

AUSTRALASIAN ASSOCIATION FOR ENGINEERING EDUCATION

NEWSLETTER

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The UNESCO Supported International Centre for Engineering Education (USICEE) is the host and organiser of the 1995 International Congress of Engineering Deans and Industry Leaders at Monash University between 3 and 6 July 1995. The AAEE President, Chairman of the Academic Advisory Committee of the USICEE and Deputy Vice-Chancellor of Monash University, Professor Peter LePoer Darvall, and Members of the AAEE Executive Committee cordially welcome delegates and participants to the Congress, wishing you fruitful and productive discussions, as well as an enjoyable stay in Melbourne. Picture above shows new buildings of the Faculty of Engineering. The building in the centre houses the USICEE.

FROM THE PRESIDENT



Prof. Peter Darvall

Swords into Ploughshares

When Sputnik went up in 1958, one of the fallout consequences was doubt, even anguish, in the US about the quality of American engineering and science education. How significant and heartening it was, then, that representatives of AAEE, including myself and Associate Professor Pudlowski were made so welcome at the recent UNESCO International Conference on Engineering Education in Moscow.

In my (very short) speech at the opening ceremony, I referred to Engineering as an international language, free of political, social, and racial tension, and vital in the process of cleaning up our planet and reaching sustainable development. Few would have agreed with, or been interested in, these aspects at the time of Sputnik. I used the phrase *swords into ploughshares*, and should have known better, since the translator had difficulty. The word *tools* was substituted for *ploughshares*. *Glasnost*, or *Openness*, was a Gorbachev policy contributing to the end of the Cold War, which has, in turn, allowed openness in dialogue unimaginable to most of us thirty-five, or even six years ago. The technology developed in the period between Sputnik and Starwars is available for peaceful application, and, particularly in the case of communications and information technology, will be a vital ingredient in advances in engineering education.

The international community of engineering educators is meeting and discussing such issues far more frequently now. In a paper entitled *An Engineer for the Twenty-first Century*, which we presented at the Conference, we discussed the subject of higher order qualities for engineers, beyond the mere technical knowhow which dominates the curriculum of most engineering courses. This theme will be prominent in discussions of engineering education in the years to come.

It is fitting that the theme of the Seventh Annual Convention and Conference of the AAEE to be held at the University of Melbourne in December this year is *Internationalisation of Engineering Education*. Elsewhere in this Newsletter, you will find an invitation from the Dean of Engineering at the University of Melbourne, Professor Bill Charters, to participate in this Conference, which will, no doubt, be as informative and enjoyable as the previous six conferences. James Cook University in Townsville also expressed interest in holding this Conference, but the (hard) decision was taken to continue to hold the Conference in major capital cities, for the moment. James Cook has a strong claim for a future conference, but we fear that many of our colleagues might not return once they sample the delights of the far North!

On the national front, the Review of Engineering Education is underway. Elizabeth Taylor, a Vice-President of AAEE, and I, are both members of the Steering Committee of the Review. Elizabeth is there both as a prime mover of Women in Engineering issues, and as an office bearer of AAEE. The Steering Committee, numbering about twenty, has so far held a meeting in Canberra, and a *Futures Conference*, over two days, in Melbourne. It has set up taskforces on Interface with the Community, Interface with Students, Interface with Industry, Interface with the Profession, Education Programs, and on Institutional Policies and Systems. Members who wish to contribute ideas for these taskforces should contact myself or Elizabeth Taylor at UTS. In the context of this Review, I urge you to read excellent articles on gender issues in engineering education by Linda Wilkins and Alice Ford, in this issue of the Newsletter.

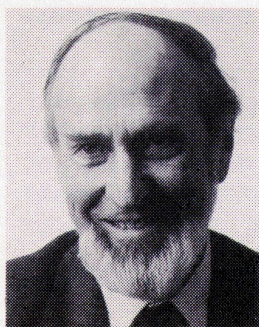
The challenge for engineering educators has been well expressed by Mr Peter Laver, General Manager, External Relations for BHP thus: *Although most engineering products - whether*

they be satellites, computers, bridges or power stations - can be conceived, designed, built and be operating in two or three years, it takes a much longer time frame to produce the people who undertake this work. Several years of formal education followed by a decade or more of experience are required to ensure that future engineers are capable of discharging the responsibilities which will be placed on them. For educators of engineers the challenge is awesome. Not only must they anticipate what the future knowledge and skills requirements are likely to be, but they must inculcate in the next generation the passion for further learning, for excellence, for integrity and for imagining a better world, all so essential for future social and economic development.

The International Congress of Engineering Deans and Industry Leaders will be getting underway at Monash at about the time you receive this Newsletter. I hope that many of you will be there to develop your own international network in engineering education, and enjoy the discussions about challenges facing us all.

*Professor Peter LePoer Darvall
Deputy Vice-Chancellor
Monash University
President of AAEE*

INVITATION FROM THE CHAIRMAN OF THE 1995 AAEE CONFERENCE



Prof. W. Charters

The AAEE Conference to be held at the University of Melbourne this year will have even greater relevance than usual for all engineering academics and industrialists in Australia due to the major review of engineering education currently underway in this country.

The review process will involve major commitment of time and resources from the Department of Employment, Education and Training, from the Australian Council of Engineering Deans, from the Institution of Engineers, Australia and from the Australian Academy of Technological Sciences and Engineering.

Any forward vision developed at this stage must be sufficiently far sighted to accommodate the needs and attributes of Australian engineers graduating in and past the year 2000 and with a working life extending through to 2040.

At the University of Melbourne we have been at the forefront of engineering education in Australia with our first graduates appearing on the local scene in 1863 and our first postgraduates in 1941 entering the Australian engineering workforce. Like many other Australian universities we are currently focussing our efforts on increased international activities at both the undergraduate and postgraduate levels as well as on international collaborative research programmes.

In the coming half century there is little doubt that we will see a major increase in internationalisation for all Australian universities and in addition a strong concentration on the Asian/Pacific region of high growth dynamic and increasingly technologically sophisticated economies.

Australian engineering graduates must be increasingly educated to appreciate the importance of management skills and communication strategies in order to reap fully for Australia the benefits available from new high tech industries which develop from university/industry cooperative research projects and centres.

It is quite certain that our engineering graduates are also likely to require in the future a

much broader and deeper understanding of at least one language and its background culture from a country in our immediate region. At present Australian consulting and contracting companies have a deservedly high reputation in the region and are constantly putting more effort into their offshore endeavours as SE Asian countries continue their phenomenal rates of industrial growth.

I would urge all of you to make a serious attempt to attend and participate in this important watershed event for engineering education in Australia, which will lay the foundations for engineering growth in the 21st century.

Professor William W.S. Charters
Dean
Faculty of Engineering
The University of Melbourne

INVITATION FROM THE ORGANISING AND PROGRAM COMMITTEES CHAIR



A/Prof. M. Aldeen

The 7th Australasian Association of Engineering Education's Annual Convention and Conference is being held at a time when university education in general is experiencing a drive for restructuring the scale of which has rarely been witnessed before, not only in Australia but all around the world. Academics and administrators of education are now having to grapple with issues such as quality, productivity, accountability, relevance, etc.

Academics are now more than ever expected to provide higher and measured quality of teaching, increasing and higher level administration, and high quality research. It is now a given matter of fact that researchers should and are expected to attract external funds to support their own research activities. This is all taking place in an environment where government funding of education has been, and will be for years to come, on the decrease.

It is within these parameters and limitations that academics are now required not only to function but also to search for and find ways of improvising and improving the quality of their teaching. If they are to survive, it is imperative that universities be more relevant to the community they serve and that staff undertake a constant search for innovative and more efficient ways of course teaching and resource management. These issues and challenges can only be resolved by resource pooling and sharing. A forum like the AAEE annual convention and conference is an ideal opportunity for all of us to air, discuss and reflect on our ideas and experiences regarding these issues.

It is befitting that the 7th AAEE annual conference be held at The University of Melbourne. Not only is the University one of the most prestigious and the second oldest university in the country, but also it is one of a few universities which have been very active in promoting new innovations in both teaching and learning. The University has based its teaching on international best practice in order to produce graduates of world standard in the engineering profession.

The Organising Committee has installed for participants, an action packed conference program. This includes exciting presentations on the latest development in a wide range of topical issues concerning teaching and learning. Renowned experts in the field have been invited to deliver keynote speeches. Panel discussions involving a number of well known university and industry representatives have been planned. This is all backed up by industry and academic exhibitions where the latest products, computer software and hardware, teaching equipment, videos etc are presented.

I would therefore like, on behalf of the Conference Organising and Program Committees, to warmly invite you all to take part in this important annual event as contributors or delegates. I am sure that through positive and thoughtful discussions of the issues raised above we will be able to refine our approach to education and achieve an enhancement to the whole process of teaching and learning. It is through such processes that our relevance to the community at large be sustained. I therefore urge you to look at this event not only as a means of reporting results but also as a means of interacting with other colleagues and benefiting from each others experiences. The Organising Committee is endeavouring and will spare no effort to make this event as pleasant, comfortable and successful as it possibly can.

*Associate Professor Mohammad Aldeen
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AUSTRALASIAN WOMEN IN ENGINEERING FORUM

Held on 10 December 1994, at the University of Technology, Sydney, this initial forum for women in Engineering disciplines attracted over 100 participants. The Forum took place immediately before the 6th Annual Convention and Conference of the Australasian Association for Engineering Education and a heightened awareness of the issues raised in the forum appeared to inform a number of presentations and plenary sessions over the subsequent five days.

The Forum's Opening Welcome was presented by first nation women from a number of cultures. An address by Judith McIlwee via teleconferencing from San Diego, USA, then put the issues in perspective. After a short break, delegates were asked to join small groups to discuss the workshop topic *What are women's experiences in a masculine engineering culture?* Several common themes emerged from these discussions, including:

- * The concern with raising the confidence level of girls both as students and in the workplace in a male-dominated culture. The call was for more collaborative learning.
- * The importance of not assuming that minority groups in a class will be supportive of each other or will behave in the same way from year to year. There can be no expectation of *unique dynamics each time*.
- * The need to acknowledge the fact that most engineering courses are not user-friendly to women and place unnatural pressures on the individual. Women feel that they have to choose the kind of women they want to be, they have to be *categorised*.

The idea of different styles of communication and the need to recognise these for effective learning to take place was taken up by a number of speakers. Several groups expressed concern that engineering selects for a certain type of person, producing a narrow range of students. Care must be taken not to filter out diversity.

Roseni Dearden, Training Director of East London Advanced Technical Training Ltd, next gave delegates a practical idea of how to run an inclusive program for a very diverse set of students. Her one year courses train 300 students per year for 30 hours per week with a very high success rate in placements.

The afternoon sessions concentrated on the theme of Transforming Cultures: School, University and Workplace, with a plenary session chaired by Liz Godfrey from the University of Auckland. This was followed by three speakers from the Reach Centre for Multicultural Education of Seattle.

The working part of the day concluded with a discussion of significant strategies and projects in education and industry sub-groupings. Strong support for establishing the forum as an annual event was demonstrated at a later meeting convened by Marian Boman, the Director of the Women in Engineering Unit at UTS.

Ms Linda Wilkins
Monash University

FEMALE ARTS STUDENT MEETS MALE ENGINEER: A TEST FOR INSPIRING INTEGRATION

When I began my Arts degree at UNSW four years ago I would never have imagined that it would have led me to having lunch at an engineering conference on a table with ten middle aged men, indistinguishable in their dark suits and conservative hair cuts. As a youthful looking twenty-something female arts student I felt *other* in this situation in the strongest Derridean sense possible. At this point I wondered how far the Australasian Association for Engineering Education conference's theme and aim of *inspiring integration* could stretch. To my surprise and delight, and to the conference's credit, considerable understanding and integration was reached between many different individuals and groups, including myself and those impenetrable looking male engineers.

For me, the process of integration began when I collaborated with my father on a project which we entitled *It is time to look at men in engineering*. We combined Robin's experience in engineering education and the engineering workplace with my background in feminist and postmodern theory in a paper which examined the male nature and direction of engineering. In doing this we hoped to show how engineering could be broadened to become more inclusive of women and other cultures which are largely excluded by the male Anglo-Saxon culture that currently dominates the engineering profession in Australia.

The spirit of integration and diversity which was at the centre of our project was also a significant feature of the Australasian Association for Engineering Education conference where we presented our paper. In the conference's plenary sessions, the point of view of North American academics was mixed with those of important engineers in industry. While the perspective of a male politician was combined with the ideas of a female engineer pushing for integrity and quality within the profession. However, the integration of ideas and attitudes was best displayed in the lively parallel sessions where students and academics, managers and consulting engineers, equal opportunity officers and education specialists met to present and discuss a myriad of issues ranging from the technical one of *straight line approximation to bode plots of second order functions* to the observation that the engineering profession has a problem dealing with feminism.

The Australasian Association of Engineering Education was also a successful exercise in integration as it was linked with the Inaugural Australasian Women in Engineering Forum. At the forum the experiences of indigenous and other minority ethnic groups were drawn upon to help women, and like-minded men, to see how they could transform the engineering culture to become more inclusive. Even though I was in the minority as an Arts student I did not feel as if I was left out of this discussion. Instead, the Australasian Women's forum was a very affirming experience for me because its participants were applying to real problems the feminist approach that I believe in as they discussed how women and men could work together on the problem of inequality within gender relations to improve engineering, as well as society, for everyone.

At the engineering education conference which followed the now male dominated participants made an effort to consider the issues of gender and cultural inequality that the women's forum and people such as myself were raising. Although many male, and some female engineers, could not make sense of or did not agree with the approach and attitudes I held, I felt that by the end of the conference a degree of integration and mutual respect had been achieved between myself and those male engineers with whom I thought I had no ideas in common. During the course of the conference I had to reconsider my position as I applied my ideas, which were developed in the academic world of UNSW's Arts department, to real cases of gender inequality and difficulties. And while I tried to understand the male dominated world of engineering and figure out how my ideas could be constructive, I noticed that the male engineers began to listen to my point of view, even when they did not agree with it, as they came to understand why putting gender on the agenda was important. What more could one ask for to inspire integration!

Ms Alice Ford

Student

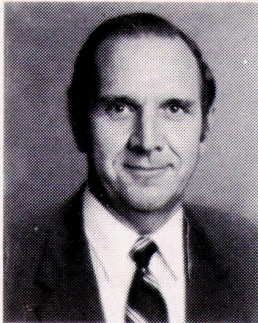
The University of New South Wales

A CALL FOR RENEWAL OF MEMBERSHIP

At the 6th Annual General Meeting the Executive Committee did not seek to increase membership fees, and it was decided that membership fees for 1995 would remain the same as they were in 1994. Association members are kindly asked to renew their membership, and to encourage their colleagues who are not members of the AAEE to join our Association. Although fees are payable by 30 January each year, AAEE members who are corporate members of the IEAust are encouraged to renew their AAEE 1995 membership through the IEAust, using the IEAust's 1995 Subscription Form.

A call for renewal of membership is therefore made and a single-page reminder is included in this issue for those who are not members of the IEAust.

DEVELOPMENTS IN ENGINEERING EDUCATION IN THE UNITED STATES



Introduction

After several decades when reward mechanisms for engineering faculty members swung strongly toward funded research and scholarly publications as primary criteria, a reverse movement has been gathering momentum in the United States of America - toward higher priority on undergraduate education. This movement has been fueled by demands for more accountability in undergraduate education overall, from consumers and from governments, and by a major program at the National Science Foundation, aimed at reform of engineering education.

Dr Russel Jones

Several promising trends can currently be observed in undergraduate engineering education in the United States:

- * the curriculum is being made more *user friendly*, in order to reduce expensive losses of students in the early years of engineering study, and to attract and retain more non-traditional students - particularly women and minorities (eg fewer courses in the first year, tutorial safety nets in difficult math and science courses, introductory engineering courses in the first year, ...);
- * introduction to design and other engineering topics in the first year, in order to keep students motivated and to provide a rationale for the study of basic math and science courses;

- * integration of mathematics, science and engineering topics in *just in time scheduling* approach to first year;
- * incorporation of broader topics into the engineering curriculum, such as economics, aesthetics, ethics, international issues, ...;
- * increased use of educational technologies (computers, video, communications, multi-media) in the classroom and beyond;
- * shifts in mathematics coverage to include more probability/statistics and numerical methods, less classical mathematics.

These trends are gradually replacing a period of lack of interest in undergraduate education by many engineering faculty members in the United States, several decades when reward mechanisms centered on funded research and scholarly publications as primary criteria.

Research as top priority

Since the end of World War II, engineering faculties in the United States have placed top emphasis on the conduct of research and development, primarily funded from sources external to the university such as government agencies and industry. This direction developed because of the great success of the federal government in stimulating and utilizing the results of university research to bring an end to World War II (eg radar, nuclear weapons), and the conviction among policy makers at the interface between government and universities that the post-war economic recovery could also be fueled by capitalizing on the outputs of funded research and development efforts at universities - particularly in the science and engineering areas. In addition, with the rapid advance of science and technology, research activity has become one of the primary mechanisms of keeping faculty members current in their fields.

With this shift in emphasis toward research and development in engineering faculties, less attention has been paid to undergraduate teaching and curriculum development, and to inclusion of the more practical aspects of engineering practice in engineering education. Typical undergraduate engineering programs have become more scientific in content and more analytical in approach. In many engineering schools, the first two years have been dedicated almost entirely to mathematics and science subjects, with engineering courses introduced only in the latter two years - to those students who survived the lower division with essentially no contact with engineering faculty members.

Engineering faculty members who moved directly from their own undergraduate programs into research oriented graduate programs to earn doctoral degrees, then immediately obtained positions on university faculties without any exposure to engineering practice, have become a cadre of research oriented PhD's with little interest in undergraduate education for engineering graduates who will enter practice. As universities have become dependent on external research funds to balance their budgets, faculty reward systems have been changed to reinforce research and development activity, with the attendant external funding. Tenure and promotion criteria in engineering schools put research and scholarly publications first, teaching a distant second, and service to the institution or to the profession a far distant third. External funding primarily from government research sources, and from the research operations of industry, has pulled engineering faculty members away from practice oriented interests and expertise, and their courses for undergraduates have moved toward more analytical content and less practical content as a result. Faculty have preferred to interact with graduate students, who help in the conduct of the research and development work and in the preparation of scholarly papers, to the detriment of interactions with undergraduate students.

These trends have resulted in a significant gap between engineers in academia and those in industry or practice. They have also led to a significantly reduced commitment on the part of universities to undergraduate education, with a concurrent increase in emphasis on graduate education and research.

With this emphasis on research and publication, the commitment of individual faculty members has tended to shift away from their own institutions, and toward the community of research sponsors and publication editors who provide the mechanisms to build momentum to satisfy the revised reward structure at universities. Another result of the emphasis on basic research by faculty members has been a narrowing and fragmentation of technical fields in engineering, as specialties are pursued in classic research approaches.

This movement of engineering faculties away from engineering practice has led to many strains with the engineering profession at large. Practitioners involved in the accreditation of engineering programs, through the Accreditation Board for Engineering and Technology, have pressed for more emphasis on engineering design in undergraduate curricula, but faculty members who have little if any experience with engineering practice have resisted that pressure. Since engineering schools have moved toward graduates with less knowledge of engineering practice, a new type of technical school - Engineering Technology - has evolved over the past several decades, preparing four year graduates who are prepared to go immediately into industrial positions with a knowledge of the practical aspects of engineering - albeit with a less well formed mathematics and science base.

Another result of the movement of engineering faculties toward research, with less emphasis on engineering practice, has been difficulty in attracting and retaining women and minorities in engineering programs in the numbers that are being sought by society at large. Many of these students who have not traditionally been attracted to engineering are turned off by the heavy concentration on analytical approaches, and the lack of engineering practice content in the curriculum - particularly in the first two years of study.

Reform efforts

Several driving forces have led universities to start to reverse the emphasis on research, external funding, and graduate education in engineering and other fields of study. Universities in the United States are under increasing public and government pressures to provide evidence of:

- * value added to the graduates of their undergraduate education programs;
- * accountability for faculty resources, and how they are being expended;
- * exit measures of the quality of their graduates.

Part of this pressure comes from those who are providing financial and other resources to the universities in a time when the economy is tight - parents who pay tuition bills, and government bodies who provide subsidies or other forms of support. Part of the pressure comes from the undergraduate students themselves, as they recognize that jobs are going to be difficult to find upon graduation, and they strive to be as competitive as possible at the end of their college years.

The American society at large has also increased the pressure on its colleges and universities to make education and graduation more accessible to minorities and women - including engineering education. Such non-traditional students in engineering are demanding a more *user friendly* curriculum, involving top faculty members in engineering, for their university experiences.

Another major driving force for change is the significant decrease in research and development funding currently being experienced. The federal government has dramatically cut military programs as a result of the end of the Cold War, and prior R&D funding in support of military efforts has also been cut substantially - with more such cuts forecast. In addition, industrial funding for R&D has diminished in the current economic climate, including that portion which flows to universities. As a result, many engineering schools and universities which previously had aspired to be primarily research institutions are

re-examining their future paths, and shifting to undergraduate education as a more important focus.

Some positive leadership for the shift in emphasis from R&D to undergraduate education in engineering schools has come from the National Science Foundation (NSF), the federal government body charged with stimulating both educational reform and research in the engineering and science fields. Through its Engineering Education Coalitions Program, started in 1990, NSF has provided significant funding to groups of engineering schools willing to work toward systematic reform in engineering education. As will be described in the next section, these Coalitions have developed and demonstrated major innovations in engineering education; but perhaps their major contribution has been to make research and development on engineering education credible again, on campuses where externally funded R&D has become the primary stimulation for faculty members.

NSF coalitions

At a conference of leaders of the National Science Foundation in 1989, the Belmont Conference, a plan was devised to develop a number of consortia of educational institutions to:

- * undertake comprehensive study, experimentation, and evaluation of undergraduate engineering education developments;
- * develop innovative curricula;
- * attract and retain students with diverse backgrounds and aptitudes;
- * foster coupling among academic institutions and industry to strengthen linkages to engineering practice, and
- * involve a broad spectrum of faculty in undergraduate education.

The resulting Engineering Education Coalitions Program solicited proposals from engineering schools during the Spring of 1990, citing the following goals of the Program:

- * stimulate a comprehensive, systematic reform of undergraduate engineering education;
- * provide tested alternative curricula which improve the quality of undergraduate engineering education;
- * provide tested curricula which increase the diversity of engineering graduates, especially under-represented groups, and link to K-16 education, and
- * create significant intellectual exchange and resource linkages among engineering baccalaureate-producing institutions.

From the initial group of proposal submitted in the 1990 competition, NSF chose two for funding for a five year period:

SYNTHESIS Coalition (1990)

Scope: Synthesis of knowledge for problem solving, and national engineering education delivery system.

ECSEL Coalition (1990)

Scope: Design across the curriculum.

Later competitions, as the Engineering Education Coalitions Program has held successive solicitations of proposals, have led to the funding of the following Coalitions as well:

SUCCEED Coalition (1992)

Scope: Develop *Curriculum 21*, Process Engineering and the Engineering Process.

GATEWAY Coalition (1992)

Scope: Baccalaureate engineering as an integrative process; implementation of the E4 curriculum.

FOUNDATION Coalition (1993)

Scope: Changing the culture of engineering education through curricular integration, teaming, and cooperative learning, and technology-enabled problem solving.

New Manufacturing Education -1994

Scope: Integrate engineering education with work experience in advanced manufacturing processes.

SCHEME Coalition (1994)

Scope: Comprehensive system of cross-university programs of undergraduate manufacturing engineering education.

Engineering Academy of New England (1994)

Scope: Comprehensive regional focus on manufacturing engineering education for the engineering workforce.

Results of this major NSF effort to date have been encouraging. As noted previously, the major funding and highly visible priority being dedicated to the Coalitions program by NSF have made engineering education research and development credible at universities where previously only scientific research had been emphasized as appropriate activity. The model programs developed by several of the Coalitions have also provided good models for others to adopt, in areas such as:

- * inversion of the curriculum, to bring engineering subjects into the lower division in order to keep student interest in engineering high, and to provide the rationale for the study of mathematics and science which heavily dominate the first two years of engineering study;
- * just in time coordination of math and science coverage, within the context of engineering problem solving courses as the major educational stream;
- * engineering design throughout the curriculum as a major theme, beginning in the Freshman year;
- * holistic, integrative experiences for undergraduate engineering students;
- * links to pre-college education, and increased recruitment and retention of under-represented groups;
- * integrated development of educational tools, including utilization of advanced technologies in the educational process.

Due to the large number of engineering schools directly involved in the various Coalitions, and to the size of many of those schools, large numbers of current engineering students are being directly impacted by these experimental programs. Some 40% of all current engineering students are enrolled at Coalition schools, and as the experimental approaches currently being developed and tested are scaled up, this large number of students can be expected to be beneficially impacted. In addition, due to progress reports on Coalition results to engineering education more broadly, schools outside the Coalition program are also adapting some of these new approaches for their own use.

Conclusions

Engineering education in the United States is undergoing a systemic and healthy reform, leading to more emphasis on undergraduate education in engineering faculties and to a resulting improvement in the educational process and in its graduates. This reform process is well underway, heavily influenced and supported by the Engineering Education Coalition Program of the National Science Foundation.

Dr Russel C. Jones

Executive Director

National Society of Professional Engineers

Alexandria, VA, USA

3RD EAST-WEST CONGRESS ON ENGINEERING EDUCATION

The 3rd East-West Congress on Engineering Education under the theme *Re-vitalising Academia/Industry Links* will be held in Gdynia, Poland from 16-20 September 1996 with the AAEE as a co-sponsor. This Congress is a follow-up to the extremely successful 1st and 2nd East-West Congresses on Engineering Education held in Cracow, Poland in 1991 and in Lodz, Poland in 1993, and it is hoped that the Congress will raise the profile of engineering education on a worldwide basis.

The Congress is organised jointly by engineers and educators representing Australia and Poland, and is sponsored by the UNESCO Supported International Centre for Engineering Education (USICEE) at Monash University and the Australasian Association for Engineering Education (AAEE). Other co-sponsors of the Congress include:

- * The Gdynia Maritime Academy, Poland
- * Monash University, Australia
- * The Institution of Engineers, Australia (IEAust.)
- * The International Liaison Group for Engineering Education (ILG-EE)
- * Russian Association for Engineering Education (RAEE) Russia
- * Other institutions and organisations

Aims and objectives

The objective of the Congress is to bring together educators from east and west to continue the dialogue about common problems in engineering education in the context of rapidly changing technology, to discuss the need for research on methodology and curriculum development, and to foster the links, collaboration and friendships established during the previous East-West Congresses on Engineering Education.

In particular, the Congress will look at the re-vitalisation of academia/industry links, in the context of a rapidly changing industrial and economic situation in Central and Eastern European countries, with particular emphasis on effective approaches to engineering training, including further and continuing education of engineers. There will also be scope for informal gatherings and discussions which will help to renew international contacts and establish new friendships.

Topics

The theme *Re-vitalising Academia/Industry Links* has been chosen to emphasise the importance of systematic and comprehensive collaboration between the two parties in engineering education and industrial training. The emerging new industry of a market driven economy in a post-centralised system has a special role to play in the process of modernisation of education institutions. Suggested topics for Congress papers include,

but are not limited to, the following areas:

- * Academia/industry collaboration programs.
- * Effective methods in training engineers and technologists.
- * Current issues and trends in engineering education and industrial training.
- * Case studies.
- * Social and philosophical aspects of engineering and its impact on modern societies.
- * The nature of cognitive processes, heuristics, and creative thought.
- * Curriculum design and evaluation and the relevance of liberal education.
- * New programs and teaching systems for engineering education and industrial training.
- * Community attitudes towards engineering education and industrial training.
- * Participation and equity in engineering education.
- * The importance of multimedia in engineering education and industrial training.
- * Design methodologies of computer-aided instruction and artificial intelligence.
- * The impact of new technology on the effective training of engineers and technologists.
- * Further and continuing education needs of engineers and technologists, etc.

It is anticipated that proposed papers will present research findings describing the effectiveness of new approaches to engineering education and the achievements of engineers and educators in improving engineering education in general, and engineering curriculum, instruction and methods of training in particular.

The needs of industry are of particular interest, especially as they relate to matters concerning methods and effectiveness of training in further and continuing engineering education. The implementation of special collaborative programs, novel methods and modern approaches to industrial training are of particular relevance to the Congress theme.

The venue

The Gdansk-Sopot-Gdynia agglomeration has a special role in reviving the Polish economic base, with a wide range of industries. This region has a long and vibrant history and is regarded as one of the most attractive areas on the Baltic coast with the historic city of Gdansk, the birth place of Solidarność, the first free trade union in the former socialist block.

In 1996 Gdynia will celebrate its 70th anniversary. It was built as the major Polish port at the time when Gdansk was a free city. Gdynia is one of the most favourably located Polish cities spreading over seven hills, surrounded by forest with the Baltic Sea below. It provides visitors with many attractions and places to visit.

Gdynia been chosen to host the Congress because its accessibility from Central and Eastern Europe allows participants from these countries, with scant funds available for travel and accommodation, to make the relatively short trip to the Congress.

The Gdynia Maritime Academy is a specialised technical university with over 75 years history and tradition. The mission of the Academy is to educate and train highly competent and proficient marine officers for the world's merchant fleet and fully qualified shore-based personnel. The studies are conducted at undergraduate and postgraduate levels.

Over 10,000 students per year take part in various education and training activities and the Academy employs over 300 teaching staff to supervise the courses. The teaching facilities include well equipped lecture theatres, laboratories and workshops. Also, the Academy operates three training vessels, the famous tall ship *Dar Młodzieży* (*Gift of Youth*), the flagship of the Academy, and two specialised research vessels. Students are accommodated in the Academy-owned hostels.

It is proposed that a one-day seminar be held at the Technical University of Lodz, the host

of the 2nd East-West Congress on Engineering Education on Monday, 23 September 1996, on the theme of the last Congress (*Enhancing Engineering Education Research*). The purpose of this seminar is to discuss progress in this particular area.

Call for papers and contributions

A call is made for papers, contributions and other Congress activities on the topics mentioned above, or on any other topic and activity relevant to the Congress theme.

Prospective authors should submit an abstract of 250-350 words, in English, outlining aims, content and conclusion of their papers, as well as other contributions. The abstract should include the title, author(s) name, affiliation, mailing address and telephone number. Authors are asked to indicate the category into which their papers fall. Papers will be printed directly from the author's typescript. Papers must be presented by the author(s) personally and will not be published in the proceedings unless presented. Sessions will be structured to encourage useful discussion, and it is intended that such discussion be summarised towards the end of the Congress.

Deadlines

Intended authors should note the following deadline dates:

- * Receipt of abstracts: 20 December 1995
- * Notification of acceptance of abstracts: 31 January 1996
- * Receipt of final manuscripts (camera-ready copy): 29 March 1996
- * Acceptance of papers notified: 30 May 1996

Social program

A wide range of activities is envisaged for the social and accompanying persons programs. The highlights of the Congress attractions are a half-day Baltic Sea cruise on *Dar Młodzieży* and an excursion to a medieval castle of the knights of Teutonic Order in Malbork.

Congress patron

His Excellency Jonathan Thwaites, the Australian Ambassador to Poland, the Czech Republic and Slovakia, has accepted our invitation to become the Congress Patron.

Enquiries

All correspondence relating to the Congress and proposals for papers should be addressed to the General Chairman: A/Prof. Zenon J. Pudlowski, USICEE, Faculty of Engineering, Monash University, Clayton, Melbourne, VIC 3168, Australia, Telephone: +61 3 990-54977, Fax: +61 3 990-51547, e-mail: ZJP@eng.monash.edu.au.

FORTHCOMING CONFERENCES ON ENGINEERING EDUCATION

Australia, Melbourne, 3-6 July 1995 - 1995 International Congress of Engineering Deans and Industry Leaders. Organised by: Monash University, Clayton, Melbourne, Australia. Contact person: A/Prof. Zenon J. Pudlowski, Tel: +61 3 9054977, Fax: +61 3 9051547, e-mail: ZJP@eng.monash.edu.au

Turkey, Istanbul, 14-16 August 1995 - International Conference on Recent Advances in Mechatronics (ICRAM'95) (including a session on education). Organised by: Bogazici University, Istanbul, Turkey. Contact person: Prof. Okay Kaynak, Tel/Fax: +90 212 2872475, e-mail: kaynak@boun.edu.tr

Slovakia, Bratislava, 13-15 September 1995 - 3rd International Conference on Computer-Aided Engineering Education (CAEE'95). Organised by: the Slovak Technical University, Bratislava, Slovakia. Contact person: Prof. Daniel Donoval, Tel: +42 7 723486, Fax: +42 7 723480, e-mail: caee95@elf.stuba.sk

Greece, Thessaloniki, 25-27 September 1995 - International Symposium on Electromagnetic Fields in Electrical Engineering (ISEF'95) (including a session on education). Organised by: the Technical University of Lodz (TUL), Lodz, Poland. Contact person: Prof. Slawomir Wiak, Tel: +48 42 312571, Fax: +48 42 362309, e-mail: wiakslaw@lodz1.p.lodz.pl

USA, Minneapolis/St. Paul, 15-20 October 1995 - 4th World Conference on Engineering Education. Organised by: the Technology-Based Engineering Education Consortium (TBEEC), William C. Norris Institute, Bloomington, Minnesota, USA. Contact person: Dr E. Rex Krueger, Tel: +1 612 8530225, Fax: +1 612 8530287, e-mail: wcnrex@epx.cis.umn.edu

Australia, Melbourne, 10-13 December 1995 - 7th AAEE Annual Convention and Conference. Organised by: the AAEE and the UNESCO Supported International Centre for Engineering Education (USICEE). Contact person: A/Prof. M. Aldeen, Tel: +61 3 9344-7298, Fax: +61 3 9344-6678, e-mail: moh@mullian.ee.mu.oz.au.

Japan, Chiba, 23-26 April 1996 - 2nd Mid-Term AESEAP International Conference on Engineering Education. Organised by: the Japanese Society for Engineering Education (JSEE). Contact person: Mr Kohsaku Harada, JSEE, c/o Mita-Arusu Bldg. 3-5-21, Mita, Minato-ku, Tokyo 108, Japan.

Poland, Gdynia, 16-20 September 1996 - 3rd East-West Congress on Engineering Education. Organised by: the UNESCO Supported International Centre for Engineering Education (USICEE) and the AAEE. Venue: The Gdynia Maritime Academy, Gdynia, Poland. Contact person: A/Prof. Z.J. Pudlowski, Tel: +61 3 9905-4977, Fax: +61 3 9905-1547, e-mail: ZJP@eng.monash.edu.au.

USICEE UPDATE

The UNESCO Supported International Centre for Engineering Education (USICEE) is now well into its second year of operation. In March the Centre released its first annual report (1994) which describes an energetic year of establishment of the Centre, developing its many activities and linkages, both nationally and internationally, and integrating itself strongly into the life of the Faculty of Engineering at Monash University. The report is available on request.

The operations of the USICEE are an expression of the external focus of Australian engineering education. Internationalisation of engineering education is certainly an idea whose time has come, and in pursuing this idea we both benefit our own students and enhance engineering education worldwide.

The Centre acts as a focus for engineering education in Australia, being the secretariat for the Australasian Association for Engineering Education (AAEE) and for the International Liaison Group for Engineering Education (ILGEE). The USICEE is determined to work in cooperation with other Australian and international engineering schools and academics and, as a symbol of that, is grateful for the willingness of some prominent engineering educators, to serve on its Academic Advisory Committee.

Future plans include hosting international conferences, continuing research into engineering education, and conducting further courses. Grants have been sought to establish links with several countries, and to support research and development activities. The Centre aims to become a centre of excellence for Australia and to play a leading role in engineering

education in the world. Its future depends on continuing support from Monash University and other Australian organisations, while it gradually increases its income from courses, grant applications, publications and donations.

1994 was a difficult year, but an extremely rewarding one, when we were able to unite many, rather fragmented, forces to create an entity which will develop engineering education further. We wish to express our sincere thanks to all of those who identified themselves with this initiative and helped to advance the cause and activities of the Centre.

New Dean

It our pleasure to welcome the new Dean of the Faculty of Engineering at Monash University, Professor Michael L. Brisk. Professor Brisk brings to the Faculty over 30 years experience in Process Control and Process Systems Engineering, with a career spanning both academia and industry. Professor Brisk was a senior lecturer in Chemical Engineering at the University of Sydney for 11 years before moving to ICI, working in both the UK and Australia for a total of 17 years. In 1993 he received the IEAust/ICChem/RACI Award for Excellence in Applied Chemical Engineering for his work in Process Control, and in 1994 was elected a Fellow of the Australian Academy of Technological Sciences and Engineering.

International

In the international arena, the USICEE has established links with other universities and professional bodies. A four-party agreement between Monash University and three prestigious and long-established overseas universities has been initiated by the USICEE Director, A/Prof. Zenon J. Pudlowski. Participating universities are The University of Strathclyde in the UK, The University of Pavia in Italy and The Technical University of Lodz, Poland. This agreement has been approved by all four institutions and was signed on 26 May 1995 during the celebrations of the 50th anniversary of the Technical University of Lodz.

The Agreement will facilitate co-operation between the four parties, especially in the areas of exchange of research results, dissemination of course information, joint developmental activities and exchange of staff. Seven co-operative agreements have been signed between the USICEE and other academic organisations worldwide to establish collaboration on academic and research related activities. The countries involved are Hungary, Poland, Russia, Vietnam, United Kingdom, Egypt and Turkey.

A number of international visitors have also been welcomed at the Centre and several of these visitors have presented seminar papers as part of the *USICEE Academic Visitors Seminars Series*.

APHEN-EE Network

APHEN is the Asia-Pacific Higher Education Network, an initiative of the UNESCO UNITWIN program discussed in the last newsletter. With the establishment of the APHEN-EE network, it is essential to create a forum for concerned educators to discuss issues of innovation in engineering and technological education, not only by electronic means, but also in person. Therefore, the 1st Asia Pacific Forum on Innovation in Engineering and Technological Education will be organised by USICEE in June 1997 at Monash University, Melbourne, Australia. Particular emphasis will be placed on the participation of people from the Pacific Rim, including South-East Asia, Pacific Russia and South America. It is envisaged that the forum will generate an action oriented agenda for the APHEN-EE network to develop engineering education and to strengthen the collaboration and exchange of information between countries of the Asia Pacific region. It is anticipated that other regional international organisations concerned about engineering education will be involved in this enterprise. A call for papers will be circulated at the end of this year.

Monash Engineering Education Series

The establishment of the Monash Engineering Education Series, begins a new era in the activities of the USICEE. It adds a new dimension to Australian engineering education by creating a source of information on research and development activities in engineering and technology education. Moreover, this series opens up tremendous opportunities for engineering educators to share their achievements with local and international colleagues.

The idea for establishing this series comes from the Centre's mission to stimulate research and development activities in engineering education and to facilitate the transfer of information, expertise and research results in this field. This series will be open to all academics involved in engineering education research and will become an expression of a dialogue between engineering educators worldwide.

The publication of a book entitled *Computers in Electrical Engineering Education - Research, Development and Application* by Z.J. Pudlowski et al, and indeed the establishment of this series, has been possible because of the commitment of the Faculty of Engineering at Monash University to excellence in engineering education. The Faculty of Engineering, which has already demonstrated excellence in engineering research, now aspires to become an international leader in research and development activities in engineering education.

Tremendous support for these activities comes from the office of the Deputy Vice-Chancellor, the former Dean of the Faculty of Engineering and the President of our Association Professor Peter Darvall. The establishment of this area of academic endeavour at Monash University is a notable achievement of the Faculty during his Deanship.

This first book is the result of successful research and development activities carried out by members of the Electrical Engineering Education Research Group (EEERG) established in the Department of Electrical Engineering at The University of Sydney in 1988. The University of Sydney is perhaps regarded in the Australian academic community as a rather traditional academic establishment. Yet it was this institution which supported these research and development activities, which would have been radical in other so-called modern and progressive universities. This book is a tribute to those at the University of Sydney who had the vision and courage to commit their institution to such a unique academic endeavour.

Other publications in this series are envisaged to be released later this year.

Electronic Publishing Project

The Monash University Library, the USICEE and the Unit of Medical Informatics at Monash University have recently received a grant to research the possibility of establishing an electronic journal. The journal would be distributed worldwide through a global electronic network such as Internet. The *Australasian Journal of Engineering Education* (AJEE) has been identified and selected as the most suitable journal, published at Monash University, to be made available electronically.

Work is presently being carried out to allow delivery of one issue of the AJEE using this new medium. It is anticipated that Vol.6, No.1 will be released through Internet (free of subscription fee in the first instance) in September 1995, with the possibility of other issues to follow.

New Building

The Faculty of Engineering at Monash University underwent a period of radical modernisation and expansion of its infrastructure under the deanship of Professor Peter Darvall (1988 - 1994). Several new buildings were erected in this period. Two more

buildings were commissioned at the beginning of this year (see the picture in the front cover).

Over the last four years the Faculty has been a partner in eight successful applications for cooperative research centres (CRC) in diverse fields across the Faculty, in addition to another eleven centres based in the Faculty. In the most recent time the Faculty was chosen by the UNESCO Steering Committee on Human Resources Development for Technical Industry Stimulation to establish the USICEE. The new infrastructure has allowed the Faculty to provide the centres with necessary space and facilities.

As a result of this building expansion the USICEE was able to obtain its own dedicated space, sufficient for immediate needs. The three-storey building shown at the centre of the front-cover picture houses the USICEE.

E-Mailing Lists

The Centre runs several electronic mailing lists for the benefit of the engineering educational community: The most recent addition is the APHEN-EE list. APHEN-EE is the Engineering Education sub-network run by this Centre. The list is open to all those interested in Engineering Education.

- * AAEE - The Australasian Association for Engineering Education
- * USICEE - The Centre's Newsletter
- * APHEN-EE - Asia-Pacific Higher Education Network - Engineering Education
- * CBLG - Computer Based Learning Group
- * PBL-LIST - Problem Based Learning
- * HYDROLOGY - Australian hydrology
- * MATHCAD - Use of the Mathcad program

You may subscribe to any of these by simply sending a one line e-mail message of: subscribe *listname* to MAJORDOMO@eng.monash.edu.au, where *listname* is one of the list names from above. Thereafter, send messages to other people on the list by sending to *listname*@eng.monash.edu.au, eg *USICEE*@eng.monash.edu.au.

Should you wish to unsubscribe yourself at a later date, just send a one line message of: unsubscribe *listname* to the MAJORDOMO address (above).

Contact Roger Hadgraft, Associate Director of the Centre about these lists, and also about the following item.

World Wide Web site

The Centre's activities can be accessed on the Internet using any of the World Wide Web browsers (such as *Netscape* or *Mosaic*) at:
<http://civil-www.eng.monash.edu.au/usicee/usicee.htm>

AUSTRALIAN KEY CENTRE OFFERING RESEARCH PARTNERSHIP OPPORTUNITIES

The Centre of Advanced Materials Technology (CAMT) is the Australian Key Centre for teaching and research in materials technology and was established in 1989 at Monash University. The main activities of the Centre are joint research and development with industrial partners, consulting work and education. The Centre uses the skills and resource base of the University for these activities.

The Centre is actively consulting to industry in the materials technology field and a recent independent study by Kimberley Smith & Associates, Chartered Accountants, has shown that over \$7 million of benefits have been achieved to date. This shows that the Centre has

proved to be a world class research, advisory and consulting service and has been cost effective in supporting local industry.

On the education front, the Centre organises seminars to assist industry in keeping abreast with recent developments in materials technology. The Centre has also designed demonstration units showing the new technology at work and industry has been invited to view them.

The Centre has identified a promising research area in the wear characteristics of elastomers and is currently designing and building a facility which will simulate wearing under service conditions.

Elastomer is the general name given to the group of materials which show rubber like properties such as bounce and flexibility. It includes rubbers and also extends to several plastic materials that perform in the same way.

An Australian research grant has been obtained to set up the facility and industry is being consulted to give an indication of the most relevant research areas and invited to become partners. The surface wear mechanisms to be studied include impact, abrasion, gouging and erosion under various conditions. The wear mechanisms will be studied using a scanning electron microscope to correlate wear in service and this will lead to new rubber and polymer and rubber formulations which have improved wear characteristics. Local and overseas partners are invited to join in the project and the following opportunities will be available to them.

- * A ground floor opportunity to participate in and take a leading role in the research effort.
- * The sharing of intellectual property on a confidential basis. This will give industrial participating partners a competitive edge.
- * Gain access to the research facility and thereby avoiding the expense of setting up *in house* R & D facilities.
- * Utilise the opportunity to educate personnel in the research area and other areas of interest which are available at Monash University.
- * Assistance in accessing the Australian market especially in the mining sector.
- * Take advantage of R & D expense tax concessions.

This opportunity will be especially attractive to overseas industry who may be suppliers to or manufacturers of rubbers and elastomers and wish to enter the Australian market. Overseas research institutions who have an interest in the area may also be interested as there are opportunities for cultural exchange and the sharing of the research effort.

The Centre would welcome enquiries which can be directed to Mr Robin Owen, Business Development Manager, CAMT, Monash University, Wellington Road, Clayton, Victoria 3168. Australia. Tel: +61 3 990-54941, Fax: +61 3 990-54998.

UNESCO INTERNATIONAL CONFERENCE IN MOSCOW

An International UNESCO Conference on Engineering Education - ICEE'95 was held in Moscow, Russia, between 23 and 25 May 1995. The Conference was organised by the Russian Association for Engineering Education (RAEE) under the auspices of UNESCO and in collaboration with the International Liaison Group for Engineering Education (ILG-EE) and other international organisations, including the AAEE.

The organisers spared no effort to make the Conference a success both academically and socially. The Conference attracted close to 400 participants, mostly Russians, with representatives from all corners of the world. Our Association was well represented with the President, the first Vice-President and two other members attending.

Most of the conference deliberations concentrated on the role and function of the engineering education institution in transition from a state controlled system to free market economy. The Conference has demonstrated an extremely positive approach of the Ministry of Higher Education in the Russian Federation which has become a facilitator and promoter of change in the Russian academic institutions. Moreover, the recovering Russian industry, led by *Kazieva & Hermes-Holding Co., Ltd*, a Russian-American company which was the general Conference sponsor, strongly supported the Conference. This company alone supported the Conference by donating a substantial amount of money (\$US100,000).

It is a pity that at the time of great challenges and changes to Australian engineering education such attitudes are alien to our politicians and our industry leaders.



The picture above shows the opening ceremony of the UNESCO International Conference on Engineering Education held in Moscow. The RAEE President and Rector of the Moscow Aviation Technology University, Professor Boris Mitin addresses participants of the Conference. Seated next to Prof. Mitin are the Minister of Higher Education, Dr Vladimir Kinelev (l) and Madam Ludmila Kazieva (r), President of the General Conference Sponsor.

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

Associate Professor Zenon J. Pudlowski, Faculty of Engineering, Monash University, Wellington Road, Clayton, Melbourne, VIC 3168, Australia, Telephone: +61 3 990-54977, Fax: +61 3 990-51547, e-mail: ZJP@eng.monash.edu.au

Association members and academic institutions are invited to contribute to the Newsletter on matters relating to membership and engineering education.

Send contributions to the Editor at the address above.