



Engineering Professors' Council

Newsletter June 2009

Guest Feature

The Changing Face of Engineering

Paul Jackson, Chief Executive, The Engineering and Technology Board (ETB)

With the current issues facing global finance as well as the recent focus on major public projects such as Crossrail, the benefits of an engineering qualification are becoming increasingly apparent.

The recession has changed the way the UK thinks, with society, politicians and the media all waking up to the limitations of an economy with too much dependence on the financial sector. Parliamentarians across the political divide are talking up the importance of a solid science and engineering research base, whilst a third of employers plan to recruit graduate engineers this year¹, compared to less than a quarter planning to recruit in media, accounting, consulting or law. Add to this the increasing pressure to deliver key construction projects such as the Olympics, and the current climate affords a real opportunity to communicate the benefits of an engineering degree.

It is not entirely surprising then that the latest figures from UCAS show a continued rise in the number of engineering and technology applications, up 13.3% on last year. Nor does it come as a complete shock that recent ETB research found 66% of the general public would recommend a career in engineering to their children, family or friends. Not that the engineering community can in any way afford to rest on its laurels. With the increasing array of subjects on offer, we must act quickly to harness this newfound

¹ The Graduate Market 2009, www.highflyers.co.uk

Congress Debates Future



The EPC annual congress on 20-22 April 2009 at Heriot-Watt University in Edinburgh provided an opportunity for engineering academics from across the UK to come together with representatives of industry, commerce, the Civil Service, senior politicians and government bodies. Two broad themes, "Educating Engineers for Society" and "Engineering Research and Knowledge Transfer," underpinned this year's agenda.

engagement and persuade young people, in particular, that engineering is a real and exciting option for them themselves, not just for other people.

Engineering research is going from strength to strength in the HE sector with the most recent Research Assessment Exercise revealing an impressive 58 to 71 per cent is independently rated as 'world leading' or 'internationally excellent'. In order to maintain and develop this excellence, however, we must ensure the educational pipeline continues to provide both the quantity and quality of engineering talent required. With the UK's long-term economic future hinging on its ability to develop high value goods and services, increasing the pool of graduate engineers is key.

One project developed to tackle this issue is the UK's largest annual fair celebrating young people's achievements in science and engineering – The Big Bang. With over 6,500 attendees, the Big Bang 2009 entertained and informed over 200 schools representing all socio-economic groups. The fair received support across the political and media spectrum, with the Prime Minister, Gordon Brown, Lord Drayson, Minister for Science and Innovation, Boris Johnson, Mayor of London and Phil Willis MP, Chair of the Innovation, Universities, Science and Skills Committee all lending their voices to promote the event. Next year, we are looking forward to working with the EPC to ensure routes through to higher education are fully represented. The ETB is also seeking to extend the talent pool by coordinating a new range of education enhancement and enrichment activities, as well as working with partners to facilitate a greater unity of messaging and communications on behalf of the engineering community as a whole. All of which serves to increase our impact and outreach, thus adding value, increasing external fundraising opportunities and allowing the ETB to build on the monies raised via registrants' fees.

We know from our *Engineering UK* report that young people are engaged with the environment around them. They really want to make a difference and to bring about positive change. Our role as educators and as engineers is to help communicate the role of engineering in delivering this positive change.

Engineering certainty in an uncertain world

*Prof. Barry Clarke,
EPC President*



"If you really want to change the world, choose a career in engineering"

(Mandelson, 2008)

and "be the change"
(Gandhi) reflect the

developing status of engineering education and research in higher education. The EPC is tackling this emerging, exciting world of engineering in a variety of ways.

The recent Innovation, Universities, Science and Skills Committee report highlighted their view that engineering is one of the UK's great strengths and UK engineering and engineers are highly regarded internationally; that the strength of the UK's engineering base means that the UK can play a major part in solving global problems such as climate change, food and water supply, energy security and economic instability; and the recent economic crisis has presented the Government with an opportunity to restructure the economy by building on the existing substantial strengths of UK engineering. The Royal Academy of Engineering is addressing this by leading a study into new engineering programmes that build on links between academia and industry ensuring that engineers will be prepared for the 21st century. This is a common theme that is being developed by a number of bodies including an alliance of Sector Skills Councils, Professional Institutions and universities. This academia/industry link reflects the need to develop flexible approaches to education that ensure that future engineers can deal with the uncertainty created during times of great change. EPSRC is challenging

engineers to develop new ways of working to tackle the emerging grand challenges created by this change. The Government is increasing its investment in science and engineering to encourage more people to enter the professions and to tackle the challenges ahead.

The EPC's work has to be relevant and have impact. It is currently looking at admissions, assessment, international affairs, future of engineering education, ethics and mathematics. There were a number of significant achievements in the last year. This included the launch with ETB of an in-depth study into the cost of teaching; the development of the mathematics module for the new diploma; and a survey of students on their views of the transition from school to university. EPC also led and took part in a number of seminars including the annual Congress.

All of this work requires substantial commitment from the secretariat and the executive group of EPC. But the path they tread is that of its members. The 2009 Congress focused on the transition from school to university, engineering degrees of the future, the REF, the National STEM programme, and outcomes from engineering research. The outcome from this Congress is being used to set policy for 2010 which includes two new working groups to look at the impact of the sustainability agenda on engineering education and the future skills needs to teach engineering. We are also considering the role of support staff in engineering education.

We are entering a new era for engineering which is creating opportunities for us. The EPC has built up excellent working relations with a number of bodies that affect engineering teaching and research. These links will prove to be increasingly important as we move into this new era, an exciting but challenging era.

The Future of Engineering Degrees

Prof. Barry Clarke



A session at the recent EPC Congress in Edinburgh focused on the activities of the Build Environment Skills Alliance (BESA), RAEng and EC(UK); that is on the roles of the sector skills councils, industry and the professional institutions in developing engineering degrees. Professor Barry Clarke, University of Leeds, introduced the session by highlighting the importance government places on the need to raise the higher skills level in the UK. Building upon work published by UK Commission for Employment and Skills he demonstrated that the UK has some way to go in raising skills levels if it is going to meet the challenges set by its competitors and continue to attract overseas students. Carolyn Campbell, Assistant Director for Overseas Issues, QAA, emphasised this point in her presentation, highlighting the fact that the quality and relevance of UK engineering degrees is excellent but changes to international standards across the world should be a concern to universities in the UK. She also highlighted the fact that higher education in the UK is important for national competitiveness.

Barry Clarke used the findings of the RAEng report on Educating Engineers for the 21st Century published in 2007 (http://www.raeng.org.uk/news/releases/pdf/Educating_Engineers.pdf) to identify the challenges faced by those responsible for designing

engineering programmes. This included the facts that UK graduate engineers are still world-class and industry is generally satisfied with their overall quality, but there are simply not enough of them; engineering courses are seriously under-funded (a fact supported by the ETB/EPC report (http://www.etechnology.co.uk/_db/_documents/FINAL_ETB-EPC_Study_Summary.pdf) on the cost of engineering education); funding and ranking-driven focus on research is constraining the development of innovative learning and teaching in engineering; universities and industry need to find more effective ways of ensuring that course content reflects the real requirements of industry, and enabling students to gain practical experience of industry as part of their education; the accreditation process for engineering courses should be proactive in driving the development and updating of course content; and reform of the engineering qualifications system at European level should focus on the importance of output competences as the primary means of assessing educational achievement. Professor Peter Goodhew, University of Liverpool, developed this further by talking about the extension of the RAEng report, which is the ongoing study into the current approaches to experience-led engineering degree courses and identification of effective practices within current and developing experience-led engineering degrees that meet the needs of industry. Peter highlighted a number of the case studies being used to demonstrate developments taking place which included sandwich placements, sponsored programmes, design projects, activity-led learning, CDIO implementation, project work and curriculum enhancement, and developing industrial links and bespoke courses.

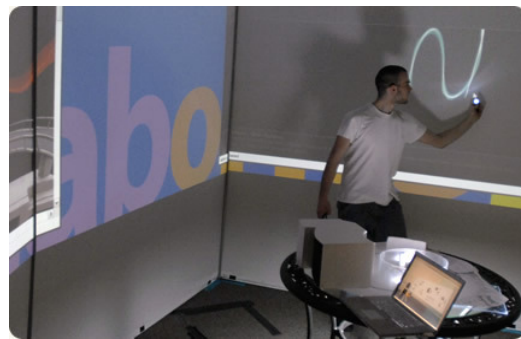
Richard Shearman, Deputy CEO EC(UK), presented the EC(UK) perspective, which was to see the development of societal issues, intellectual curiosity, ability to think, learn

and communicate and the need to develop a professional culture amongst graduates.

These developments are taken place, according to Barry Clarke, against a background of the government's drive to generate more and more employable graduates (quantity and quality) and to raise the skills and capacity for innovation and enterprise of those already in the workforce. This is the focus for the developing agenda of BESA, an alliance of sector skills councils and professional institutions in the built environment that is to look at the move towards skill based education with increasing emphasis on employer engagement in the educational process, with a flexible approach to HE entry points and learning and assessment, developing programmes that meet the needs of industry, using the accreditation processes to proactively develop programmes, ensuring that the right infrastructure including resources and staff are in place and that there is a financially sustainable future for HE.

Academics of the Future

Prof. Denise Bower, Leeds University



Recognising the challenges that engineering departments will face as they strive to deliver world-leading engineering degrees to address the global challenges that engineers will face, it was agreed at the 100th Meeting of the Committee of the Engineering Professors' Council to establish a Staffing Working Group

to consider the profile and skills that will be required of academic staff. The remit of this Group is to examine issues pertaining to the recruitment, progression, professional development and support for academic staff in HE engineering departments, with a particular focus on the skills that staff will need to teach engineering degrees in the future, and what role EPC should play in ensuring that staff have those skills. This will include an examination of how many staff are / need to be professionally qualified and what support they might need if their industrial experience is limited or not relevant to the challenges of the future; and identify the support that all staff will need to ensure that they are able to address the global challenges ahead. The group will liaise with a number of other organisations to establish what work is currently being undertaken regarding gender issues and propose some practical suggestions that can be promoted by EPC and put into practice by the EPC membership. Similarly, work is currently being undertaken by the Professional Institutions regarding professional qualifications, and this Group will liaise with them to provide a focal point for their work with engineering departments. The main focus of the Working Group, however, will be to establish a clear understanding of the skills that academic staff in HE engineering departments will need to teach the degrees of the future.

Visit the EPC Website

Copies of the presentations from the recent congress, plus details of other Engineering Professors' Council activities and briefing papers, are available on the EPC website www.epc.ac.uk

RAE and Beyond

Prof. Raffaella Ocone, Herriot-Watt University



The underlying theme of the session “RAE and beyond” at the recent EPC congress was the future of research in the UK and, importantly, how excellence can be measured in a simple and effective way. The five talks explored the RAE legacy, its impact on REF and how the funding council can measure research standards effectively.

The scene was set by Professor David Gani, Director of Research at the Scottish Funding Council, who explored the current challenges in science and engineering, and analysed the UK national priorities. Despite the major focus on Scotland, the lessons to be learned were general. Main points of the presentation were the kind of investments that the SFC has made in science and engineering and the advantages of the research pooling initiatives, to increase the critical mass of researchers. The talk explored how the SFC will engage with the engineering community; opportunities for funding were identified and the importance of KT discussed.

RAE will be replaced by REF: an excellent account of current thinking and progress of REF was given by Professor Geof Tomlinson, who was the Chairman of the General Engineering Sub-panel for the RAE2008 and is now a member of the REF Expert Advisory Group. The talk concentrated on the current views from the recent Expert Advisory Group meeting and the HEFCE Workshop, and tried

to answer questions regarding the way forward with the REF.

Bibliometrics will play a crucial role within REF. Professor Ton van Raan, Director of the Centre for Science and Technology Studies (CWTS) at Leiden University, presented an overview of the measurement of research performance based on advanced bibliometric methods. He addressed aspects such as differences in publication and citation cultures among fields of research, interdisciplinarity, collaboration, 'knowledge users', and scientific excellence. Sense and nonsense of bibliometric analysis were discussed, demonstrating that advanced bibliometric methods, when properly applied, are a relevant element in research evaluation procedures, particularly at the level of research groups, university departments and institutes.

Measuring excellence was the dominant topic of the talks by Dr Philippa Hemmings, Head of Programme for the Process, Environment & Sustainable Engineering Programme at EPSRC, and Dr David Sweeney, Director of Research, Innovation and Skills at HEFCE. These two talks complemented the previous ones, showing how research excellence in engineering can be supported and measured. Themes were the ongoing commitment of HEFCE and EPSRC to support excellence, innovation and diversity. Dr Hemmings stressed the economic impact and the commitment to encourage collaboration, support students, skilled scientists and engineers, fostering international collaboration. Dr Sweeney stressed that HEFCE remains committed to supporting excellent research that responds to policy aims and user needs. The discussion which followed was centred around the dominant themes of research funding and research excellence, and benefited from strong audience participation.

Outreach – Engineering into Society

Prof. Fred Maillardet

Fred Maillardet opened the session on Outreach at the EPC congress in Edinburgh by explaining that the focus would be on how to attract more young people to considering engineering as a career. He reminded the audience that it was one thing to interest young people but quite another to maintain that interest. He listed both the incentives and the disincentives and argued that 'real practical engineering' could be the key attractor. He used a 300 year old windmill to illustrate how engineering could be linked to history, social science and sustainability; engineering doesn't have to be dry and boring and unconnected with people!

Elsa Ekevall and Ernie Spencer then described *Engineering the Future*, an EPSRC funded project aimed at deepening the understanding of engineering and embedding it across schools and universities. They showed how the total number of students studying engineering and technology at university had fallen over the last decade, although the numbers were now recovering. Most young people are either unaware of what engineering is all about or have the wrong impression. Excellent classroom teaching, particularly involving practical work, is vital to create interest. The careers provision in the project schools is being explored and encouragement given to embed engineering in the school curriculum. The profile of the E in STEM is thus being raised within schools.

Nigel Weatherill outlined the *National STEM Programme*. This £20M HEFCE initiative will start in August 2009 and has the twin foci of raising awareness and widening participation, and also improving higher level skills and increasing employer engagement, specifically including SMEs. This programme is seeking examples of good practice to embed nationally and will commence using four

existing regional pilot projects. National consultations will follow. There will be emphasis on 'adding value' and the long term sustainability of all projects. A 'hub and spoke' management structure is being designed to ensure appropriate information flows in both directions.

Katy Bloom focused on the local manifestations of the STEM Programme where ensuring cohesion among all the STEM partners is a key objective. The generally declining A level entry statistics over the last 30 years were presented and international student performance comparisons explored. The Project ROSE findings regarding students' interest in careers in science were explained, showing that motivational problems are not confined to the UK. Ten action programmes are being introduced to group current initiatives into families. Attracting the right people to become teachers unsurprisingly remains the top priority, but forward-looking professional development is also critical, as is the introduction of an enhanced and enriched curriculum.

The plenary discussion focussed largely on the challenges of orchestrating the ambitious National STEM programme without losing the enthusiasm evident in local initiatives.

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Forthcoming Events

2010 Congress

10-12 April 2010

EPC Annual Congress 2010 -
Loughborough University

*The Congress themes will be placed on
the EPC website shortly.*

*Open to all with an interest in
engineering in higher education*

Seminar for engineering admissions tutors

5 November 2009

Royal Academy of Engineering

*Details will be placed on the EPC
website shortly.*

New Assistant Director

Dr Piers Baker joined the Engineering Professors' Council as Assistant Director on 1 June, following two years as Director of the International Office at Imperial College London. After a PhD on the



archaeology of Afghanistan at Cambridge, he spent over 20 years in the British Diplomatic Service, working mostly on European issues, latterly as deputy ambassador in Vienna, before his return to the academic world.

EPC Committee Members for 2009/10

President	Professor Barry Clarke	University of Leeds
Past President	Professor Ray Allen	University of Sheffield
Honorary Secretary	Professor David Harrison	Glasgow Caledonian University
Honorary Treasurer	Mr Ian Whyte	University of Manchester
Elected Members	Professor Bill Milne Professor Alistair Sambell Professor Sarath Tennakoon Professor John Turner Ms Angela Dean Professor Denise Bower Professor Robin Clarke	Cambridge University University of Northumbria Staffordshire University Portsmouth University University of Derby University of Leeds University of Ulster
<u>Co-opted Members</u>	Professor Bill Banks Professor Fred Maillardet Professor Dik Morling Professor Helen Atkinson Professor Tony Unsworth Professor Tony Brown	Strathclyde University University of Brighton University of Westminster University of Leicester Durham University Manchester University
<u>Annual Congress Convenors</u>	Professor Bob Reuben Professor John Dickens Dr Rob Best	Heriot Watt University 2009 Loughborough University/ HEA Engineering Subject Centre 2010 South Bank University 2011
<u>Sectoral Group Representatives</u>	Professor Raffaella Ocone Professor Keith Case Professor Clive Neal-Sturgess Dr Dave Twigg Professor Jim Yip Professor Stephanie Haywood	Heriot-Watt University Loughborough University University of Birmingham Loughborough University University of Huddersfield Hull University
<u>Working Group Chairs</u>		
Admissions	Professor Dik Morling	University of Westminster
Costings	Professor Helen Atkinson	University of Leicester
Ethics	Professor Raffaella Ocone	Heriot-Watt University
External Relations	Professor Ray Allen	University of Sheffield
Future engineering degrees	Professor Barry Clarke	University of Leeds
International	Professor Clive Neal-Sturgess	University of Birmingham
Maths	Professor Fred Maillardet	University of Brighton
Staffing	Professor Denise Bower	University of Leeds
Sustainability	Ms Angela Dean	University of Derby