

# Engineering education world

*Contributions are invited for this new feature. News items on policies that concern the engineering education world, new courses and curricula either of a unique nature or of international interest, new innovative laboratories and concepts, funding news for engineering research projects involving international participation, special international continuing education courses and news, industry-university interaction, engineering faculty news, and developments in engineering education of international interest. Please send news items and conference information to the Editor-in-Chief. Public relations offices of universities and human resources divisions in industry are requested to contact the Editor with news items concerning engineering education and training.*

## World

### *Is virtual reality the next educational tool?*

Virtual reality, which enables users to get 3-D images, the sound and the feel of an environment, was pioneered by American engineers in the 1970s. The United States Air Force used the method to train pilots and astronauts. Developments for information and training are on the increase, and following an expected surge of computer-aided instruction with the availability of improved authoring tools, it can be expected that the next stage in training and subsequently applied engineering education will be virtual reality. One of the leaders in VR is the French electronics giant **Thomson**. The company has concluded an agreement with **VPL Research Inc.** of California for the use of their VR patents. A logical application in maintenance training for airlines and aerospace manufacturers is already imminent, because manufacturers must specify the times needed for repair, training with VR offers considerable savings on repair contact hours. Other applications are the remote control of robots operating in hazardous environments such as underwater or in a nuclear waste plant. Video signals can be sent to a remote VR operations site that is safe for the operator, who then sends signals to the robot. With VR applications still three times as costly as current computer 3-D applications, it will be some time before widespread applications are in use.

## Europe

### *Diffusion of know-how a major R&D aim*

New directions for research and development are being proclaimed for the European Community by the new research commissioner **Antonio Ruberti**. In a recent speech before the European Parliament's technology and research committee he declared: 'In order to relaunch growth and produce a new rhythm of economic and social development, in addition to common product standards and generic technologies a third factor is required. This is the production of knowledge development—of know-how by training and diffusion of scientific knowledge by information systems and the media.' With a budget of 3.5 bn ECU (\$4.0 bn) this statement, in conjunction with the engineering background of the research commissioner, is bound to have an impact on the development of educational tools for training future generations of engineers in Europe.

## France-United Kingdom

### *Salaries war imminent*

As reported below (under United Kingdom and Eastern Europe) a competitive salary situation is becoming a new feature of competition between countries. Engineering companies are looking for the cheapest positioning of their production

facilities. As automation progresses, the needs are not so much controlled by the cheapest labour, but more by skills and infrastructure of locations. This latest manifestation is the transfer of Hoover, the famed vacuum cleaner producer, from Longvie in France to Glasgow in Scotland. The loss of working places has brought accusations of social dumping from the French. The 400 new positions in Glasgow will amount to a saving of \$1.2 million in labour costs for the company per year.

## United Kingdom

### *And suddenly there was light*

The University of London plans to widen the criteria for awarding professorships. It is considering awarding the title for teaching innovation. This would indeed be an innovative move, signalling a departure from the traditional award of professorships almost exclusively for excellence in research. Geoffrey Alderman, chairman of the academic council, said that there is staff who give their major scholastic effort to teaching rather than research will now be given the chance to become professors. At the University of Central England eight new professorships were created when the polytechnic became a university, demonstrating that academic leadership is no less estimable than research achievements. We wonder whether such moves are going to flatten the pay differences between research and teaching professors analysed by Fairweather and Paulsen in Volume 8(2).

### *Being British means lower salaries*

British scientists employed at European scientific establishments such as the JET Torus nuclear fusion project in Oxfordshire are being paid as little as half the salaries of their European colleagues employed with similar duties at the centre but paid by the European Commission. The Commission has rejected a demand for equal pay by the British staff. Such transnational remuneration differentials will be of increasing concern and are bound to create investment rivalries in the coming years. As seen from the current academic salary scales in eastern Europe reported below, such gaps are likely to create future shifts in high tech and R&D support across an open boundary and free economy world.

### *Another endangered species—the external examiner*

British students have for long known (mostly) the benefits of an external examiner, who is consulted over students' grades and evaluations. This system is intended to ensure a fair and unbiased evaluation procedure. With the advent of the mass university, and with an increasing number of students studying under transnational schemes such as ERASMUS, with credit transfer models, problems have arisen. External examiners are no longer able to cope with the work load which is also poorly remunerated,

with examiners having to travel to other institutions in the course of their duties. A report by the National Council for Academic Awards recommends a reform in the system by putting forward 15 proposed changes. They include incorporating their work into quality assurance schemes, letting the examiner in on total student performance, not just in his or her relevant subject, and more preparation and visits by the examiners. Training workshops for examiners, and a database have been established. The report is *External Examiners: Changing Roles?* (Council for National Academic Awards, London, 1992).

## United Kingdom–Germany

### *Joint M.Sc. in advanced software technology*

The proliferation of joint degrees is apparent in Europe of the 1990s. This degree is a three-semester top-up over either an FH or a Bachelor degree in information science or in business informatics jointly set up by the **University of Wolverhampton** (formerly Wolverhampton Polytechnic) and the **Fachhochschule Nordost-nedersachsen** in Lüneburg. Prerequisites are at least a grade of 'good' in Germany or a 'second' in the UK. The second semester is mandatorily spent in Wolverhampton. The course size is limited to 15. In the UK a fee of £2,000 is paid per semester. Contact Professor H.-D. Knöll, Volgershall 1, 2120 Lüneburg, Germany. Tel: +49-4134 286148; fax: +49 4134 286140.

## Germany

### *Vocational training loses popularity*

The foundation of German economic success is the well-trained non-academic professional. A study of vocational training tendencies shows that the trend is shifting towards academic degrees, creating a shortage of available non-academic professionals. The emerging possibilities for non-academic professionals to enter higher education could contribute to a disturbance in balance between academic and non-academic professionals. Academic unemployment rates—never a problem in the 1980s—are on the increase, outpacing the relative difference in numbers that existed before the recession. Trainee job vacancies for non-academic professionals often go unfilled. Some statistical interpretations put the number of apprentices currently trained in business and industry as lower than the number of students.

### *Student fees-student protest*

The introduction of student fees advocated by the Science Council has angered students, causing demonstrations and protests. The proposal has since been shelved. The initial plans were to introduce a penalty fee for students who spend too long at universities before obtaining their degrees.

Students maintain that facilities, courses and examinations do not allow them to finish their studies in the 'regular' period. The question remains whether the economy will bear the costs for too long. Reform in German higher education is difficult to achieve, and was last implemented following the 1968 student unrest. With the by now 'conservative' forces advocating the system, it is probably only a matter of time before the country realizes that some measures of direct taxation, such as Autobahn tolls or study fees, is unavoidable.

#### *CeBit emphasis on telecommunications*

CeBit-World Centre Office, Information and Telecommunications, the international showcase for the industry, was staged from March 24 to 31 in Hanover. The number of exhibitors has increased to 5,600 from 5,400 last year. Some prominent exhibitors are missing though, as exemplified by **Motorola**. The emphasis this year was on telecommunications, the growth market projected to double in the coming years. This is especially true, in view of the catching up that eastern Europe has to contend with. In addition, networking occupied two halls, themselves linked in a LAN for visitors to experience live. At the other end of the scale laptops were shown with highly increased capacities and peripherals. Multimedia and the next step, virtual reality, were also seen. Virtual reality applications in manufacturing were demonstrated by the **Fraunhofer Institut of Stuttgart**. With the strong machine tools industry in Germany developments in the area of robotics, flexible manufacturing systems and VR CAD are expected to emerge.

#### *Study costs and popularity survey*

Few surprises in the ranking of study choices for males and females in Germany. For males the most popular subject is economics and business studies with 14%, followed by mechanical engineering (13%), electrical engineering (11%), law (5%), information sciences (5%), civil and construction (4%), architecture (4%), medical studies (3%), physics (3%) and chemistry (3%). For women economics and business were tops as well with 11%, followed by law with 7%. None of the engineering subjects were in the top ten for women. Expenditures per students were highest for medicine with \$20,000 per student per year. Engineering students were comparatively cheap at \$5,000 per student. As reported, a shift in popularity of courses is in progress with the top engineering contenders—mechanical and electrical—losing in popularity due to the recession.

#### *Special research areas*

German research supported at universities by the DFG, the governmental agency for research support, has designated 178 special research areas to be supported with DM420 million (\$260 million) for 1993. Some of the areas supported are models

and methods for parallel development of products and processes (mechanical engineering) for **RWTH Aachen**, physics and chemistry of thin optical layers for the **University of Jena**, metal thin films for magnetic storage for the **Free University of Berlin**, multi-component layer systems for **Erlangen Nürnberg**, artificial intelligence for **Karlsruhe**, and high-temperature studies for recoverable space vehicles for **Stuttgart**.

#### *The responsibility of the engineer is related to chaos*

The Federation of Engineers (VDI) has been promoting a continuing debate on the professional responsibility of engineers. Recently in a 'technology dialogue' that took place in Düsseldorf, the experts came together again, after the VDI rejected proposals for setting up behavioural codes for engineers. The question centres on 'whether the engineer may practise what he knows and what he is capable of doing' according to VDI president **Klaus Czeguhn**. Considerable discussion took place on the desirability of codes, models of behaviour, and the question of individual and group responsibilities. The discussion was widened as **Wolf-Michael Catenhausen**, parliamentary chairman of the research commission, raised the question whether one may propose behavioural models when we do not even know what the industrial society of the future will look like. Fundamental rethinking was advocated by **Wolf Dieter Grossmann**, an ecologist. We need to revise our concepts of a linear development pattern of our social and technical systems. We can learn from biological and chaotic systems that planning and controlling does not necessarily entail security. We should consider systems that allow for unexpected developments and have a degree of flexibility.

## **Eire**

#### *A unique privilege under pressure to reform*

In the Republic of Ireland 10% of the upper house of parliament—the Senate—are traditionally elected by university graduates. But the universities are limited to the University of Dublin, Trinity College, and the National University of Ireland. A push by the Transport, Energy and Communications minister **Brian Cowen** to reform this unique practice is under way. In particular, the new, technology-oriented universities such as Limerick, and the technical colleges also want to have a vote. The issue is not yet resolved, and debate may lead to a comprehensive review of this unique democratic practice.

## **Austria-Italy-Spain**

#### *European post-graduate degree in Geographical Information Systems*

A new postgraduate course co-sponsored by the European Commission's COMETT programme is

being developed by the **Technical University of Vienna** in Geographical Information Systems. The course is aimed at professionals working in land resources management dealing with the efficient distribution of spatial resources using modern IT-based databases and systems. The course will start in Vienna in 1993 and move to Italy in 1994 and to Spain in 1995. For further information contact Karen Kemp + 43 1 588013784.

### Eastern Europe

#### *Wide band of academic salaries*

Table 1 shows the current salaries of academic personnel in Central and Eastern European countries. The differences speak for themselves. Although purchasing power for essential needs may be commensurate with the earnings for each country, it is clear that infrastructure and equipment in higher-education institutions can be assessed from the given salaries. It will take years before some measure of compatibility between East and West is achieved in remuneration. Until then, a shift of development work to the poorer countries can be expected, as mentioned elsewhere in these columns.

### Poland-Australia

#### *International faculty of engineering*

A unique new international course will be launched at the **University of Lodz** in October this year. It is a four-year bachelor of engineering course in electromechanical engineering. The course will be taught in English and is strongly supported by Australian faculty members. The initiative is due to **Zenon Pudlowski**, who teaches at the **University of Sydney**. The thrust of the course will be in robotics, mechatronics, automation, manufacturing, control, systems, information technology and electrical engineering. The course will have a 70% engineering content, 12% management, 8% design and 10% information technology. Teaching will be modular to accommodate guest faculty. Future plans are to develop a master's and a doctoral programme. An annual fee of \$6,000 is planned, which it is claimed is an average of less than half the tuition fees in an Anglo-Saxon country. The founding dean, Dr. Pudlowski, is a member of the editorial advisory board of the journal. Contact: International Faculty of Engineering, Technical University of Lodz, Skorupki 6/8, 90-924 Lodz, Poland. Tel: +48 42 366456; fax: +48 42 368522.

### Bulgaria

#### *International education—marching on*

International and private university ventures are coming up like mushrooms in Eastern Europe. Bulgaria has the private **American University of**

**Bulgaria**, now followed by the **New Bulgarian University**, established with the help of the open society fund of Hungarian American **George Soros**. Programmes of this university include a TEMPUS-supported computer sciences M.Sc. Another university is the **International University** with joint English studies with the **University of Portsmouth**. As in the other new Bulgarian universities, computer science is the main subject, in addition to the humanities and law. Students from these universities may continue their post graduate work in Western Europe and the USA.

### USA

#### *Clinton's technology program*

The Clinton administration's proposals for R&D show expected shifts in emphasis. The losers are clearly the larger and more expensive research areas. The biggest losers are the space station *Freedom*, the particle accelerator SSC in Waxahachie, Texas, nuclear research and Department of Energy establishments. The largest gains are by the National Science Foundation (NSF), the neutron source at Oak Ridge, fusion research at Princeton, fast computers supported by NSF, the National Institute of Health (NIH), National Institute of Standards (NIST) and NASA, fiber optic networking for universities, joint research projects between government and industry in the energy sector (DOE), industrial research by the NIST, and special medical areas such as AIDS. The plan published as 'A vision of change for America' sets an increase of \$207 million for the NSF in 1993, and a total increase of \$2,297 million for the agency between 1994 and 1997. The research areas receiving the biggest increases will be atmospheric sciences, oceanography, energy sciences, high-speed computers, materials and manufacturing technologies.

### China

#### *First science and technology park in Shanghai*

A high-technology park is being set up in the Pudong New Area of Shanghai. The venture is run by a conglomerate of 60 universities and colleges. It will be selling scientific results of institutions and function as a bridge for students returning from overseas who will participate in the technological developments in the park. The so-called China Colleges and Universities Scientific and Technological Department Park will enjoy special governmental advantages, conferences and support.

### Armenia-USA

#### *Helping Armenia—the American way*

After the devastating earthquake in Armenia in 1988 two American professors of Armenian des-

Table 1. Net monthly salaries in the public sector (ECU)

Profession	Country											
	ALB	BG	CZ	EE	H	LV	LT	PL	RO	SLO	SQ	
Secretary	13-17	36-64	109-153	17-24	95-155	19-20	9-16	110-131	32-54	281	100-135	
Administrator	17-22	37-74	120-168	28-35	115-155	20	10-18	—	33-35	305	116-185	
Head administrator	21-27	60-93	160-224	33-40	155-250	—	12-21	131-154	40-42	372	140-190	
Technical assistant	18-21	38-61	148-203	22-28	95-190	22-23	11-19	110-140	27-29	317	100-135	
Technician	21-24	44-74	160-224	33-40	155-220	24-25	13-23	—	39-42	349	110-160	
Assistant university lecturer	20-25	53-87	177-246	35-44	155-220	28-31	10-18	131-162	44-50	484	140-200	
University lecturer	24-29	73-120	193-281	39-61	190-333	30-33	19-33	154-184	50-57	551	150-225	
Head of Department (professor)	32-36	88-132	215-289	54-69	333-524	35-38	27-48	263-306	64-81	621	175-240	
Others	21-29 <sup>a</sup>					38-42 <sup>b</sup>			42 <sup>c</sup>			
Others (assistant professor)						33-36			56-64			

1 ECU = US\$ 1.2.

ALB = Albania, BG = Bulgaria, CZ = Czech Republic, EE = Estonia, H = Hungary, LV = Latvia, LT = Lithuania, PL = Poland, RO = Romania, SLO = Slovenia, SLQ = Slovak Republic.

Salaries are for December 1992.

<sup>a</sup> Engineer.<sup>b</sup> Rector.<sup>c</sup> Stagiaire/trainee.

cent, **Mihran Aghabian** of the **University of Southern California** and **Armen Kiureghian** of the **University of California, Berkeley**, both professors of civil engineering, launched, with University of California system support, a new university in Yerevan, Armenia. Initially offering courses in earthquake engineering, industrial engineering and business, it is called the **American University of Armenia**. The university is also supported by the US Agency for International Development (AID) and by the Armenian General Benevolent Union, a philanthropic organization based in the USA. The university requires a 3 month intensive English course for its students prior to taking up their studies, all courses being in English. Of the first batch of students, 71 out of 102 passed their entrance course requirements. New faculty will be recruited from the graduates of the university after they have spent some time in the USA. Research is conducted in engineering, environmental management and business. Further courses in engineering, public health, agricultural sciences and an undergraduate college of arts and sciences are also planned.

### Australia

#### *Insatiable appetite for higher education*

Australian teenagers are applying in their masses for places in higher education institutions. Out of 300,000 applicants for 1993 over 50,000 will have to be turned away. Government schemes to increase the capacities of universities and technical and further education colleges have not been able to satisfy demand. The government is also promoting two schemes that should help alleviate the situation: open learning, with university courses developed via television, and a scheme for **Monash University** to introduce a 13th learning year in which students with fewer qualifications can pick up further credits missed at school.

### Conferences

#### **International Conference on Engineering Design ICED '93**

17-19 August 1993, The Hague, The Netherlands  
Information: Klv1—Congress Office  
PO Box 30424, 2500 GK The Hague, The Netherlands  
Tel: +31-70-3919890 Fax: +31-70-3919840

#### **Eighth World Conference on Cooperative Engineering Education**

30 August-3 September 1993, Dublin, Ireland  
Contact: Conference Administrator, Dublin City University, Dublin 9, Ireland  
Tel: +353 1 7045424 Fax: +353 1 7045505

#### **Second East-West Congress on Engineering Education**

20-24 September 1993, Technical University Lodz, Poland  
Contact: Z. Pudlowski, Electrical Engineering, University of Sydney, Sydney, NSW 2006, Australia  
Tel: +61 2 6922000 Fax: +61 2 6604706

#### **Computer Aided Engineering Education**

22-24 September 1993, Polytechnic Institute of Bucharest  
Contact: Professor Daniel Joan  
Polytechnic Institute of Bucharest  
spl.Independentei 313  
77206 Bucharest, Romania  
Tel: +400 121190 Fax: +400 120188

#### **VR '94**

Virtual Reality Forum, Applications and Trends  
10-11 February 1994  
Fraunhofer Institut, Nobelstrasse 12, 7000 Stuttgart 80, Germany. Contact: M. Wapier.  
Tel: +49 711 9701307 Fax: +49 711 9701399