki, P. Eng.
J. T. Winstone, P. Eng.
M. Woelcke, P. Eng.
J. I. Wong, P. Eng.
D. P. Zack, P. Eng.
M.L. Zahn, P. Eng.

Congratulations to **Joe Ike Wong** for achieving 100% on the Professional Practice Examination. □

CCPE Considers

(continued from page 2)

dations of the Evans Committee. They deferred any decisions on the Taylor and Dupuis committee reports until the semi-annual meeting in November. This will allow the provincial Associations time to consider the ramifications of the committee recommendations.

Council has previously registered with C.C.P.E., A.P.E.M.'s comments etc. on the reports prior to the C.C.P.E. meeting. Council is presently looking at these reports again and will register the A.P.E.M. viewpoints at the November C.C.P.E. meeting. It should be noted that any decisions of C.C.P.E. relating to recommendations in these reports are not binding on any provincial Association. □

Professional Engineers' Wives Association Announce 1986-87 Program

The Professional Engineers' Wives Association would like to invite all those interested to take part in the following events. For further details contact Mrs. A. Penman at 489-7668.

Sept. 23/86 Membership Tea, Wine and Cheese, home of Mrs. D. R. Grimes, 191 Victoria Crescent, 1:30-3:30 p.m.

Oct. 28/86 Luncheon, Carlton Club, 280 Fort Street, Fashion Show—World Fashion.

Nov. 25/86 45th Anniversary Dinner, Chamber of Commerce, 500-167 Lombard Ave., Speaker, His Worship W. Norrie, Q.C., Reception for members and spouses 6:00 p.m. Dinner 7:00 p.m.

Jan. 27/87 Luncheon, Hungarian Restaurant of Winnipeg, 174 Isabel Street, Ethnic Entertainment.

Feb. 24/87 Luncheon, Cibo's Restaurant of Winnipeg, 283 Bannatyne Avenue, Speaker, Constable Linda Kisil—Lady Beware.

Mar. 24/87 Luncheon, Birchwood Inn, 2520 Portage Avenue, Hat Fashion Show, Maria's Hat Design.

Mar. 31/87 Dinner with the Big and Little Sisters. Hollow Mug, International Inn, Optional attendance by members.

Apr. 28/87 Luncheon, Holiday Inn South, 1330 Pembina Highway, Annual Meeting.

June 2/87 Golf, Bridge and Lunch.

Luncheon Reception: 12:15 p.m. Lunch: 1:00 p.m. □

NSERC Grants

To enable researchers to make greater contributions towards understanding and solving problems of national concern, the Natural Sciences and Engineering Research Council is awarding strategic grants for projects of Canadian interest. The following categories have been chosen:

1. Biotechnology, 2. Communications and Computers, 3. Energy, 4. Environmental Toxicology, 5. Food and Agriculture, 6. Industrial Materials and Processes, 7. Oceans, 8. Open. The program's budget is $32.2 million.

This year, five members of our Association and professors at the University of Manitoba, were awarded NSERC strategic grants.

In the environmental category, J. A. Oleskiewicz of the Civil Engineering Department, will research the controlling of sulfide toxicity in anaerobic processes.

In the food/agriculture category, W. E. Muir of the Agricultural Engineering Department will study and develop low cost methods for wheat ventilation.

In the nuclear energy category, J. Graham of the Civil Engineering Department will study the mechanical properties of sand-clay buffers for nuclear waste storage at elevated temperatures.

L. Shafai of the Electrical Engineering Department will research antennae development for Canadian satellite applications.

T. R. Hsu of the Mechanical Engineering Department will research techniques to enhance the permeability of oil sands by effective in-situ fracture between wells. □

1986 Concrete Buildings Award Program

Entries are being accepted for the 1986 Concrete Buildings Award program sponsored by the Portland Cement Association (PCA) of Skokie, Illinois.

This award program offers recognition to the building team of architect, engineer, contractor, and owner. The awards will be presented at the Third International Forming Conference at the Westin Galleria Hotel, Dallas, Texas, November 1986.

Concrete buildings of all types completed in the United States and Canada between September 1984 and September 1986 are eligible for judging. Materials used may be cast-in-place concrete, precast concrete, concrete block, or other concrete products. Entries must be submitted by September 30, 1986.

Entry forms are available from R. Waddell, Canadian Portland Cement Association, 200-5 Donald Street, Winnipeg, Manitoba R3L 2T4. Telephone 204-477-1220. □

Licences Issued in June and July 1986

J. G. Agar, P. Eng. (Alta.)
K. A. Bocking, P. Eng. (Sask.)
J. C. Burford, P. Eng. (Alta.)
J. W. Butler, P. Eng. (Ont.)
D. B. Burnes, P. Eng. (Alta.)
G. L. Colborne, P. Eng. (Sask.)
P. B. Elliott, P. Eng. (Alta)
P. W. Given, P. Eng. (Alta.)
R. J. Grafton, P. Eng. (Alta.)
H. H. H. Ho, P. Eng. (B.C.)
W. P. Hodkinson, P. Eng. (Ont.)
J. D. Hubbert, P. Eng. (Ont.)
B. J. Lukes, P. Eng. (B.C.)
E. C. McRoberts, P. Eng. (Alta.)
B. Pandey, P. Eng. (Ont.)
H. H. Singer, P. Eng. (Ont.)
B. Singleton, P. Eng. (Ont.)
C. G. A. Straub, P. Eng. (Sask.)
D. R. Sutherland, P. Eng. (Alta.)
D. W. Tam, P. Eng. (Ont.)

IN MEMORIAM

With deep regret
the Association records
the passing of:
ROBERT M. HARDY, P.Eng.
of Edmonton

Professional Development

AN INTERNATIONAL CONFERENCE ON CONCRETE IN TRANSPORTATION
SEPTEMBER 8-10, 1986 — Vancouver, B.C.
Holiday Inn Harbourside

The conference is sponsored by the British Columbia Chapter — American Concrete Institute, Canada Centre for Mineral and Energy Technology, and the Canadian Portland Cement Association.

While the program has yet to be finalized, abstracts have been submitted on a wide variety of transportation related topics. Technical tours are also planned which include: Annacis Cable-Stayed Bridge, Advanced Light Rapid Transit (ALRT) System, and Vancouver Harbour Marine Tour.

For further information about the conference and a registration package, contact: Concrete in Transportation, Venue West Conference Management Services, 801-750 Jervis Street, Vancouver, B.C. V6E 2A9.

CALL FOR PAPERS

Winnipeg, Canada will be the location of the next Executive Council Meeting of the International Federation of Municipal Engineers (IFME).

In conjunction with this meeting, the Institute for Municipal Engineering Committee of the Manitoba Chapter of the American Public Works Association is proud to be hosting the First North American IFME Seminar on June 24-25, 1987.

The theme of the conference will be Municipal Engineering: Challenge of the '90's. Prolonging and enhancing the life of our infrastucture will demand new and sometimes radical technological change. The choice is clear — find and finance the new technology or replace and enlarge the infrastructure.

If you are interested in presenting a paper (20-30 minutes) at this conference, please send your name, job title, affiliation and a general title before October 15, 1986, to: The City of Winnipeg, Waterworks, Waste & Disposal Department, 1500 Plessis Road, Box 178, Transcona P.O., Winnipeg, Manitoba, Canada R2C 2Z9. Attention: Mr. A. H. Permut, P.Eng.