



AUSTRALASIAN ASSOCIATION FOR ENGINEERING EDUCATION

NEWSLETTER

Vol.2, No.3

Sydney, September 1990

2,6,0080



The response to the call for papers for the 2nd Annual Convention and Conference, to be held at Monash University, Melbourne, in December, 1990 has been enthusiastic. Conference Chairman Professor Peter LeP Darvall has written a report on the progress of the conference and this is presented overleaf. Picture above shows a part of the campus at Monash University.

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Engineering

PROGRESS WITH THE 2ND ANNUAL CONVENTION AND CONFERENCE

NEW PATHWAYS AND METHODS IN ENGINEERING EDUCATION

Venue: Monash University, Clayton, Victoria

Date: Sunday - Tuesday, December 9 - 11, 1990

Chairman: Professor Peter LeP Darvall, Dean of Engineering, Monash University

At the day of writing (August 21, 1990) 112 abstracts have been received and several more promised. Many abstracts have been selected as worthy of paper presentation and authors are now being notified. A number of papers have been received for each of the advertised topics

- * Promotion of science and technology in schools
- * Bridging courses to engineering
- * Industry/academia co-operative education
- * Articulation in the range trade certificate to professional degree
- * Distance education
- * Postgraduate and continuing professional education
- * Balancing the curriculum between technical and general material
- * Application of teaching technologies and self-directed learning
- * Implementation of recommendations from recent reviews of engineering education
- * New course structures in engineering and technology
- * Combined degrees
- * Retention, productivity and quality assurance in engineering education
- * The role of educational psychology in engineering education
- * Computer simulation versus laboratory experimentation
- * Engineering education in industry
- * Student response to engineering courses

Added to these topics are the groups:

- * Women in engineering
- * First year courses
- * Computer literacy in engineering
- * Engineering education in other countries

A small number of keynote speakers has been selected, with more to come in some of the topic areas. While most of the response, as expected, has been from academic institutions, submissions have been solicited and/or received from DEET, from schools (for Technology Education in the Early Years), from industry and professional bodies such as IEAust and APEA (for articulation and continuing professional education), and from the Armed Services (for the particular requirements of the engineering profession in this area). Although the deadline for abstracts has passed, the Organising Committee has agreed that especially interesting abstracts will continue to be considered as they come in. **No abstracts have yet been received from New Zealand.** There have been offerings from authors in Canada, China, France, India, Indonesia, Malaysia and South Africa. Student organisations have also submitted abstracts on their response to engineering courses.

Upwards of 200 people (including those presenting papers) have expressed an interest in attending the Conference. This will ensure that the registration fee can be kept to a minimum.

Unfortunately, the Senate is scheduled to sit during the time of the Conference, so that Senator John Button will be unable to address the Conference Dinner. However, Dr Michael Sargent, the especially active President of the Institution of Engineers, Australia, has

accepted our invitation to be Guest Speaker at the Conference Dinner.

There will be some difficulty in finding time for all the anticipated papers within the 2.5 days of the Conference. It will be necessary to run parallel sessions. However, they will be kept to a minimum. It is intended that there be some innovative modes of presentation, eg debates.

The Organising Committee consists of Professor Peter Darvall (Monash University, Chair), Professor Trevor Cole (University of Sydney), Dr Zenon Pudlowski (University of Sydney), Mr Harry Wragge (Telecom Research Laboratories), Mr Geoff Hansen (Monash University School of Applied Engineering), Dr Tony Richardson (VUT, RMIT), Dr Bill Roebuck (EPM Consultants), Dr Ken Spriggs (Monash University College, Gippsland), Dr Mike Taylor (Monash University, Secretary), Associate Professor Bill Charters (University of Melbourne), Dr Murray Gillin (Swinburne Institute of Technology), Dr Geoff Lleonart (VUT, FIT) and Mr Geoff Sutherland (IEAust Victoria Division).

Authors intending to submit late abstracts should contact Dr Michael Taylor on (03) 565-4959, or by fax on (03) 565-4944.

*Professor Peter LeP Darvall
Dean of Engineering
Monash University
Conference Chairman*

FROM THE PRESIDENT

We are hearing a lot about two aspects of engineering education which have important ramifications for us all in both industry and higher education - *articulation* and *continuing education*.

Articulation is becoming a reality very rapidly as opportunity is given to ever wider parts of the technical and engineering workforce to upgrade their skills. The ACTU and The Institution of Engineers, Australia, are both playing their part in providing a structure and encouragement for this process. They are both to be applauded in addressing the outstanding need within Australia to upgrade the skills base of our workforce. If, through such upgrading, we are better able to design, develop, manufacture, install and operate advanced engineering products and services at world-competitive prices and quality, then perhaps we can maintain our standards of living into the future.

Universities will need to give careful attention to what role they will play in this process. Not all institutions will be, nor should be, part of the articulation process. Articulation is just one aspect of the overall creation of advanced skills in Australia. The majority of good graduate engineers will continue to come through direct entry from school into a four-year university degree. There are some universities which will structure their degree to cater most effectively for this stream and thereby make it difficult to incorporate articulating students.

There will be other universities who see in articulation a new and exciting niche opportunity to attract mature and motivated students to a program catering to the special needs of this new group.

There are other institutions which have been part of an articulation process for many years already. For these, the opportunities will expand greatly.

One sees then, that although our universities now all belong (at least in Australia) to a *National Unified Scheme* this does not mean - and never should mean - that we offer a

unified approach to engineering education. We all, as well as the nation, will benefit from a diversity of roles amongst our university engineering departments with each addressing its own community and with courses and structures turning out their own particular types of graduate. We are certainly going to need a wide range of capabilities, skills and types of engineer.

And once turned out, the role of education does not end. We are all aware of the Australian Federal Government's introduction of a training levy on larger employers. Many will be aware of (at least in some Australian States) of the diversion of payroll tax into a fund supporting educational activities in engineering. We have also read of The Institution of Engineers, Australia, forming a company to handle aspects of continuing education. In continuing education is yet another potential opportunity and responsibility for the engineering departments of our universities.

But it would be unwise to enter this field without listening to the experience of those already in it. Continuing education is unlikely to be the goldmine that some might be expecting.

Continuing education will be of engineers looking for immediate upgrading of skills relevant to their current job. They will be engineers with other responsibilities to their job, home and family. They will be working for employers who will only invest their funds in support of education when the relevance is very clear. They will not be likely to be interested in higher degrees.

The relatively small base of industry in Australasia is going to make it difficult to attract the numbers to justify expensive course preparation. Most courses will *saturate* the market very quickly and will need major revamping if they are to continue.

This is an area where the initial costs to create a course, advertise it, and pay the presenters are almost independent of the number of attendees. Continuing education is a very risky business. It is with interest that the IEAust company (rather than the university) is likely to carry the financial risk this entails for the courses they identify, promote and commission from a university.

An alternative to bringing people together for a course is to have in-house courses at the workplace. Salford University in England has a marvellously innovative approach using double-decker buses modified by the bus company to be tutorial rooms upstairs and lounges downstairs. These trundle from factory to factory offering courses on-site, with obvious savings to employers and attendees. Other examples exist of the use of telecommunication links of various capacity as a means of on-site access to courses.

Perhaps the most extensive of these is the National Technical University in the USA made up of 25 universities in a consortium to present classes and courses via satellite television broadcast with return audio link. A major element of their offerings is in engineering. NTU has enrolled over 40,000 students in non-credit courses since 1987 and over 12,500 in courses towards a degree since 1984. They have achieved an average course *attendance* of 450 and, at a cost of about \$65 per day per attendee, the cost is well below the \$150 - \$350 per day of the more usual course.

Does NTU have relevance to us in Australasia? Yes, it does. AUSSAT has been in the news lately and it may not be widely known that AUSSAT does offer an effective means to duplicate the experiences of NTU. It will require an imaginative packaging of costs from AUSSAT. It will require a most careful balancing of production quality against production cost. It will require a most careful market study of appropriate courses to offer. And it will require the co-operation of a number of universities to provide the spread of available skills and material.

Within New South Wales, the State Government is currently implementing a government information network on which educational material can flow. Similar networks already exist in other States.

As an Association involved with industry, government, professional bodies and tertiary institutions, the AAEE can play a special role in articulation and continuing education. Both are in critical need. Both will require special approaches and resources. Both will require the inter-institution and inter-sector co-operation which the broad base of the AAEE can facilitate. Are we prepared to accept the challenge? Where is the entrepreneur amongst the membership?

Professor Trevor W. Cole
President of AAEE

The journal of the Institution of

ENGINEERS AUSTRALIA

June 1, 1990

EDUCATION TIMEBOMB TICKS AWAY



Dr Mike Sargent

While it is satisfying to observe the increasing understanding of the critical role that the profession of engineering plays and will play in the future well-being of Australia, while we applaud the higher emphasis given to the education of engineers for Australia's future, there is an urgent need to *close the loop* in the engineering education strategies of the government.

Increasing the number of students in engineering courses is but one part of the question - similar emphasis must be given to the other elements of the engineering education system:

- * the resourcing of engineering faculties both with staff and equipment
- * the recruitment of an academic staff of high intellectual and professional standing
- * the encouragement of higher degree studies for professional engineers.

Engineering is a profession whose role is the application of technology in the service of the community. It is therefore ludicrous to educate engineers for Australia's future based on technology of the past. Yet, how many engineering schools do we see which are funded so poorly that the monies available are barely able to maintain existing facilities, and provide no room to introduce new technologies. Continuation of the present funding arrangements will lead inexorably to the development of our engineering schools as technological museums, despite the valiant efforts of dedicated staff.

Similarly, a crisis exists in the academic staffing of our engineering facilities. The country has allowed the salaries of academic staff to fall to such a level that teaching in the faculties has become an unattractive career option for promising young academics. The paucity of science and mathematics teaching in secondary schools should be a stark warning of things to come in engineering education if we as a community do not redress this inequity, and provide financial incentives, comparable to other career options, for capable engineers to become the teachers of future generations of professionals. It is foolhardy to

think that the highly qualified engineers required by Australia can be educated by anything less than the best talents available in the profession.

The timebomb ticking away in our engineering education system is, however, the decline in the number of Australian engineers pursuing higher engineering qualifications - the masters and doctoral students. For these provide the feedstock for the technological experts and engineering educators of future generations, a resource we cannot replace easily by immigration, or waving a magic wand. Inadequate incentive is provided for engineers to pursue higher qualifications - the financial support available during the studies is woefully inadequate, and the financial rewards (for acquiring higher qualifications) provided by industry for higher-degree graduates are virtually non-existent.

If we wish to be a great country again, we need to change our culture to one which encourages and rewards achievement, and educates the best with the best.

Dr Mike Sargent

President

The Institution of Engineers, Australia

THIRD MEETING OF THE EXECUTIVE COMMITTEE OF AAEE

A third meeting of the AAEE's Executive Committee was held on Tuesday, 15 May 1990 at 4 pm in the School of Electrical Engineering at The University of Sydney. The agenda included a number of vital issues for the operation of the Association. Most of the discussion centred on the progress of the 2nd Annual Convention and Conference of AAEE and the East-West Congress on Engineering Education. The Association's activities for 1990 also formed a substantial part of the agenda.

Members of the Executive Committee discussed several ways of conducting a survey on engineering education research and developmental activities within Australasia, and a survey on engineering education publications. Questions and topics to be included in a special questionnaire were also considered. Further discussion on the feasibility of the application of electronic communication was also carried out. The Editor informed members of the Executive Committee of progress with the first issue of the *Australasian Journal of Engineering Education*.

Other future activities were also discussed, namely, the venue for the 3rd Annual Convention and Conference of the AAEE in December, 1991. A letter of intent had been received from the head of the Department of Electrical and Electronic Engineering at Manukau Polytechnic in Otara, Auckland, New Zealand, to host the 3rd conference. The Committee expressed the view that more time should be given for preparation of the 3rd annual meeting, and a decision on the most suitable venue should be made earlier, that is, at a fifth meeting of the Executive Committee, which will coincide with the 2nd AC&C at Monash. The Committee decided that a call for expression of interest to host the third conference should be made in this issue.

In addition, it was decided that on Wednesday, September 5, 1990, an official launching of the *Australasian Journal of Engineering Education* will take place at 6pm in the School of Electrical Engineering at The University of Sydney. Details on this event will be included in the next issue.

EXPRESSIONS OF INTEREST

A call for expression of interest is made to host the 3rd Annual Convention and Conference of AAEE in the second week of December 1991. The Executive Committee

invites academic institutions throughout Australasia to submit a written proposal in which the following criteria for selection should be considered:

- * Profile of the institution
- * Conference objectives
- * Conference themes and special areas of interest
- * Academic staff interest and support (suggested organising committee)
- * Local support by academia, industry and professional organisations
- * Conference facilities to support the lecture program
- * Facilities for registrants and transport needs
- * Estimate of financial situation and proposed budget, etc.

Submissions should be forwarded to the AAEE President, Professor Trevor W. Cole, School of Electrical Engineering, The University of Sydney, NSW 2006, Australia by December 1, 1990.

A CRISIS IN ENGINEERING UNDERGRADUATE STANDARDS!



Mr R. Grzebieta

The Victorian Structural Branch Committee of the Institution of Engineers, Australia, is concerned about what they perceive as a trend towards lower undergraduate standards in Bachelor degree courses in engineering schools throughout the country. They feel that action must be taken to enforce minimum standards and improve the incentive for pursuing engineering as a career through improved remuneration to engineers. The latter includes viable fees for consultants and salary increases for engineering academics.



Mr P. Clancy

Late last year, *The Age* newspaper reported that, following a survey, many tertiary institutions inflated course entry scores which they published. Some engineering schools publish entry scores of 225 or lower (see Table 1). The two previous facts suggest that there are minimum entry scores around 200, that is a bare pass in each subject of the Victorian Certificate of Education (VCE). Some engineering schools publish higher entry scores which often do not indicate a higher standard but rather more exaggeration. In the complicated process of enrolments, whereby many students each apply to many tertiary institutions, there is a tendency to inflate entry scores. It is a race for status by the tertiary institutions.

Another report in *The Age* (February 21, 1990), stated that last year, the raw marks for many VCE subjects were artificially increased, i.e. standardised. For example, marks for mathematics B were changed from 32.5% to 50%, physics from 38% to 50%, chemistry from 34.5% to 50% and English from 43.5% to 50%. The marks were lifted to ensure that at least 70% of students passed in each subject, except for English for which the minimum proportion of students passed was 80%. The new VCE will be worse because it will, in effect, pass all students. The report infers that the raw marks have been declining in recent years. It is implied that the main reason for the decline is to double the student retention rate. Thus the extra students would have less ability and lower the average performance. This article does not aim to ridicule the increase in school retention, but rather, points out that VCE marks today may be comparable possibly to scores of below 200 obtained a few years ago. The Federal Government intends to increase the retention rate which will further devalue future VCE results. If it was not acceptable to enrol prospective engineering students with scores below 200 in the past, then today, students with marks below 225, say, should not be accepted either.

Institution	Engineering	Economics	Law	Medicine
University of Sydney	388	386	446	453
University of New South Wales	368	401	442	437
University of Technology, Sydney	325		400	
University of Western Sydney	270			
Canberra College of Advanced Education	271	283		
University of Newcastle	287			434
University of Wollongong	280			
University of Melbourne	377	401	447	442
Monash University	341	378	429	423
Latrobe University	311	311		
Ballarat College of Advanced Education	202			
Bendigo College of Advanced Education	231			
Chisholm Institute	255			
Footscray Institute	261			
Gippsland Institute	281			
Royal Melbourne Institute of Technology	283	370		
Swinburne Institute	259	351		
University of Queensland	349	317	425	425
Griffith University	331			
Queensland University of Technology	331		388	
James Cook University	267	267	337	
University of Southern Queensland	281			
University of Central Queensland	259			
Northern Territory University	221			
University of Adelaide	417	360		430
South Australian Institute of Technology	221			
University of Western Australia	316	283		433
Curtin University	289			

NOTE 1: This table is based on figures supplied by admissions authorities in each State, converted into NSW equivalent scores by the NSW Universities and Colleges Admissions Centre.

NOTE 2: Extract from "The Professional Engineer" APEA Journal, April 1990, Vol. 44, No.3.

TABLE 1: The National Scoreboard: Cut-off Scores for Admission to various Degrees for 1990

The argument is often put that a course entry score is a poor predictor of performance during training and is therefore not a sufficient criterion by itself to debar a prospective student entering an engineering course. This can be true for an individual but the profession should be more concerned with the overall performance of all undergraduates. Low entry scores certainly must lead to a lower performance of the overall undergraduate body during training and in the longer term, a lowering of the standard of the profession as graduates move into the workforce. The Williams Report (see Table 2), which reviewed engineering education around the country, revealed very high failure rates of 30-50% at many engineering schools. The low performance may be worse. Standardisation of marks at engineering schools is a long established practice. Considering the quantity of low entry scores, the amount of standardisation is likely to increase.

In the future, standards may decline even further. The federal minister for the Department of Employment, Education and Training, Mr. Dawkins, has suggested that tertiary institutions be funded on the number of graduates rather than on the number of entrants which is the current practice. Furthermore, there is a surge in numbers of undergraduates in engineering schools which is part of an overall planned growth in engineering graduates. Academics are suggesting that the increase is not necessarily being filled by bright students because, at present the brighter students are choosing financially more rewarding career paths such as accounting, economics, law and medicine (as indicated by the high cut-off scores in Table 1). The increase in numbers in engineering can be filled only by students with even lower entry scores. To increase the number of graduates even further, greater standardisation may have to occur. Can the engineering profession afford to permit the entrance of undergraduates with real marks of 35% in mathematics and physics? Furthermore, many engineering schools now enrol students who have not done either of these subjects. The Victorian Education Department coerces engineering schools to accept students on the basis of the VCE score alone. To address this problem some institutions are now offering bridging courses. However, this shifts the resources for teaching engineering undergraduates to educating inadequately qualified VCE students.

State/Institution	Comple- tion lag:4/6 yr ratio*	Apparent Completion Rate/Admission Year								
		1977	1978	1979	1980	1981	1982	1983	Mean	Trend #
New South Wales										
University of Newcastle	70/30	42.9	29.4	36.8	42.1	29.1	51.2	41.4	38.8	1.1
University of New South Wales	91/10	46.7	53.1	53.9	67.2	64.4	62.1	79.9	60.8	4.6
University of Sydney	100/0	62.2	60.3	51.4	51.8	61.7	73.5	75.0	62.0	2.7
University of Wollongong	70/30	40.1	42.9	61.1	46.2	45.3	40.3	48.6	45.7	0.2
University of Technology, Sydney	0/100	53.6	42.2	51.6	61.6	45.4	51.1	62.6	51.9	1.4
STATE TOTAL		49.5	47.5	51.6	57.3	53.0	57.8	66.0	54.9	2.6
Victoria										
Monash University	100/0	50.2	51.0	55.9	81.4	83.4	68.4	58.5	64.1	3.1
University of Melbourne	100/0	71.4	58.8	96.4	72.6	62.8	76.0	45.0	68.8	2.8
Ballarat CAE	90/10	43.1	46.7	47.6	80.0	67.7	65.6	45.7	56.3	2.3
Chisholm Institute of Technology	90/10	54.0	53.4	74.7	45.4	47.2	53.4	64.4	54.5	0.1
Footscray Institute of Technology	90/10	26.5	35.9	56.8	35.1	46.3	43.6	26.8	36.8	0.2
Gippsland Inst. of Adv. Ed.	60/40	41.7	64.3	78.6	33.1	42.5	53.1	65.9	50.0	0.5
Royal Melbourne Inst. of Tech	80/20	32.2	50.7	48.5	54.7	54.0	66.8	57.8	52.2	4.1
Swinburne Inst. of Tech.	70/30**	47.1	60.0	57.3	46.8	49.6	42.7	45.8	48.5	-2.1
STATE TOTAL		46.1	52.9	64.3	58.1	57.3	59.9	50.1	55.1	0.0
Queensland										
James Cook University	100/0	53.3	40.4	54.8	54.7	76.5	46.6	40.0	51.0	-0.2
University of Queensland	100/0	50.3	64.3	57.2	68.7	72.9	68.7	70.3	61.6	3.0
Capricornia Inst. of Adv Ed	80/20	46.4	75.0	72.4	59.6	44.0	60.6	59.1	57.6	-0.7
Darling Downs Inst. Of Adv Ed	100/0	49.3	54.1	49.1	43.5	64.8	61.7	43.9	52.0	0.5
Queensland Inst. of Tech	60/40	71.3	72.5	71.4	62.3	63.9	55.9	63.9	64.9	-2.2
STATE TOTAL		55.6	64.0	61.7	62.4	67.3	60.8	61.5	61.9	0.6
South Australia										
University of Adelaide	90/10	59.3	53.5	47.5	55.2	63.0	77.3	72.3	61.0	3.6
South Australian Inst of Tech	80/20	43.3	35.2	29.7	41.5	36.8	36.4	35.9	36.8	0.1
STATE TOTAL		51.4	43.3	37.5	47.2	46.9	50.1	48.1	46.5	0.5
Western Australia										
University of Western Australia	100/0	42.1	45.4	54.5	53.5	64.1	52.4	49.6	51.8	1.6
Curtin University of Technology	70/30	91.5	67.5	45.8	54.4	45.6	53.5	41.0	53.4	-6.4
STATE TOTAL		63.9	57.4	49.3	54.0	52.8	53.0	44.4	52.7	-2.3
Tasmania										
University of Tasmania	90/10	66.3	30.2	64.3	85.0	71.3	61.5	56.9	59.6	1.5
Tasmanian State Inst. of Tech		NA								
Australian Maritime College		NA								
STATE TOTAL		66.3	30.2	64.3	85.0	71.3	61.5	56.9	59.6	1.5
Australian Capital Territory										
Canberra CAE		NA								
University Total		51.8	51.0	57.8	61.8	61.9	63.3	62.0	58.8	2.3
Non-university Total		48.8	51.6	51.9	51.8	48.8	50.7	48.5	50.2	-0.1
AUSTRALIA TOTAL		50.5	51.3	55.2	57.2	55.7	57.3	55.6	54.9	1.0

TABLE 2: APPARENT COMPLETION RATES FOR DEGREE LEVEL ENGINEERING AWARDS

- * Based on relative proportion of full time to part time students in 1986. Six year completion lag for 1982 and 1983 admission years estimated from 1986 completions.
- ** Completion lag for full time students (co-operative course) is 5 years
- # Linear regression slope coefficient based on 1977-1983 apparent completion rates.

The problems mentioned above cannot be solved by relying on the professional ethics of academic engineers. They are in a very compromised position. If they take an ethical stand to maintain standards, there will be fewer graduates, funds will be cut and their livelihoods threatened.

As an example of some of the concerns viewed by academics, the following extract, which forms part of an annual report (April 1990) submitted to the faculty of engineering by the Chairman of one of Australia's leading engineering departments is presented:

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...the time that has had to be devoted to mergers, the continued devolution of administrative activities to Departmental level, the time wasted in the disastrous General Staff (salaries) Review (still unresolved) and increased student numbers without any increase in resource allocation has finally seen a significant reduction in the quality and quantity of teaching and research. This has occurred despite an obvious increase in voluntary staff time to try to cope with an ever increasing work load. This coupled with the trend towards lower salaries for Academic Staff and General Staff in the Departments relative to outside salaries and remuneration packages for Senior Administrative Staff has made it increasingly difficult to recruit good staff and is making for a general lowering of staff morale. Everyone now knows that positive response to the Government's and Union's demands will only result in increasing demands to teach more students, merge, provide more information, etc., without any increase in resources, specifically recurrent funds, to employ staff to do the additional work.

The above statements express concern for the large decline in the morale of engineering academics. It is obvious that eventually it will lead to the lowering of standards of graduate engineers. Somehow this situation has to be rectified. Part of the approach, obviously, involves the enforcement of rules for entry to an engineering course, progression and graduation. However, the enforcement of rules may only partially solve the problem.

Unfortunately, another factor which has influenced the decline of engineering standards is the relatively poor remuneration paid to engineers, scientists and engineering academics. Comparisons with other professions are often based on graduate incomes. This comparison is very misleading. The comparisons should be made at several levels, e.g. average incomes and partnership incomes. For these incomes, engineers, scientists and engineering academics in Australia are well behind. Recently, the *Australian Financial Review* reported that the average income for male lawyers in Australia was \$74,000. The APEA recently reported an average income for professional engineers some \$30,000 less. Leading professionals in the business (lawyers and accountants) commonly receive remuneration packages in excess of \$100,000. Leading health professionals receive similar packages. However, the leading professional of technology, engineers and scientists in Australia, are paid about half (around \$50,000) of that which other leading professionals receive.

Directors' fees for large consulting engineering companies designing multi-storey buildings and bridges are less than those for the humble suburban accountant, who prepares tax returns for the average business. Directors' fees at between \$80 to \$100 per hour are much less than the \$400 per hour for a Queen's Counsel.

Some may argue that the above comparisons are distorted - that employer incomes are being compared with employee incomes. The main body of engineers are employees, whereas a large proportion of other professionals are self-employed. This article argues that cross comparisons are valid. The aim is to compare the body of incomes of one profession against another. Certainly, this is the comparison which prospective intelligent students would consider.

There is little wonder why bright school leavers who are conscious of the expense of a future family, home and a car may be inclined to avoid engineering (as reported on page 7 of the newsletter of the AAEE March 1990 (Vol. 2, No. 1)). Some places in engineering schools are taken by students rejected from law, medicine, and economics. Some engineering schools are trying to circumvent this problem by luring the brighter students through industry scholarships. Some institutions have even gone to the effort of offering combined engineering/economics and engineering/law degrees. However, because someone chooses to do a combined degree does not mean he/she will practice as an engineer. Most students who are now completing combined degrees have indicated they prefer to become economists and lawyers because of the better financial opportunities.

Of the professions mentioned above, engineering is the only one which has to cope with the influx of volume of immigrant professionals - like Australia's farmers having to cope with the European Common Market dumping farm produce in world markets. For every 3,000 engineering graduates qualified yearly, there are 3,000 immigrant engineers (see *Engineers Australia*, March 23, 1990 issue, page 16). A far greater proportion of engineers are employed in the government sector. Much of consultants' work comes from the government. The government uses its massive influence to depress the price of engineering like some monopolist in the stock exchange. Doctors resist government health schemes for fear of government control over the quality of health and their incomes. Why then are engineers tolerating these controls?

The Institution of Engineers, Australia, has to involve itself in both the education and remuneration issues. Other professional institutions do, e.g. the AMA. The Institution appears to limit its concerns to the science of engineering and sees remuneration clearly delineated as an industrial issue outside its charter. However, salary is directly related to self esteem and incentive to perform the task demanded (if one pays *peanuts*, one can only expect to employ *monkeys*). The problems discussed in this article are complex and cannot be tackled from the neatly separated directions of science and remuneration. To try to tackle education standards alone eventually would prove to be ineffective. The Institution of Engineers has to muddy its hands and tackle both the educational and remuneration issues. The Institution of Engineers must take the following action:

- * Enforce minimum standards throughout undergraduate courses. Use the threat of withdrawing reaccreditation of courses. Minimum scores and passed high school subjects required for entry should be stipulated and enforced.
- * Exert continued determined pressure to increase engineers' remuneration:
 - Seek ways of reducing government control - difficult to achieve but important as a long-term objective.
 - Exert determined pressure to drive up engineering remuneration in the public sector, including salaries for academics and consultants' fees. Alternatively, lobby for a reduction in the number of engineers employed in the public sector and have government make greater use of consultants.
 - Reduce the number of immigrant professionals by at least half, if not more. This can be achieved by introducing more stringent qualification procedures.
- * Work in close co-ordination with the ACEA and APEA to achieve the remuneration objectives.

It will be a great irony if Australia's engineers in the future lose large contracts to their counterparts overseas. Furthermore, Australian engineers stand to lose overseas recognition. Sadly, The Institution of Engineers, Australia, who are the trustees of professional standards, have allowed them to decline. The Institution of Engineers must take action to achieve results measured in academic standards and hard cash. It must not tinker away with timid diplomatic paper shuffling.

Raphael Grzebieta (Secretary)
and
Paul Clancy (past member)
on behalf of
Victoria Structural Branch Committee
The Institution of Engineers, Australia

HOT EUROPEAN SUMMER IN ENGINEERING EDUCATION

A number of important international activities concerned with engineering and technology education have taken place during summer in Europe. These range from international conferences and symposia to well-established international projects carried out with substantial support from governmental and other bodies. The European Community, for instance, has established several programs (ERASMUS, COMETT, LINGUA) to improve personnel qualifications and technology transfer required for the development of the European Open Market. Community Action for Education and Training for Technology (COMETT) is one of the important programs which cater for community needs, by co-ordinating and sponsoring several important activities.

With the changing political climate in Eastern Europe, the Council of Ministers of the European Community adopted on May 7, 1990 a new scheme called **TEMPUS**. This scheme is set up specifically to promote the development of higher education systems in the countries of Central/Eastern Europe, such as Hungary and Poland. It is anticipated that the two countries may apply for membership of the EEC in the near future. TEMPUS, initially established for the two countries, is set to include Czechoslovakia, and perhaps in the near future the Soviet Union. Under this scheme financial support is available for joint European projects, mobility grants for staff and students and complementary activities for European associations in higher education, publication and information activities, surveys and studies, and youth exchange. Over \$US30 million is set aside for these activities.

It is encouraging to see that Australia and New Zealand also are taking part in this important enterprise. Australasia cannot afford to miss this opportunity and must use any conceivable means to allow information transfer and further development and advancement of its higher education system. Members of our Association have also taken part in several international conferences and meetings on engineering and technology education.

Symposium in Vienna

An international symposium called *Engineering Education 2000*, organised by Internationale Gesellschaft für Ingenieurpädagogik (IGIP) in conjunction with the American Society for Engineering Education (ASEE) and the Institute of Electrical and Electronic Engineers (IEEE), was held in Vienna, Austria, between July 2 and 5, 1990. This symposium comprised the 20th annual conference of IGIP and ASEE's Frontiers in Education '90. The symposium attracted over 400 participants and over 220 papers were presented.

The symposium was followed by a scientific program at the Technical University of Budapest, Hungary, the objective of which was to commemorate the 50th anniversary of the founding of the Institute of Graduate Studies there. Several institutions and organisations were also involved in the organisation of this gathering, including the AAEE.

Third Meeting of ILG-EE

A third meeting of the International Liaison Group on Engineering Education (ILG-EE) was held on July 4, in conjunction with the IGIP symposium. The group's agenda included several issues important for the international engineering education community. Future meetings, to be co-ordinated by the ILG-EE such as the 3rd World Conference on Engineering Education (Portsmouth 1992) and the 4th World Conference on Engineering Education (Vienna 1995) were thoroughly discussed. Preparations for the 3rd World Conference are well under way, and a preliminary call for papers is set to be circulated late this year. In addition, the secretary of ILG-EE reported on the Steering and Organising Committee meeting of the East-West Congress on Engineering Education (to be held in Cracow, Poland, in 1991) which was held in Cracow, between June 18 and 22, this year.



The Castle in Pieskowa Skala

Members of ILG-EE were concerned that future meetings on engineering education should not clash. They did not want future meetings organised by international and national organisations, which aim at an international audience, to be scheduled for the same time. Possible involvement of, and association with, such organisations concerned about engineering education, as ASEE, IGIP, SEFI, FEANI, IACEE, AAEE, CCEE and others, were also discussed.

Future international projects supervised by the ILG-EE, as well as meetings of the Group were discussed. The Group decided to hold its fourth meeting in Cracow, Poland, on Wednesday, September 18, 1991, at 3pm, in conjunction with the East-West Congress on Engineering Education. A beautiful Renaissance castle, called *Pieskowa Skala* (pictured left), located in the middle of a national park about 15 km from the Old Town of Cracow, is the venue. It is anticipated that formal discussions will be followed by an official banquet there, for members of the group and their partners. The guests also will have the opportunity to visit a museum in the castle, which houses an unique collection of medieval and Renaissance furniture.

CATS '90 in Barcelona

An International Conference on Computer Aided Training in Science and Technology (CATS '90) was held in Barcelona, Spain, between July 9 and 13, 1990. This conference, which was organised by the International Centre for Numerical Methods in Engineering (CIMNE) under the leadership of Prof. Eugenio Oñate, was sponsored by the Community Action for Education and Training for Technology and UNESCO.

The main objective of this conference was to discuss recent developments and advances in computer-aided methods for education and training in science, technology and engineering. Special emphasis was placed on specific approaches toward computer-assisted instruction and the methodology for teaching software design. The conference attracted close to 200 participants world-wide and over 120 papers were presented and included in the proceedings.

A dedicated team of academics from a number of European countries, such as E. Oñate and B. Suárez (Spain), D.R.J. Owen (UK), B. Schrefler (Italy), B. Kröplin (West Germany) and M. Kleiber (Poland), put in a lot of effort to ensure that the conference was a big success. The proceedings, published by *Pineridge Press*, include many interesting papers. They cover a wide range of theoretical and applied subjects related to the use of computers for higher education in structural and mechanical engineering, electrical and telecommunications engineering, mathematics and physics, among other fields. The publication is recommended to anyone who has an interest in computer-based education and training. Although the AAEE also was involved in the organisation of this conference and it had earlier circulated in its Newsletter a call for papers, not many of our members were at this important gathering.



Conference Executive (l-r) Prof. M. Kleiber, Dr D. Owen, Prof. E. Oñate, Dr B. Suárez and Prof. J. Heinrich.

NEW MEMBERS OF AAEE

It is encouraging to see the steady growth of membership of the AAEE, especially in recent weeks. We are pleased with the number of professors, academics and industry leaders, as well as undergraduate and postgraduate students joining the Association, but at the same time we are concerned that several members have not, as yet, renewed their membership. A reminder for renewal of membership together with the remittance form is included in this Newsletter.

This issue features short biographies and photographs of two new members, who have been randomly selected for presentation. Since publication of the last issue, we have received applications from persons in countries such as the People's Republic of China, Scotland and Israel, but most new members represent Australia. **Professor Les Berry** of Bond University, Gold Coast, Queensland, and an industrialist from Melbourne, Victoria, **Mr Kevin Davidson** of M.B. & K.J. Davidson Pty. Ltd, are presented here:



Professor Les Berry is the Director of the Centre for Teletraffic Research at Bond University and is a Professor of Teletraffic Science within the School of Information and Computing Sciences. Prior to coming to Bond University, Prof. Berry was the founding Director of the Centre for Teletraffic Research at the University of Adelaide.

His research has focussed on teletraffic theory, with attention being given to both fundamental traffic problems and relevant practical telecommunication problems. Prof. Berry has actively supported the principle of university/industry interaction for over 20 years. He has published over 60 research papers and contract reports in teletraffic engineering and has presented papers at each International Teletraffic Congress since 1976. His current research relates to the design, performance and reliability of future multiservice communications networks and development of CBL in telecommunications.

He has extensive teaching experience both at the undergraduate level and in the

supervision of postgraduate students. He has been instrumental in the organisation of several international conferences for teletraffic scientists and has developed a commercially available database of teletraffic references with an associated reference management program. Prof. Berry is a fellow of IEAust.



While graduating from Royal Melbourne Institute of Technology as an electronic engineer, Mr Kevin Davidson helped to set up the family business M.B. & K.J. Davidson Pty. Ltd. in 1973. Joining the company in December 1974, Kevin commenced as a sales engineer, distributing the products Davidson's represented in the field of acceleration, vibration, strain, force, sound, motion control and more. Kevin took over as Managing Director of the company in 1986, expanding both the markets and products.

Along the way he obtained membership of the IREE, IEAust, IICA and Australian Institute of Management (AIM). Currently, Kevin is on the IICA committee.

The company has expanded, employing more sales engineers, office staff plus two other significant additions. The first being the setup of its own in-house service/workshop facility, staffed by 3 technicians. The second was the opening of its own Sydney office to look after New South Wales operations, thus providing more support to its customers.

Although now more heavily involved in the day-to-day running of the business, Mr Davidson still visits customers, helping them keep a "finger on the pulse".

ENGINEERING EDUCATION SURVEY

In the June AAEE Newsletter, a survey questionnaire was included which sought more specific information about Engineering Education throughout Australasia than could be gained through general information sources. Subsequently, a library search was initiated to gather other general information concerning the institutions of higher education that are eligible to be part of the survey. Eligibility requires that each institution offer at least one fully accredited four-year engineering program. The library search has compiled much of the general information needed concerning respective institutions. However, it can not tell us which of the academic staff within those institutions are performing either course management or developmental work. It also does not tell us where new and innovative teaching strategies are being employed, or where the real teaching expertise in various engineering fields can be found in Australasia. This is the information which we lack, and are seeking to gain from the membership.

Survey questionnaires that have been received thus far have been sent in by Deans, Department Heads and individuals. The responses indicate quite strikingly that different institutions pursue different educational philosophies. Some institutions are viewing the present climate of higher education restructuring as an opportunity for expansion of their Bachelor of Engineering programs to other locations. Other institutions are content on developing courses within the context of their existing structures. Two notable courses of study that institutions have mentioned they are considering for development are Environmental Engineering and Engineering Technology. Both of which areas are of current topical interest. Almost all respondents mentioned that work was progressing in Computer Aided Learning methods.

I would like to emphasize the individual's role in the Engineering Education Survey. By far, the most informative responses that I have received have been from individuals that have written about their own, their departments' and their institution's educational initiatives. In many cases, Engineering Deans or Department Heads may not know their fellow educator's background well enough to include all pertinent data when completing the questionnaire. In order that your institution is portrayed correctly in the survey, please fill out the questionnaire as you would for your department and return it to me at the address shown below. Additionally, the remaining institutions that are eligible for the survey will be contacted at the Engineering Department level to directly solicit this information. Utilizing both individual response and departmental response, a clearer profile of Engineering Education in Australasia can be gained.

Perhaps the most important question of the survey concerns innovative educational techniques and media. The responses to this section have included: project-based design courses, resource based education and video tutorials. I am sure that each of us has some innovative teaching methods that others in the field of engineering education could benefit from learning.

Mr Scott Grenquist, Department of Industrial Technology, University of Newcastle, P.O. Box 84, WARATAH NSW 2298

EAST-WEST CONGRESS ON ENGINEERING EDUCATION

As our members are aware, in addition to the planned sequence of world conferences, the AAEE will organise and sponsor jointly with our Polish colleagues an East-West Congress on Engineering Education in Cracow, Poland, between September 16 and 20, 1991. The objective of this gathering is to bring together engineering educators and industry representatives from the East and West and to consider common problems in engineering education and industrial training in the context of an age of rapid technological change and political climate in Eastern and Central Europe. Particular emphasis will be given to the improvement of training methodologies and exchange of ideas and information on engineering and technology training, including modern curriculum design, implementation and evaluation.



Members of the Steering Committee of the East-West Congress on Engineering Education meet in Cracow, Poland (l-r) Prof. L. Szklarski, Prof. T. Lipski, Prof. Z. Kuczewski, Dr Z. Pudlowski, Assoc. Prof. T. Marek, Prof. T. Cole and Prof. M. Szafarczyk.

A call for papers, which was circulated in March and April this year, has stimulated an excellent response from academics and industry leaders world-wide. The idea of having an international meeting in Poland has attracted considerable attention there, in Czechoslovakia, Hungary, the USSR, as well as in other developed and developing countries. So far, 150 people world-wide have expressed interest in attending this Congress, with over 40 paper proposals (**September 30 is the deadline for paper proposals**). It is hoped that our members will form a large contingent of participants and will present interesting papers on a variety

**INTERNATIONAL CONFERENCE
ON
COMPUTER AIDED ENGINEERING
EDUCATION - CAEE'91**



**Czech Technical University,
Prague, Czechoslovakia**

September 3 - 6, 1991

20TH INTERNATIONAL SYMPOSIUM

**INGENIEURPADAGOGIK '91
ENGINEERING EDUCATION '91**



**Dresden University of Technology,
Dresden, East Germany**

September 11 - 14, 1991

of topics concerning recent developments in engineering education and industrial training in Australasia. Members intending to submit a paper proposal and to attend the Congress should contact the Newsletter Editor.

A Steering and Organising Committee meeting was held at Jagiellonian University of Cracow, between June 18 and 22, this year. President of AAEE, Prof. T.W. Cole and AAEE Executive Director, Dr Z.J. Pudlowski, represented our Association at this meeting. The discussions centred mostly on Congress format and on how particular sessions should be structured to ensure the maximum of participants' involvement. It was decided that, apart from formal lectures and paper presentations, sessions of special interest to participants and plenary sessions will be organised to create the opportunity for more thorough, in-depth discussions. A special two-day workshop will be organised by the Technical University of Gdansk in the following week, where the participants should have a more hands-on experience in the design and development of engineering education curricula. An exhibition of books, teaching courseware, computer software and teaching equipment is also planned in conjunction with the Congress.

The social program will include several exciting activities for participants as well as for accompanying persons. As one of the oldest and most beautiful cities in Poland, Cracow offers many tourist attractions. There are many interesting objects to see and places to visit. The Congress Dinner, for instance, will take place in a medieval salt mine (Wieliczka), which is one of the twelve of the world's treasures maintained and sponsored by UNESCO.

The banquet hall in the main, which caters for over 300 guests, the Chapel, as well as other smaller rooms, are carved inside a huge block of salt. A number of post-congress tours, including Warsaw, Wroclaw, Zakopane, Gdansk and other cities, will be offered to participants and their partners, at moderate prices. It has been decided that the Congress will be associated with two other meetings concerned with engineering education, which are scheduled for September 1991 in Prague, Czechoslovakia, and in Dresden, East Germany.

An International Conference on Computer Aided Engineering Education (CAEE '91) will be held in Prague, between September 3 and 6, 1991 at the Czech Technical University. The main topics of this conference include expert systems, knowledge engineering, information systems and experiments evaluation. Round-table discussions on topics of common interest in this area also will be organised.

IGIP is planning its 1991 annual conference, called *Engineering Education '91*, to be held at the Dresden University of Technology, East Germany, between September 11 and 14, under the theme *Modern Training and In-service Training of Engineers - Results and Prospects*. To obtain a higher degree of compatibility in training and in-service training of engineers within the European framework with the developing countries actively involved, is one of the main aims of this conference. According to the organisers, the conference aims to take the opportunity to intensively inform participants on the international stage and, as well as to present latest findings of research in engineering education, and to establish new contacts. The President of IGIP, Professor A. Melezinek, suggests that next year Dresden and Cracow should institute similar arrangements to those of the host institutions in Vienna and Budapest this year.



King's Palace and the Vistula River in Cracow, Poland. Cracow, former capital city of Poland, is the venue for the East-West Congress on Engineering Education, sponsored by the AAEE (details inside).

For details of the Association and membership applications write to the Editor:

Dr Zenon J. Pudlowski, School of Electrical Engineering, The University of Sydney, SYDNEY, NSW 2006 Australia, Tel. (02) 692 2000, Fax: (02) 692 3847
