



The Royal Academy
of Engineering

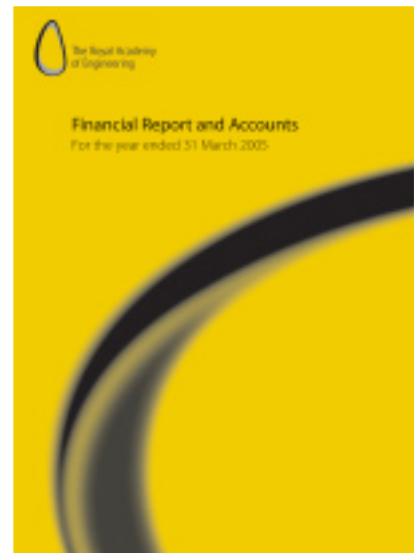
Annual Report

2004-2005

Annual Report 2004-2005

This Annual Report provides a detailed account of the most significant activities and events undertaken by or for the Academy during the financial year 2004-2005. It supplements but does not replace the Annual Review.

The summary Annual Review along with the full Financial Report and Accounts can be found at www.raeng.org.uk/about/annrev. Hard copies may be requested from the Academy.



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Enhancing national capabilities

The Academy encourages and supports links between academic research and industry. Its programmes develop and enhance excellence in engineering teaching and research, and enable engineers to continue their own professional development.

ENHANCING EXCELLENCE IN ENGINEERING TEACHING AND RESEARCH

Industrial Secondment Scheme

This scheme provides a unique opportunity for engineering academics to benefit from a period of industrial experience. Working on identified projects as part of the company 'team,' they contribute their own special expertise to the task, whilst gaining state-of-the-art knowledge which will benefit their teaching activities. The secondments provide academics with the opportunity to develop new case study material, plan new teaching modules and courses, and strengthen the links between their university department and the host organisation. Fifteen awards were made during the year (see annex for details), covering all engineering disciplines, and to a wide variety of organisations.

Senior Visiting Fellowships in Communications

Supported by the Vodafone Group Foundation, the scheme provides funding for an engineering department in a British higher education institution to play host for a period of between two and four weeks to a senior academic from an overseas centre of excellence. The objective is to promote international relations and networking within the academic community on the broad topic of global and/or mobile

communications. In the period under review twenty five awards were made, the details of which are in the annex.

Research Chairs and Senior Research Fellowships

The Academy's schemes to support Research Chairs and Senior Research Fellowships (SRFs) were established in 1987. Both provide joint funding with industry and other research organisations to support strategic research in UK universities. Appointments are normally for a period of five years. The industrial funding is an important feature of these schemes and it is pleasing to note that every pound funded by the Academy now attracts over four pounds from industry. All of the Research Chairs and SRFs are detailed in the annex.

During the year four new Research Chairs and eight SRFs were appointed, including the new Leverhulme Trust appointments, bringing the total number of awards to 34. One SRF is jointly funded with The Daphne Jackson Trust. The Trust enables highly qualified women and men to return to their research careers in science, engineering or technology after a career break due to family commitments; these SRFs are usually for two years.

Although most appointments are supported by industry, a number have been jointly supported with

other organisations. There are two chairs jointly supported under the Engineering and Physical Sciences Research Council's (EPSRC) Innovative Manufacturing Initiative; these have both now entered their fourth year.

The new Leverhulme Trust Senior Research Fellowships provide an opportunity for mid-career engineering academics to be relieved of their teaching and administrative responsibilities to concentrate on full time research for periods between one academic term and a year. The award covers the cost of a replacement member of staff for the period of the Fellowship, thus ensuring no loss to the teaching of the next generation of engineers within universities. In this first year of the scheme we appointed seven Fellowships, each for a duration of one year.

Research Fellowships

These Fellowships, which are now funded jointly with EPSRC, are aimed at outstanding researchers from all branches of engineering who are about to finish their PhD or have up to three years post-doctoral research experience. The scheme provides funding for five years to encourage the best researchers to remain in the university engineering sector. Those selected as Research Fellows are provided with the opportunity to establish an international track record, and they are assisted by having a greatly reduced teaching and

administrative load. The Academy appoints one of its Fellows as a Mentor to offer advice and facilitate industrial contacts and again this is a valuable feature of the scheme.

Fellowships are awarded annually and almost 120 applications were received in the latest round. A rigorous selection process takes place each year. We awarded 10 Fellowships this year, bringing the total number of awards under the scheme to 38 (see annex). The total number of appointments is planned to increase significantly after the Spending Review settlement announced by the Government in March. An encouraging aspect of this scheme has been its ability to attract female researchers who account for 20% of all fellows in post.

Global Research Awards

The Global Research Awards scheme is designed to encourage engineering R&D networking around the world. It allows research engineers to work with leading technology organisations overseas for between three and 12 months, and in modules if preferred. The Academy funds 50% of the total agreed costs of the visit up to a ceiling of £35,000. During the year the scheme approved 15 research engineers for secondments covering a wide range of engineering interests in all parts of the world. Award holders current during the year are listed in the annex.

The Visiting Professors Schemes

This year was the 15th year of the Academy's original Visiting Professors (VP) in Principles of Engineering Design scheme, which helps universities to improve the industrial relevance of their design teaching. The scheme now has 120 visiting professors at more than forty universities (see annex for details). To mark the anniversary, a booklet *Educating Engineers in Design* was

published, which draws out case studies of good practice in teaching design to engineers. At a public launch event, the strong links between professional practice and teaching were reinforced by a large enthusiastic audience representing academia, the profession and Government. A performance review of the scheme has highlighted its value in improving industry-academia collaboration, and in enhancing creativity amongst students.

A second VP scheme, launched in 1998, has concentrated on developing teaching materials to highlight the role of engineering in addressing sustainable development issues. Although soundly based in technology, this scheme has focussed very much on the role of the engineer as a holistic problem solver, taking account of sociological and economic issues as well as technical ones. With the introduction of new degree accreditation requirements in 2004, there is now a need for graduating students to demonstrate sustainable development competencies. To assist this process, the Academy ran a summer school for lecturers to develop their teaching strategies for helping students to develop these competencies. A further summer school will be run in 2005. The full list of Visiting Professors in Engineering Design for Sustainable Development appears in the annex.

A third VP scheme began in pilot form in 2004 – in Integrated System Design – to help universities give their students a better understanding of the challenges of designing complex integrated systems. The Academy's vision is that students of all disciplines will be better prepared to work within large system projects, and will have a meaningful

understanding of the part that their contribution can make to better overall system design. The pilot launched with five participating universities, with a similar sized group being admitted during 2005.

ENABLING POSTGRADUATE AND PROFESSIONAL DEVELOPMENT

Engineering Professional Development Awards

This scheme supports the Academy's commitment to enhancing the potential of UK industrial engineers. Financial assistance is offered towards the cost of appropriate development programmes linked to an organisation's business plan or strategy.

In the most successful year to date for the scheme, awards totalling £240,000 were made to 52 companies which led to a further £2.1 million being generated in indirect expenditure. The company training programmes involve a total of 2,595 engineers located within the UK and internationally. The full list of companies receiving awards is in the annex.

ExxonMobil Teaching Fellowships

2004 was the final year for this scheme, which encourages high quality engineering lecturers to remain in academia by awarding them salary supplements. The Academy and ExxonMobil are discussing a possible replacement.

ExxonMobil Higher Education Support Scheme

This scheme exists to enhance national potential by supporting the delivery of quality learning and training programmes at UK universities. Funds are awarded for projects as diverse as the purchase of state-of-the-art equipment, software

packages and even capital building projects. Application is by invitation to universities that have ExxonMobil Teaching Fellows on their staff.

Details of the new teaching fellows awarded during the year as well as the university departments that received funds under the ExxonMobil Higher Education Support Scheme are provided in the annex.

International Travel Grants

This scheme, which enables young engineers to attend international conferences, made grants amounting to almost £400,000 during the year, supporting visits to more than 100 countries including Brazil, South Africa, Japan, China, Russia, South Korea, and the USA. A total of 1,052 applications were received of which 702 were successful. The scheme's on-line monthly newsletter, *The Delegate*, remains highly popular and generates significant funding enquiries from researchers undertaking literature searches.

Throughout the year the Academy publicised the wealth of activity being undertaken by travel grant awardees, including the notable work being done by Robin Kumar of Imperial College on research into sickle cell anaemia.

Sainsbury Management Fellowships in the Life Sciences

These Fellowships support young scientists of high career potential, enabling them to undertake activities related to their personal development plans. These may include learning packages, such as an MBA, national and international conference attendance, industrial visits and foreign language training. There were six Fellowships awarded in 2004 (see annex), bringing to 43 the total number since the scheme's inception.

The Panasonic Trust

The Trust's awards scheme provides grants to help engineers undertake courses to update and retrain in new developments and technologies. The scheme granted a total of £41,000 to 62 industrial engineers during the year. All the awardees received additional financial co-sponsorship from their employer.

The Trust awards Fellowships to assist recent engineering graduates undertake a full-time Masters degree course in environmental studies or sustainable development. The scheme was heavily oversubscribed for the six Fellowships available during 2004. Details of the recipients are provided in the annex.

A new initiative was launched in the past year to mark the 20th anniversary of Panasonic and the Academy working together. The Panasonic Trust Project Presentation Prize of £1,000 is awarded to the student who delivers the best final project presentation on a course associated with the Fellowship scheme. The first awardee was Ian Meikle from the MSc course in Renewable Energy and the Environment at the University of Reading, whose project looked at ways of evaluating the performance of energy saving buildings. Ian was assisted in his work by an industrial supervisor from Max Fordham LLP, Tamsin Tweddle, who was one of the first Fellowship scheme awardees back in 1998.

The Sir Angus Paton Bursary

The late Sir Angus Paton FEng FRS made an endowment to the Academy in 1986 to fund an annual bursary to recognise excellence and inspire a suitably qualified engineer to undertake a full-time Masters course related to water engineering.

The 2004 bursary will enable Benjamin Fredlund to study for an MSc in Water and Environmental Engineering at the University of Surrey.

Recognising excellence and inspiring the next generation

The Academy celebrates excellence by bestowing medals for outstanding achievement and by electing to its Fellowship the most eminent members of the engineering community. These outstanding role models, along with the Academy's Best Programme, are central to inspiring the next generation of excellent engineers.

THE BEST PROGRAMME

The Royal Academy of Engineering Best Programme is a continuum of high quality curriculum enrichment schemes in science, engineering and technology (SET). The Best Programme works in primary schools to build an enthusiasm for SET subjects, in secondary schools to promote engineering and related SET careers, in universities to support gifted engineering students and beyond university to develop the engineers of tomorrow.

This year has seen some important steps in the delivery of the Best Programme business plan.

Firstly, there have been new appointments. Matthew Harrison joined as an Academy Director in October with a remit to lead the Best Programme. Sarah Philbrick joined a month earlier as an Academy Director with a remit for development. Sarah's role relates to both the development of the Academy as a whole and to fundraising for the Best Programme business plan in particular.

Secondly, arrangements for the governance of the Best Programme have been strengthened with the formation of a new Strategy Group. This is a small group of National

Directors and CEOs of Best Programme schemes who meet twice a year to consider issues of strategic importance to the Best Programme under the chairmanship of Professor Mike Withers FEng. Actions arising from this Group are undertaken by a quarterly operations meeting that comprises senior representatives from all Best Programme schemes.

Finally, the Best Programme has begun the longer term task of building growth by targeting students and schools in neighbourhoods where the Best Programme has yet to have full impact. A first step has been the drawing together of partner organisations including universities and the Higher Education Funding Council for England to establish a consensus on what needs to be done to widen participation in engineering education. This work shows great promise and is ongoing.

In February, the Academy made a presentation of the year's progress to the Trustees of the Gatsby Charitable Foundation, the Best Programme's longest and most significant funder. The Trustees expressed support for these new developments.

Young Engineers

Young Engineers is a national network of after-school and

lunchtime engineering clubs in primary and secondary schools. Young Engineers clubs form a focal point for a series of engineering competitions where school pupils tackle complex engineering problems and compete for prizes. These national events include the Young Engineers for Britain competition and the Young Electronic Design Awards.

The network of Young Engineers clubs has grown this year with 150 new clubs bringing the total to 1250. These clubs represent 26,000 individual club members ranging in age from seven to 19. In addition, 61,000 primary school pupils took part in this year's Junior Engineers for Britain K'Nex Challenge.

This year has seen two further welcome developments. Firstly, Young Engineers merged with YEDA (the Young Electronic Design Awards), an act of consolidation that can only benefit those served by the Best Programme. Secondly, they have secured the patronage of HRH The Duke of York.

Headstart

Headstart is a well-established summer school programme dedicated to encouraging students interested in mathematics or science subjects to consider technology-

based careers. It gives Year 12 / S5 students (17 years of age) the opportunity to spend a week at university prior to making their UCAS application.

During 2004, 983 students attended one of 26 Headstart courses throughout Great Britain – of which 28% were women and 19% were minority ethnic students. Last year 86% of Headstart students reported their decision to study engineering had been confirmed as a result of participating in the scheme, with 72% reporting that the course confirmed or helped them in their choice of specific discipline.

The new Dragonfly project saw 49 girls (almost 50% up on the previous year) attending pilots at Durham, UMIST, Sussex and Surrey, to where 80 younger Dragonflies from local schools were attracted. Additionally, 140 girls and 18 Headstart alumni attended the first Dragonfly at Cardiff in March. Five more locations plan to run these girls-only modules next year, funds permitting.

Smallpeice Trust Schemes

The Smallpeice Trust has outstripped all of its targets for the year; especially through the success of its one day STEM (science, technology, engineering and mathematics) awareness courses, delivered in a

wide range of schools to young people at the key decision point of Year 9.

The Trust's courses enable young people to work with experienced professional engineers either on residential courses at universities or in STEM enrichment activities arranged in schools. A continuum of courses provides training at progressive levels in a variety of specialisms, encompassing a range of projects and management skills, with a gap year programme for pre-university engineering students. A strong interface with industry, education and professional bodies helps to ensure that the courses are properly supported, promoted and developed. The Trust continues to build on these relationships to widen the scope of opportunity available to young people and to strengthen its reputation for developing and delivering courses to a high standard.

A successful innovation during 2004 was the introduction of the Energy Challenge, at which 50 young adults were provided with an insight into offshore engineering and more specifically renewable energy. As well as continuing the Energy Challenge, the Smallpeice Trust has increased the number of student places on Smallpeice Design and Manufacture, Materials Science and Electronic

Engineering courses to accommodate student demand and further enrich current national curriculum activities.

Engineering Education Scheme

The Engineering Education Scheme (EES) encourages the most able young people to pursue a career in professional engineering by enabling them to work in teams on significant real industrial engineering projects. This is achieved through partnerships between schools/colleges and companies during the October to April period each year. The scheme operates in England, Scotland, Wales and Northern Ireland. Throughout all four regions between one quarter and one third of participants were female.

A record number of students are participating in the Engineering Education Scheme in England (EESE): over 1340 students in 330 teams during the last academic year and team numbers are expected to grow in 2005-06. In 2004, the EESE published the results of its alumni tracking survey showing that 89% of participants went on to study SET subjects at advanced level in 2002-2003. In addition to the alumni survey, the scheme undertakes questionnaire surveys of participants and their teachers. In 2003-2004, 98% of teachers thought the Scheme relevant to the educational needs of

their students. The EESE is now an access organisation for the Duke of Edinburgh Award, meaning that experience gained on the EES schemes can be counted towards the skills section of the Award, and the Scheme will continue to seek its inclusion within the 14-19 framework either as a recommended enrichment scheme or as an accreditable programme of study.

Throughout the year the EES schemes in Scotland, Wales and Northern Ireland achieved successes against a background of increasing difficulty in securing additional industrial backing. EES in Wales achieved 95% of its participation target even though the Welsh Assembly removed the responsibility for post-16 education funding from Education and Learning Wales. EES in Scotland met its target despite a drop in income: six new organisations joined the scheme to replace a similar number that left.

EES in Northern Ireland has maintained good progress throughout the year and met its participation targets. Nineteen schools worked on projects associated with eighteen companies. The results of EES Northern Ireland's latest alumni tracking survey, published in 2004, showed that 78% of participants went on to study SET subjects at advanced level in 2001-02.

The Year in Industry

The Year in Industry provides work placements for students prior to them entering university. In 2004, the scheme published results for the tracking of their alumni. Seventy-five percent of scheme participants went directly into industry on completion of their undergraduate studies and 18% went to study an advanced course; 74% obtained First or Upper Second class degrees.

In the year to June 2004, 575 students were able to benefit from the experience of an industrial secondment before commencing their undergraduate studies. The Year in Industry managed to maintain recruitment at these levels against an uncertain background over whether students electing for a gap year would end up paying higher (variable) tuition fees. The scheme has lobbied successfully for an exemption and has reviewed its organisational structure to allow the regional teams to devote more time to seeking funding from companies and from the RDAs.

Best Undergraduate Programme

The Undergraduate Programme seeks to encourage university students to retain their interest in engineering as a career through a series of awards and activities. These include business awareness courses, personal

development training courses and careers guidance seminars. The programme is open only to students who have participated in one or more of the Best Programme pre-university schemes. All such students are invited to register as they start their accredited BEng or MEng university course. This year 1,790 students registered, of whom 24% were women.

Six initiative and leadership training weekends were held on Dartmoor. Similar in format to 'outward bound' activities, these so-called WILD courses provide practical examples of team building in a challenging environment and test participants' abilities to communicate effectively. The business awareness course, which was over-subscribed, involved four teams competing in a simulated business game involving purchasing, manufacturing, stock control, sales and marketing, and personnel management.

Engineering Leadership Awards

This scheme is open to second year MEng undergraduates, all of whom are in the top 20% in their universities. Participants on the scheme have been assessed to have clear leadership potential and are provided with the funding and opportunities to undertake an accelerated personal development programme.

This year 26 Engineering Leadership Awards were made to students (eight of whom were women) at 13 universities. Each will benefit from a mentor – who will be a Sainsbury Management Fellow – and training and networking events organised by the Academy. They will receive funds of £7,500 each to be used over the next three years to improve foreign language skills, attend work placements (especially overseas), conduct studies of engineering business in specific sectors, and prepare for fast track careers in UK industry.

Executive Engineers Programme

This programme is designed for highly motivated, entrepreneurial and innovative engineering graduates to enhance and accelerate their professional development to Chartered Engineer status. The programme in 2004 was attended by 35 graduate engineers, and in addition six previous participants attended for the networking and social aspects.

Sainsbury Management Fellowships in Engineering

The award is aimed at high-flying young Chartered Engineers and covers the cost of course fees for MBA studies at selected international business schools. Eleven Fellowships were awarded during the year

bringing to 216 the total number awarded since the scheme's inception.

In 2004 Fellowships were awarded to:

Simon Bolton	<i>IMD</i>
Valentine Fontama	<i>Wharton</i>
Colin Glasgow	<i>IE</i>
Charles Haythornthwaite	<i>Berkeley</i>
Marc Lien	<i>Harvard</i>
Davina Patel	<i>LBS</i>
Thomas Smith	<i>IESE</i>
Serge Taborin	<i>INSEAD at Singapore</i>
Mark Williamson	<i>IMD</i>
Ian Wilson	<i>LBS</i>
Nicola Winn	<i>LBS</i>

GERONIMO!

Increasingly, the Academy is exploring new, creative ways of capturing young people's imagination and, thus, inspiring the next generation of engineers.

Fellows of the Academy took a high-profile part in a new television series shown on BBC 2 this January. Geronimo! was based on a set of engineering challenges held on beaches at the end of October 2004. Teams of budding (and professional) engineers from schools, universities and industry were invited to enter machines they had built to do penalty shoot-outs and triple jumps at Weston-super-Mare. In Blackpool the challenge was to build an amphibious racer and a sand-digging machine.

Advising on repairs where necessary and judging the winners from an Academy "Battlebus" were three Academy Fellows – John Burland, Chris Pearce and Jim Randle – along with one Academy Visiting Professor, Paul Wiese.

The programmes were family-oriented, with the emphasis very much on fun and hands-on engineering. They were presented by Fearn Cotton (CBBC and Top of the Pops) and Dick Strawbridge, a past champion of Scrapheap Challenge and recently retired Lt-Col in the Signals Regiment, who recreated some astonishing war-time inventions for Crafty Tricks of War, his successful BBC 2 series shown in 2004.

ACADEMY AWARDS

The Academy's annual Awards Dinner was held on 10 June at Draper's Hall in the presence of the Senior Fellow, HRH The Prince Philip Duke of Edinburgh. The Academy thanks the sponsors of the evening: BNFL, BP, Lloyd's Register, Rolls-Royce plc and South West Water.

Prince Philip Medal

Awarded to: **Professor William Bonfield CBE FEng FRS, Professor of Medical materials at the University of Cambridge.**

Professor Bonfield's work has helped to define the field of biomaterials. His outstanding achievements include developing and taking right through to commercialisation and clinical use the world leading 'artificial bone' material.

Professor Bonfield's work has provided a transformational change to a new 'second generation' of biomaterials derived from a biological template. This has made it possible to tailor and control the required mechanical and biological properties of skeletal implants.

MacRobert Award

Awarded to: **IBM for its WebSphere MQ software.**

The Websphere family of 'middleware' has helped businesses save billions of pounds by providing a failsafe means of exchanging business-critical information between computer systems, irrespective of their location and regardless of whatever hardware, programming language, operating system or communication protocol they use.

Launched in 1994, WebSphere MQ integrates servers, back office systems and databases, reliably handling hundreds of millions of

messages every day. Challenges that WebSphere MQ faced included having to support 40 different computing platforms, filing over 120 patents as well as having to transfer the original system to the Internet. But they did this successfully – and continue to improve it – such that WebSphere MQ is now an essential part of the mainstream infrastructure for over 10,000 customers, including more than 80 per cent of companies in the Fortune 100.

The other three finalists were: Delphi Diesel Systems for their E3 electronic unit injector advanced fuel system; Pilkington plc for Pilkington Activ™, the world's first self-cleaning glass; and Sharp Laboratories of Europe for their electrically switchable 2D-3D displays.

The President's Medal

Awarded to: **Jim Eyre.**

Jim Eyre has been a Partner/Director of Wilkinson Eyre Architects since 1987 and has been responsible for managing the practice's increasing workload of transportation, bridge and infrastructure projects. He has over 21 years experience in architectural practice, including working with Michael Hopkins Architects for six years prior to joining Wilkinson Eyre in 1986. Directing activity on a number of key major works, he has enjoyed involvement in a diverse range of project types at all stages of the design and construction process.

Jim Eyre's projects include the award-winning Stratford Market Depot on the Jubilee Line Extension, the Gateshead Millennium Bridge, Floral Street Bridge at the Royal Ballet School and the new Stratford Regional Station.

Silver Medals

The four medals awarded this year were presented to:

- **Stephen Brown - a partner in Buro Happold Consulting Engineers, London** - for his innovative structural solutions and acclaimed architecture that have supported successful urban regeneration.

His work includes the design and supervision of the remarkable glass and steel lattice roof over the Great Court of the British Museum and Millennium Point in Digbeth. He is leading the engineering team for the redevelopment of Battersea Power Station which is now entering the main design stage.

- **Jonathan Holt - Drilling Technology Portfolio Leader, BP in Aberdeen** - for his outstanding personal contribution to BP's "No Drilling Surprises" project.

The main focus of the "No Drilling Surprises" (NDS) project has been to identify and visualise potential geological hazards within a 3D model (HIVE™) before starting drilling. 3D visualisation software that could be updated in real time during drilling was developed in order to display hazards. Formation pressure prediction from seismic and basin modelling was developed and integrated inside a 3D volume to improve communication across disciplines, optimise oil well design and reduce safety risks during drilling. Both of these developments were industry firsts.

- **Professor Christopher Snowden FEng CEng FIEE FIEEE - Chief Executive Officer at Filtronic ICS and a professor at the University of Leeds** - for his outstanding contribution to the UK microwave semiconductor industry.

While at Leeds University he pioneered the application of physical device modelling to the

design of microwave semiconductors and circuits, facilitating the rapid and accurate development of new devices. The technology that he introduced became the foundation for a manufacturing process at a leading US microwave company.

- **Stuart Moran - one of the founders of Surgical Innovations, a small company based in Leeds** - for his development of innovative, safe and efficient surgical laparoscopic devices.

Patients and the whole community have benefited immeasurably from the introduction of surgical procedures which no longer require large access wounds but which utilise tiny incisions. Patients no longer need to stay in hospital for an extended stay, but may often attend as day patients and return to normal activity within a day or two.

Sir Frank Whittle Medal

Awarded to Professor Ian Young OBE FREng FRS for engineering innovations in medicine, recognising his contributions to the development and commercialisation of Magnetic Resonance Imaging (MRI). This is only the fourth time the medal has been bestowed.

MRI as an imaging technique is used primarily in medical settings to produce high quality images of the inside of the human body. It is based on the principles of nuclear magnetic resonance, a spectroscopic technique used by scientists to obtain chemical and physical information about molecules. Professor Young was one of two authors who published the first image of a head in 1978 and built the world-first MRI machine to use a super-conducting magnet for imaging, an approach now in almost universal use on patients worldwide.

Medal for the Public Promotion of Engineering

This medal, one of the Academy's newest awards, was given to radio and TV presenter Kate Bellingham. Kate is involved in many projects to promote science, engineering and technology to the general public. She is President of Young Engineers and sits on the advisory board for the publications arm of the Institute of Electrical Engineers. In 1997 Kate was awarded an Honorary Doctorate in Technology by Staffordshire University in recognition of her outreach work and in 2003 she received an MSc in Electronics with distinction at the University of Hertfordshire.

FELLOWS

The Academy's Fellowship consists of the nation's most distinguished engineers. Election to the Fellowship is, therefore, one important way that the Academy can celebrate excellence. Up to 60 Fellows are elected annually from nominations made by existing Fellows. They are distinguished by the title 'Fellow of The Royal Academy of Engineering' and may use the letters 'FREng' after their name. Each year a smaller number of Honorary Fellows and Foreign Members may be elected in recognition of their exceptional contributions to engineering. The Annual New Fellows' Dinner was held on 15 November at Draper's Hall in the presence of the Royal Fellow, HRH The Duke of Kent.

New Honorary Fellows elected in 2004 were:

Ray Dolby OBE

Founder and Chairman of Dolby Laboratories Inc.

Sir Christopher Gent

Chairman, GlaxoSmithKline

Sir Richard Sykes FRS

Rector, Imperial College London

New Foreign Members elected in 2004 were:

Robin John Batterham

*Chief Technologist, Rio Tinto Ltd;
Chief Scientist of Australia*

Jane Grimson

Vice-Provost, Trinity College Dublin

New Fellows elected in 2004 were:

Robert Anthony Ainsworth

*Assessment Technology Group Head,
Plant Integrity Branch, British Energy
Generation*

Gehan Anil Joseph Amaratunga

*Professor of Engineering and Head of
Electronics, Power and Energy
Conversion, University of Cambridge*

David Anderson

*Emeritus Professor, School of
Engineering, University of Warwick*

Keith Beattie OBE

*Chief Engineer, London Underground
Ltd (LLU)*

Patrick Bellew

*Principal, Atelier Ten, Environmental
Engineers & Building Services Engineers*

Christopher Bishop

*Assistant Director, Microsoft Research,
Cambridge; Professor of Computer
Science, University of Edinburgh*

W Richard Bowen

*Consultant; formerly Professor of
Chemical Engineering and Director of
Centre for Complex Fluids Processing,
University of Wales, Swansea*

Clive Burrows

Director of Engineering, First Group (Rail)

Geoffrey Malcolm Byham MBE

*Head of Engineering, Westland
Helicopters Ltd*

Richard Ernest Challis

*Professor of Ultrasonic Engineering,
University of Nottingham*

John David Coles CB

*Chief Executive, Warship Support
Agency, Ministry of Defence; Head of
the Royal Corps of Naval Constructors*

Anthony George Constantinides

*Professor of Signal Processing, Imperial
College London*

Jonathan Mark Cooper

Professor of Bioelectronics and Bioengineering, University of Glasgow

Wilfred James Corrigan

Chairman & CEO, LSI Logic Corporation

David John Fletcher CBE

Group Director, Easynet Group; Chairman, IRISYS Ltd

Lajos Hanzo

*Professor of Telecommunications
Head of Telecommunications
Research Group, University of
Southampton*

David Robert Hayhurst

Professor of Design and Manufacture & Materials, Manchester University

John Neville Hutchinson

*Consultant; Emeritus Professor of
Engineering Geomorphology and
Senior Research Fellow, Imperial
College London*

Allan Robert Jones

*Executive Manager, Environment and
Combustion, Power Technology,
E.ON UK plc*

Michael James Lockett

Corporate Fellow, Praxair Inc

Nicholas William Mckeown

*Professor of Electrical Engineering and
Computer Science, Stanford University*

Andrew William Nelson OBE

President & Chief Executive, IQE plc

Richard Jonathan Parker

*Director of Engineering & Technology,
Civil Aerospace, Rolls-Royce plc*

Maria Petrou

*Professor of Image Analysis,
University of Surrey*

Brian Phillipson

*Programme Director, Eurofighter
GmbH Ltd*

John Michael Rotter

*Professor of Civil Engineering,
University of Edinburgh*

Jonathan Peter Kyle Seville

*Professor and Head of Department
of Chemical Engineering, Deputy
Head of the Formulation Engineering
Research Centre, University of
Birmingham*

Robert Skidmore FRSA

Managing Director, SciMed Limited

Nigel Kenneth Henry Slatter

*Professor of Chemical Engineering,
University of Cambridge*

Yong-Hua Song

*Pro-Vice Chancellor and Professor of
Electrical Energy Systems, Department
of Electronic and Computer Science,
Brunel University*

Richard Syms

*Professor of Microsystems Technology,
Imperial College London; Director,
Microsaic Systems Ltd*

Cornelis Joost Van Rijsbergen FRSE

*Professor of Computer Science,
University of Glasgow*

Stephen Charles Alexander Walker

Investment Director, Thames Water plc

Michael William Welton

*Retired, formerly Chief Executive,
Balfour Beatty plc*

Laurence Glynn Williams

*Director, Nuclear Safety and Security,
Nuclear Decommissioning Authority*

Robert William Witty

*Chief Technology and Programmes
Officer, National Air Traffic Services Ltd*

David John Wright CBE

*Non Executive Director, Alvis PLC &
Raytheon Systems Ltd; formerly
Executive Director, GKN*

DECEASED FELLOWS

It is with enormous regret and sadness that the Academy learned of the deaths of several Fellows during the year, whose excellence and inspirational abilities will be greatly missed.

- **Prof J Argyris** CBE FREng FRS
- **Dr R Baker** FREng
- **Prof W J Bray** CBE FREng
- **Dr T Broom** OBE FREng
- **Admiral Sir Lindsay Bryson** KCB FREng FRSE
- **Prof R C Coates** FREng
- **Mr G David** OBE FREng
- **Dr G B R Feilden** CBE FREng FRS
- **Prof D C Freshwater** FREng
- **Sir William Harris** KBE CB FREng
- **Prof A Hendry** FREng
- **Sir Godfrey Hounsfield** CBE HonFREng FRS
- **Sir Robert Hunt** CBE DL FREng
- **Mr E V Jenkins** FREng
- **Mr C J Kirkland** OBE FREng
- **Prof H Nicholson** FREng
- **Dr G Oates** FREng
- **Prof R Park** OBE FREng FRSNZ (Int Fellow)
- **Mr J E Pateman** CBE FREng
- **Dr G G Pope** CB FREng
- **Mr F F Poskitt** OBE FREng
- **Prof B Scarlett** FREng
- **Dr P E Trier** CBE FREng
- **Prof A D Young** OBE FREng FRS

Leading Debate

The Academy assists in the development of policy on issues that have an engineering dimension. It does this at both national and international levels by formulating own-initiative policy statements and submitting expert evidence to parliamentary and government bodies. The range of our work in public engagement is diverse, and encompasses a variety of meetings, events, lectures and other gatherings.

RISK AND ETHICS IN ENGINEERING

The Academy's programme on risk is led by Mr John Turnbull FREng. It has concentrated on developing and refining the recommendations contained in three reports on aspects of engineering risk published in 2003. Particular emphasis has been placed on addressing the recommendation contained in the report *Humans in the Control Loop* that sectors should learn from each other concerning good practice for the assessment and management of risk of humans in complex engineering systems. A workshop was held in November 2004, with an invited audience from a number of different sectors, to explore how this could be achieved. This is being followed up in 2005 with a number of visits to 'blue chip' companies to explore their practices and share experiences in greater depth. The outcome is likely to be a report which will identify exemplary practice, and suggest ways in which industry sectors might benefit from this.

Another of the published reports, *The Societal Aspects of Risk*, encouraged the Academy to hold its first debate at Church House in June 2004. Called *Trust Me, I'm an Engineer*, it was chaired by Mr Ian Taylor MBE MP, a former Minister of Science and Technology. The panel comprised Sir Peter Williams

CBE FREng FRS, Professor Kathy Sykes, Bristol University, Douglas Parr, Chief Scientist, Greenpeace UK, and Tony Gilland of the Institute of Ideas. A large and varied audience contributed to a lively debate, demonstrating how effective such a forum can be in bringing together people from many disciplines – both within and without engineering – and in generating ideas for further work.

Two working groups on ethics have met several times in the last year. The first, chaired by Mr Christopher Earnshaw FREng, is addressing the codes of conduct adopted by the engineering institutions, considering whether there is a need for greater harmonisation, and for recognition of the responsibility to a wider group of stakeholders. This work is being carried out in conjunction with EC(UK) and many of the engineering institutions, and will report its findings towards the end of 2005.

The second group, chaired by Mr Andrew Haslett FREng, is addressing the issue of the teaching of ethics within UK undergraduate engineering courses. The group which is jointly sponsored with the Engineering Professors' Council, has prepared a draft curriculum, and is canvassing the views of the heads of UK university engineering departments on its

content, prior to preparing a final version in September 2005. Funding is being sought for a proposal to develop a body of relevant ethical case study material for use in engineering courses.

INTERNATIONAL MATTERS

International Review of Engineering Research

An important international benchmarking activity was undertaken during the year. Working with the Engineering and Physical Sciences Research Council (EPSRC), the Academy invited 25 distinguished international experts to review EPSRC-funded engineering research in UK universities. Academy President Lord Broers chaired a small steering group to oversee the planning and preparations for the International Review Panel's visit in November 2004. A major exhibition *A Celebration of UK Engineering Research and Innovation* was held at the Excel Centre in Docklands, London to supplement visits by sub groups of the Review Panel to 45 university research groups around the country.

Led by Professor Tom Everhart, President Emeritus of Caltech, the Panel's findings – published as *The Wealth of a Nation* – make important reading. The reviewers were impressed by much of the conventional research

they witnessed but they observed less cutting-edge activity than expected. In its recommendations the panel encouraged more inter-disciplinary interaction and more interaction between research engineers and scientists. In addition, the Panel suggested that more researchers should focus on the impact – in addition to the quality – of their work beyond university boundaries.

European Council of Applied Sciences and Engineering (Euro-CASE)

The Academy has continued to support the annual European IST prize competition sponsored by Euro-CASE with Professor Andrew Hopper FREng as the UK member and with Professor John O'Reilly FREng on the Executive Jury which selects annually three Grand Prize winners. In 2004 three British companies reached the final shortlist of 20.

Council of Academies of Engineering and Technological Sciences (CAETS)

The annual meeting of the CAETS Council took place in Stavanger, Norway in May in conjunction with a seminar on energy issues organised by the Norwegian academy with international participation. Lord Broers, Peter Saraga OBE FREng and Philip Greenish CBE represented the Academy at the Council meeting, while Professor Michael Laughton FREng attended the energy seminar.

Visit of the French Academy

Following the successful meeting hosted by the French Académie des Technologies and the British Ambassador in Paris in May, the Academy and the French Ambassador, H.E. Mr Gérard Errera, hosted a return event in London on 9–10 December.

The French Ambassador hosted lunch at his residence and a dinner was held

at the Academy in honour of the President of the French academy, Jean-Claude Lehmann and his delegation.

Professor Mark Welland FREng FRS gave a summary of the findings of the joint Royal Society/Royal Academy of Engineering report on nanotechnology issues at a workshop on 10 December. This was followed by presentations and a discussion on energy issues with Professor Ian Fells CBE FREng FRSE, Dr David Lindley OBE FREng FRSA and Philip Ruffles CBE RDI FREng FRS giving a UK perspective.

It was agreed that the two academies should continue their cooperation with regular bi-lateral meetings to discuss issues of mutual interest.

Annual meeting of the Swedish Academy

Vice President Peter Saraga OBE FREng represented the President at the 2004 Annual Meeting of the Royal Swedish Academy of Engineering Sciences (IVA). The proceedings opened on 28 October with a Royal Technology Forum on *The Role of Universities in the Europe of Knowledge*. Presentations were given by the Swedish Minister of Education and Research, and representatives of the European Commission. Dr Tim Cook, Managing Director of Isis Innovation, Oxford, gave a presentation about the activities they undertake to facilitate technology transfer.

On the following day the Annual Meeting of IVA took place in the Stockholm Concert Hall in the presence of HRH Princess Lillian of Sweden, government ministers and foreign ambassadors. The Chairman of IVA, Dr Arne Wittlöv, opened the proceedings which included the presentation of prestigious awards. Professor Lena Torrell, President of IVA, gave a comprehensive summary of the year's activities and made a plea

for more effort, and financial incentives, to encourage the most promising young people into engineering careers. In the evening a dinner for 600 Fellows and guests was held in the City Hall, the venue for Nobel Prize award dinners.

POLICY ADVICE

Own-initiative reports and submissions to Government

Academy reports and submissions are produced after wide consultation amongst the Fellowship and following a process of peer review, consistent with Government guidelines on the provision of scientific advice. The Academy produced more than 12 reports and responses, covering topics such as electricity generation, climate change, future transport needs, IT trends and an evaluation of research quality in engineering disciplines.

A joint report produced with the British Computer Society, *The Challenges of Complex IT Projects*, found that billions of pounds are being wasted every year on new IT systems. Despite many examples of good practice, there is still a lack of professionalism in software engineering that could be dangerous in safety-critical systems. This report found that Britain is failing to produce software engineers and managers with the IT and project management skills to commission and execute complex IT projects. In January a meeting was held to discuss the recommendations contained in the report. The meeting was chaired by the President and the speakers included Professor Frederick Brooks Jr FREng, John Suffolk, Director General Criminal Justice IT and Pieter Lindeque Distinguished Engineer and certified Executive IT Architect, IBM Global Services. Discussions are continuing outside

the Academy to progress some of the recommendations.

The joint Royal Academy of Engineering and Royal Society report *Nanotechnologies and Technologies; Opportunities and Uncertainties* was launched in July 2004. The study was initially requested by the Office of Science and Technology and a Government response was received in February 2005. Significantly, the Fellows on the Working Group that produced the report were joined by people representing other groups and professions. The innovative approach taken by this broadly-based working group resulted in a report which addressed the key issues of potential public concern, including the ethics, risks and sustainability of nanotechnology. In the words of the Group's Chair, Professor Ann Dowling CBE FREng FRS, the report separated "the hype and hypothetical from the reality".

The Government accepted the majority of the Working Group's recommendations, including that nanoparticles should be treated differently from similar materials in macro form, but stopped short of agreeing to fund a centre to study Nanotoxicity. And, in recognition of the inclusive manner in which the two Academies' report had been prepared, the Government used its response to announce its new general principles for public engagement.

Coverage and response to the report in the UK and overseas was very positive from the full range of stakeholders in industry and in the NGO sector. In addition to the press launch, a public meeting was held in September, chaired by Nick Ross, to discuss the report and associated science brief aimed at making the subject accessible to the general public.

At the request of the Woodrow Wilson International Center for Scholars in Washington, Professor Ann Dowling CBE FREng FRS, Chair of the study group, attended a meeting with US policy makers and NSF International. Praise was forthcoming for the conduct of the study as well as for its findings, particularly on the potential toxicity of nanoparticles.

Under the leadership of Mr Philip Ruffles CBE RDI FREng FRS a recommendation was made to HEFCE on *The Assessment of Research Quality in Engineering Disciplines* for use in the 2008 Research Assessment Exercise. A small working group drafted the proposal which was then discussed at a Fellows' meeting held in January. Subsequently there have been further discussions with HEFCE, the main Engineering Panel and Engineering sub-panel chairs.

Transport 2050 was published in March 2005 and recommended a variety of measures to improve one of the worst transport systems in Europe – congestion costing the UK £15 billion a year. The report presented a fifty year vision of the UK transport system and identified actions to be taken now to combat congestion and control emissions in the long term. One of the suggestions was that people should pay the real cost of every journey they make. The report argued that the implementation of transport policy should be the responsibility of independent agencies.

Academy submissions to Parliamentary Committees

Throughout the year, the Academy made a number of submissions to inquiries by Select Committees in both Houses of Parliament. The principal submissions are summarised in the following paragraphs.

Review of the UK Climate Change Programme

The response to DEFRA's recent review of the UK Climate Change Programme argued that carbon reduction targets were unlikely to be met without a clearer policy on the future of nuclear energy. Other measures identified as needing greater attention included developing effective carbon sequestration technologies, promoting the use of combined heat and power and encouraging R&D in alternative energy technologies. The response supported mechanisms such as the EU emission trading scheme but urged the extension of current Climate Change Agreements to increase their effectiveness.

Strategic Science Provision in English Universities

The response to the House of Commons Science and Technology Committee's inquiry highlighted the disadvantages faced by SET departments within the current funding framework, given high resource costs and the scope and breadth that they are required to cover. Many departments are forced to supplement teaching costs from research grants or face closure. The Academy called for Government intervention to offer greater incentives if the demand for skilled SET graduates were to be met. In March Professor R. F. Boucher CBE FREng gave oral evidence to the Committee on behalf of the Academy.

Throughout the year, the Academy made a number of other submissions related to education matters. It welcomed the proposals set out in the *Tomlinson Report* for the development of a framework of diplomas for 14-19 learning. It's submission to the House of Commons Education and Skills Committee inquiry into *Education outside the*

classroom drew attention to the value of curriculum extension projects such as those delivered by the Best Programme and stressed the need for clarification of the legal liabilities for teachers engaged in activities outside the school. The Academy has made a comprehensive submission to the Sir Alan Langlands report, *Gateways to the Professions*, and is actively participating – through John Baxter FREng – in the work of the Private Sector Reference Group. In addition, the Academy contributed its views to the Schwartz Report on *Fair Admissions to Higher Education*, noting that the current admission systems used by universities for engineering follow the QAA Code of Practice and that these systems generally already incorporate the principal features recommended by the Schwartz Report.

Science and innovation: working towards a ten-year investment framework

The Academy response was made after a Fellows meeting held to help tease out the main issues. The President's subsequent letter to the Chancellor of the Exchequer emphasised that innovation is an iterative process and not a linear activity that occurred only at the research stage. He highlighted the need for Government to allocate resources to the critically important development stage of product and process innovation.

Sustainable Development

The Academy response to the DEFRA-led consultation, which will lead to a unified strategy to guide Government action in this field until 2020, highlighted the essential role of engineering, especially in terms of innovative research, the development of new resource efficient technologies and improved product and process design. The Academy called for enhanced support for engineering

research and education and drew attention to the Academy's contribution in offering engineering advice for sustainable development.

EU 7th R&D Framework Programme

While offering broad support for the Framework Programme and the funding opportunities it provided, the Academy's response expressed concern regarding the administrative burden that funding applications had to date placed on small businesses and research teams. Other potential concerns included the 'social engineering' required to ensure a pan-European mix of research team members.

Galileo Satellite Navigation System

The Academy's response to the House of Commons Transport Committee was supportive of Galileo, the proposed European satellite navigation system. However, the Academy raised a number of potential problems with the proposal. In particular, the frequencies and bandwidth required by the system may interfere with air traffic control radar systems. Attention was drawn to the possible temptation for Governments to cross-subsidise the system by using it to raise revenue for road-charging or other schemes. Peter Blair OBE FREng gave oral evidence to the Committee on the Academy's behalf.

Scientific Aspects of Ageing

The Academy's response to the House of Lords Science and Technology Committee was reinforced by Professor Garth Johnson FREng, who gave oral evidence on the technological advances that may improve the quality of life for the UK's increasingly aged population.

In addition to those summarised above, the Academy made submissions on a variety of other key topics:

- The Commission for Architecture and the Built Environment (undertaken by the House of Commons Select Committee on the Office of the Deputy Prime Minister)
- Carbon abatement technologies (Department of Trade and Industry)
- The 2008 RAE nomination of panel members (HEFCE)

ASSOCIATE PARLIAMENTARY ENGINEERING GROUP

The Academy provides the secretariat to the Associate Parliamentary Engineering Group (APEG). This is the sole Parliamentary Group providing a focus in Parliament for issues of concern to the wider engineering community. APEG, chaired by Bill Olnier MP, has a membership which includes Parliamentarians, business, academia and other individuals.

Its programme consists of 8–10 talks held in the House of Commons by distinguished engineers and business leaders on topics of public and parliamentary interest with an engineering and public policy theme. The 2004 Programme focused on transportation, with talks on Crossrail, Airbus, and the MIT Silent Aircraft Initiative, as well as the Role of Engineering Institutions in the 21st Century and Infrastructure, Climate Change and the Built Environment. Information on the 2005 Programme can be found on the group's website at www.apeg.org.uk. Fellows are invited to attend all meetings as Academy guests.

UK FOCUS FOR BIOMEDICAL ENGINEERING

The 2004 UK Focus for Biomedical Engineering conference, *Technology for Independent Living*, was sponsored by EPSRC, MRC and the Department of Health. A varied programme

addressing topics such as 'Independence at Home', 'Robots' and 'User Pull or Technology Push' concluded with an evening lecture given by Professor Tom Kirkwood FMedSci, *Beyond Just Coping: Technologies for a Healthier Age*.

In July Professor Richard I Kitney OBE FEng became Chairman of UK Focus, succeeding Professor Peter Wells FEng FRS upon completion of his three year term. Professor Kitney is Dean of the Faculty of Engineering and the Department of Bioengineering at Imperial College London.

A discussion seminar in October explored the issues to be raised in a forthcoming paper by Professor Elizabeth Tanner of Queen Mary College, University of London about the development and delivery of specific degrees in biomedical engineering. The final paper will be published via the Academy's website.

The second biennial Biomedical Futures meeting – *Engineering in Regenerative Medicine* – was held in Liverpool in November. Organised on behalf of the UK Focus by Professor David Williams FEng, the event was hosted jointly with the UK Centre for Tissue Engineering, University of Liverpool. Sponsorship to facilitate this important opportunity for young researchers to present their research to their peers was provided by the BBSRC, EPSRC and CCLRC.

POLICYNET

PolicyNet is an initiative of staff within the Academy, designed to serve as a network of individuals working in the science, engineering and technology (SET) policy arena. Over 100 people from 43 organisations are affiliated, ranging from policy officers to chief scientists and from medical charities to government departments. Two

meetings have been held in the past year: a presentation by Professor Sir David King, Chief Scientific Advisor to HM Government, in November 2004 and a presentation by Professor Mike Depledge, Chief Scientist for the Environment Agency in March 2005.

The November meeting attracted a record attendance of 70 members. Professor Sir David King addressed issues of climate change and climate change policy. The March event looked at the Environment Agency's work in detecting and monitoring threats to ecosystems and human health including flood-related risks.

MEETINGS AND EVENTS

Lectures

The Academy held a series of lectures, discussion meetings, briefings and debates throughout the year and continues to develop this important medium for engagement.

A key date in the Academy's calendar is the Lloyd's Register Lecture on risk management. In 2004 the topic was *Crisis Journalism* with Robert Thomson, Editor of The Times, who addressed the central question of whether the media contributes to crisis or the understanding of crisis. Vigorous debate followed his defence of his profession!

The Hinton Lecture, named after the Academy's first President, is the highlight of the annual lecture season. Last year it was given by Nicholas Donofrio, IBM's Senior Vice President for Technology and Manufacturing, on *The Value of Innovation*.

The focus of the President's New Year Reception and Lecture this year was *Terminal 5* at Heathrow. The informative and entertaining talk given by BAA's Terminal 5 Project Director, Andrew Wolstenholme, and

Dervilla Mitchell, Arup Structural Engineer, gave a fascinating insight on the management and design principals behind this £4 billion new terminal.

In March, Dr Robert Hawley CBE FEng FRSE gave the annual joint Academy and Royal Society of Edinburgh lecture, in Edinburgh. Dr Hawley's address *Engineering and the Creative Arts; A New Frontier?* highlighted some of the many examples of the many ways in which engineers and artists have worked together throughout history in fields such as painting, sculpture, theatre and film.

Speaking at the University of Sheffield in March, Richard Williams FEng gave an Academy regional public lecture on the arts, *Engineering Images: a fusion of engineering and art*. The lecture outlined the increasing importance of image-based and intelligent methods in engineering design and operation, which he demonstrated with images ranging from the production of minerals to the assessment of ways in which pharmaceutical tablets dissolve.

Academy Briefings

Over 90 Fellows and guests were present at a Briefing in April 2004, which focussed on the recent Academy report *The Cost of Generating Electricity*. The meeting was chaired by Philip Ruffles CBE RDI FEng FRS with talks given by Ian Burdon of PB Power, Claire Durkin of the DTI and Chris Lambert of the Adam Smith Institute. The subsequent discussion session addressed current UK energy policy and its international context.

The major interest generated by the report inspired a series of energy seminars, which began in November 2004. *Energy Demand 2020* was

chaired by Professor David Fisk CB FREng and explored a range of scenarios for future energy demand. *Renewables* – chaired by Dr David Lindley OBE FREng – reviewed the current situation and prospects for conventional renewables as well as fuel cells and combined heat and power. And *Fossil Fuels* – chaired by Prof Alan Williams CBE FREng – looked at reducing emissions, generation efficiency, cleaner coal and emissions trading. Future seminars will address *Transport and Oil*, *Nuclear Fission* and *Security of Supply*.

A novel Academy Briefing last year was *Engineering Challenge*, which was held in Parliament in May 2004. Delivered in the form of a quiz, it assessed the contribution of women to engineering and sought to analyse why so few women take up engineering as a career. The quiz was chaired by Claire Curtis-Thomas MP, the only woman engineer in the House of Commons, with Kate Bellingham as the compère. Suggestions raised during the question and answer session that followed included the possibility of producing an annual report ranking companies on their progress in promoting diversity among their workforce.

In October 2004, *Building Engineering Capacity in the Developing World* explored the role of the engineer in development issues and the particular part that the UK might play. It was chaired by Professor Peter Guthrie OBE FREng and focused on the eight Millennium Goals of the United Nations which include ensuring environmental sustainability and developing a global partnership for development. Other speakers included Bobby Lambert, Chief executive of ReDR, and Tony McWalter MP, a member of the House of Commons Science and Technology Committee.

In February 2005, *The Role of Innovation and Design in Engineering Education* enabled Geoff Kirk RDI, Chris Pearce FREng, Fred Maillard and Richard Shearman to speak about why design and innovation needs to be brought into the higher education curriculum and how this can be done. To coincide with the event, the Academy published *Educating Engineers in Design* – a booklet that drew together the successes and lessons learned during the 15 years that the Visiting Professors Scheme has operated.

Annual Soirée

In June 2004, the Academy's Annual Soirée was hosted by Rolls-Royce in Derby on the theme of *A Century of Innovation*. Guest of Honour was HRH The Duke of Kent, the Academy's Royal Fellow, who was shown around the exhibition by Rolls-Royce Director of Engineering and Technology, Dr Michael Howse OBE FREng.

Sir John Rose, Chief Executive of Rolls-Royce, and Lord Broers, President of the Academy, hosted the event, which was attended by several university vice chancellors and directors of the Rolls-Royce University Technology Centres. Fellows were joined by Sir Keith O'Nions, Director General of Research Councils and two former Rolls-Royce Chairmen, Lord Tombs FREng HonFRSE and Sir Ralph Robins DL FREng.

Fellows' Visits

A party of Fellows visited the Channel Tunnel Rail Link (CTRL) at St Pancras station in May 2004, courtesy of David Jeffries CBE FREng who co-ordinated the visit. The CTRL will be Britain's first major new railway for over a century – a high-speed line running for 68 miles between St Pancras station in London and the

Channel Tunnel. Fellows were given an insight into the rail link's activities through a tour of the construction sites, facilities and projects in progress.

A party of Fellows visited Terminal 5 at Heathrow in October 2004. Terminal 5 is a new major transport interchange, situated to the western end of the airfield on the site of the former Perry Oaks Sludge Treatment Works. Key players in the project from Arup and BAA provided an introduction to the overall development programme, which represents a £4 billion 10-year investment programme. Fellows toured the active construction sites, facilities and projects currently in progress, and were given the opportunity to meet and talk to the staff working at the heart of the development.

NEW VISUAL IDENTITY

The introduction of the Academy's new visual identity in October 2004 was the culmination of a long development programme that had started in December 2003 when Council commissioned an independent audit of the Academy's communications materials. Council later endorsed the audit's conclusions and agreed that it was important for the Academy's visual identity to reflect and support our aspirations and objectives and for it to reinforce our reputation for being impartial, multidisciplinary and rooted in excellence. It was deemed appropriate that the new identity should be future-focussed, dynamic and engaging to a wide range of audiences. At the technical implementation level, it was important that the new logo and identity should be supported by effective guidelines; be cost effective in terms of implementation; and should stand the test of time. The

designers – Spencer du Bois – worked alongside the Academy’s own staff, guided by a small working group of Council, chaired by the President, and by the advice of many other people, including the Senior Fellow and past Presidents. Council gave the product of this work its full support.

A key part of the new scheme is the retention of the original monogram not as a logo but as the Fellowship’s unique mark of distinction. The new identity has been very well received and is now being ‘rolled out’ across the entire range of the Academy’s materials.

INGENIA MAGAZINE

The *Ingenia* Editorial Board directs the course of the Academy’s flagship quarterly magazine. Dr John Forrest CBE FREng stood down from the Editor-in-Chief’s position during the year, having led the magazine from its conception and through its first five years of existence. His commitment to *Ingenia* – covering everything from generating articles through to securing sponsors – has been of immense importance to the Academy. His position at the helm of the magazine has been taken on by Academy vice president, Dr Scott Steedman FREng.

The Board decided this year to relaunch the magazine with a view to adopting the Academy’s new visual identity and to broaden the attraction of the magazine and its quality content to a wider audience. The new look magazine appeared for the first time in the spring and resulted in an immediate increase in the number of people and companies asking to be placed on its mailing list. The magazine’s distribution now stands at just under 5,000 per issue. Active measures are now being prepared to increase the

distribution significantly at a rate that is supported by additional sponsors to fund the extra costs involved.

WEBSITE

The Academy’s website took on a ‘new look’ in February 2005. This changeover of the website’s image was coupled with a change in its structure and accessibility, leading to an increase of around 50% in the traffic it receives. Most significantly, time spent by individual visitors has risen by almost 400%. These are excellent figures, achieved in a very short time, and will enable us to move forward with the rest of the web development programme from a position of confidence. The Academy’s other web sites (including the Best Programme site, the APEG site and a new site for *Ingenia*) feature in this development programme.

Academy Business

ANNUAL GENERAL MEETING

The 28th Annual General Meeting was held in London on 7 July 2004, with the President in the Chair. Three Honorary Fellows, thirty seven Fellows and two Foreign Members were elected. The Annual Review and Accounts for 2003–2004 were adopted and Officers and Members of Council were elected. The meeting approved changes to the Statutes: firstly, to change the designation of Foreign Members to International Fellows and, secondly, to allow non-British engineers based in the UK to become Fellows. The changes to Statutes were subsequently approved by a postal ballot of the entire Fellowship.

After the formal business of the Annual General Meeting concluded, presentations of their work were given by: Dr Ruth Wilcox, Post-Doctoral Research Fellow in the School of Mechanical Engineering, University of Leeds; Professor Chris Lawrence, Department of Chemical Engineering and Chemical Technology, Imperial College, London; and Dr Tom Richardson, Department of Aerospace Engineering, University of Bristol.

SPENDING REVIEW 2004 – SCIENCE BUDGET ALLOCATIONS

The 2004 Government Spending Review allocations were announced on 7 March by the then Secretary of State for Trade and Industry, Patricia

Hewitt, accompanied by a DTI press release which made particular mention of new funding to The Royal Academy of Engineering to recruit the best engineers to the United Kingdom.

The Academy's Grant-in-Aid allocation for the three-year Spending Review period was announced as £5.85 million (agreed as part of the last spending review discussions), £7.885 million and £9.752 million. This amounts to an increase of almost 67% over the entire period – or just over 50% after allowing for adjustments in the costing mechanisms for some university fellowships. The new money will enable the expansion of some successful existing schemes as well as the creation of several new ones.

The Director General Research Councils remarked very favourably on the quality of the Academy's funding application. He noted especially that the settlement reflected the importance of the Academy's work, particularly with the emphasis on improving the relative international standing of the UK's engineering base.

Full details of the Academy's plans for the utilisation of Grant-in-Aid funds during the Spending Review period, including the principal elements and targets, can be found on the website at www.raeng.org.uk/about/spending/default.htm.

DEVELOPMENT REPORT

Planning for Growth

The Academy received a highly significant donation of £8 million from the ERA Foundation in September: a new range of programmes is now being developed on which the income will be spent. This donation along with the continuing financial support of the Gatsby Charitable Trust and Fellows' donations, together with the award of additional Grant-in-Aid over the next three financial years, all indicate a recognition that the Academy is delivering results. Further support will enable the Academy to increase its impact nationally, at a time when the need for talented engineers and innovative engineering is ever more urgent.

To deliver its planned growth, substantially more funds will be needed to support and replenish both the Academy directly, and the Academy's Best Programme schemes. Long-term, mutually valued relationships will need to be built with a wide range of supporters – including companies, foundations and relevant public sector bodies – in order to increase and diversify financial and in-kind contributions.

In its leadership role as the UK's national academy of engineering, the Academy offers a unique partnership since its Fellowship covers the whole field of engineering in all its disciplines. Areas where there is a

common agenda and where the Academy is confident of the relevance and impact of its activities include engaging many more young people from widely different backgrounds into engineering futures, demonstrating the vitality of engineering, boosting the innovation performance of UK business and influencing the shape of government policy. Thanks to the contribution of many expert Fellows, the Academy offers involvement to its supporters in many topical briefings, events and publications.

In order to manage the increase in development effort as well as to bring together all the very many Academy contacts across its programmes, Council has agreed that the Academy should invest in a central database, which will enable the Academy to build more knowledgeable, Academy-level relationships with its actual and prospective partners and supporters. Better information will enable the Academy to enhance its marketing effectiveness: matching events and publications, for instance, to supporters' stated interests. In turn this will help deliver the Academy's public engagement objectives as well as making fund-raising partnerships that are much more valued.

Development effort takes time and prospective supporters have choices. The Academy is confident of the effectiveness and appeal of its programmes, and believes it will achieve strong additional support.

Planning a move

In July 2004, the Academy launched an appeal for funding, initially to its Fellows, so that it could be ready financially for a move to a more appropriately equipped building, which would better serve the Fellowship and the public. In the first eight months, an encouraging £400,000 has been pledged or received from 170 Fellows, towards a £4 million target. Taking account of the established Building Fund, funds raised now stand at £2,022,999.

Prompted by discussions around the Strategic Plan, the Academy recognises that the public space in its future building could be very powerful in delivering its strategic objectives: to showcase engineering excellence, to welcome, educate and inspire both Academy programme participants and the general public, to raise awareness and engagement in engineering issues and capabilities as well as providing a meeting point for Fellows. Current work is helping to refine exactly what the Academy needs and where. A range of property options is emerging, all of which will be actively pursued. The Academy will continue to seek donations from its Fellows whilst developing energetically the case for wider support.

Council

The Council – which held four ordinary meetings during the year – directs and manages the Academy and governs and controls its affairs, delegating as appropriate some of its functions to Standing Committees, each of which reports regularly to Council. As the Academy is a registered Charity, the Officers and Members of Council fulfill the role of Trustees.

OFFICERS AND MEMBERS OF COUNCIL

President

Lord Broers FREng FRS

Past President (ex officio)

Sir David Davies CBE FREng FRS

Senior Vice President

Sir Duncan Michael FREng

Vice Presidents

Prof W R Eatock Taylor FREng

Dr S E Ion OBE FREng

Mr P C Ruffles CBE RDI FREng FRS

Mr P Saraga OBE FREng

Dr R S Steedman FREng

Sir Peter Williams CBE FREng FRS

Honorary Treasurer

Mr F C Price FREng

Hon Sec for International Activities

Mr P Saraga OBE FREng

Hon Sec for Education and Training

Dr J E King CBE FREng

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Mr R Benaim FREng

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Prof D Fisk CB FREng

Sir Peter Gershon CBE FREng

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Sir Martin Sweeting OBE FREng FRS

Prof C M Taylor FREng

Sir John Taylor OBE FREng FRS

Mr J P Weston CBE FREng

Prof R A Williams FREng

Chairman Membership Committee
(ex officio)

Dr J Forrest CBE FREng

Chief Executive

Mr P Greenish CBE

Director, Finance & Administration
(Secretary to Council)

Mr A Thomas

Academy Standing Committees

Awards Committee

The Awards Committee is responsible for identifying and recommending to Council appropriate candidates for all relevant prizes and Awards, whether in the Academy's gift or not, with the exception of National Honours and the MacRobert Award.

Chairman:

Dr S E Ion OBE FREng

Members:

Prof I D Cluckie FREng

Dr A J Fox FREng

Prof A J G Hey CBE FREng

Prof C J Humphreys CBE FREng

Mr T Lazenby FREng

Dr P Watson OBE FREng

Prof P N T Wells FREng FRS

Mr P Greenish CBE

Mr T McLaughlan

Committee Secretariat:

Amy Abbott

Education and Training Committee

The Education and Training Committee's role is to oversee and be responsible for the Academy's activities in engineering education and training, and to maintain links with other bodies working in these fields.

Chairman:

Dr J E King CBE FREng

Members:

Dr A R Begg FREng

Dr D Grant CBE FREng

Prof J P McGeehan CBE FREng

Mrs R Spooncer FREng

Rear Admiral P A M Thomas CB FREng

Ex Officio:

Prof P J Deasley FREng

Prof G J Davies FREng

Dr J McQuaid CB FREng

Mr E H Norie OBE FREng

Prof M J Withers FREng

Committee Secretariat:

Dr R W Ditchfield

Mr I J Bowbrick

Engineering Policy Committee

The Engineering Policy Committee's role is to advise and be responsible to Council for the engineering policy of the Academy, and for all matters concerned with the application of engineering knowledge and principles (other than education and training). It should identify, monitor and promote attention to emerging and generic issues of importance to engineering in pursuit of this role.

Chairman:

Mr P C Ruffles CBE RDI FREng FRS

Members:

Mr J Baxter FREng

Prof T W Broyd FREng

Prof S F Davies FREng

Prof L F Gladden OBE FREng

Eur Ing Dr R P Harris FREng

Mr A M Haslett FREng

Prof M J Kelly FREng FRS

Prof A D May OBE FREng

Mr I C Ritchie CBE FREng FRSE

Mr J E Roberts CBE FREng

Mr A D Roche FREng

Ex Officio:

Prof H K D Bhadeshia FREng FRS

Prof R Holdaway FREng

Prof R I Kitney OBE FREng

Committee Secretariat:

Mr A Eades

Finance and Audit Committee

The Finance and Audit Committee is responsible for all financial and auditorial affairs of The Royal Academy of Engineering. This includes management of Academy budgets, external investment fund managers, insurance policy, risk register, audit arrangements and compliance with external financial reporting standards.

Chairman:

Mr F C Price FREng

Members:

Mr C V Betts CB FREng

Mr M J Earwicker FREng

Prof R W E Shannon CBE FREng

Prof P N T Wells FREng FRS

Committee Secretariat:

Mr A Thomas

International Committee

The International Committee's role is to advise and be responsible to Council for promoting the international interests of the Academy. In pursuit of this role the Committee's interests include oversight of the Academy's relations with the Council of Academies of Engineering and technological Sciences (CAETS) and the European Council of Applied Sciences and engineering (Euro-CASE)

Chairman:

Mr P Saraga OBE FREng

Members:

Prof G J Davies FREng

Prof R Holdaway FREng

Prof M A Laughton FREng

Prof A J Morris FREng

Prof W O'Riordan FREng

Prof G R Tomlinson FREng

Committee Secretariat:

Dr A Walker

Membership Committee

The Membership Committee is responsible for considering candidates for election to The Royal Academy of Engineering and for submitting a list of not more than 60 names to Council for approval before each Annual General Meeting. Each of the five Members of the Committee chairs a Panel covering a specific area of expertise.

Chairman:

Dr J R Forrest CBE FREng

Ex Officio:

Lord Broers FREng FRS

Mr A D Roche FREng (Panel 1)

Mr J K Banyard OBE FREng (Panel 2)

Prof M J H Sterling FREng (Panel 3)

Prof J Garside CBE FREng (Panel 4)

Prof B Mellitt FREng (Panel 5)

Committee Secretariat:

Mrs J Wagstaff

(see overleaf for details of other Panel members)

Additional Panel Members:

Panel 1 (Mechanical, aeronautical, marine and manufacturing engineering)

Mr J Baxter, Prof W N Dawes,
Dr J Ferrie CBE, Prof D Gosman,
Mr K G Jackson, Prof D T Pham OBE,
Mr R Parry-Jones CBE, Prof D Williams

Panel 2 (Civil, structural, public works and building services engineering)

Prof R E Allsop OBE, Mr R Benaim,
Prof R J Chandler, Prof P M Guthrie
OBE, Mr P R Head OBE, Prof A E Long,
Prof P K Stansby, Mr T J Thirlwall

Panel 3 (Electrical, electronic, control engineering and computing)

Prof W Fairney, Prof H D Griffiths,
Prof G W Irwin, Dr W S Jones OBE,
Mr K J Ralls, Prof R H Smallwood,
Mr E A Wallis, Prof S Watts MBE

Panel 4 (Chemical, fuel, process, mining and materials engineering)

Prof J S Archer CBE, Prof R S Benson,
Dr S E Bold, Mr P J Davidson,
Prof G A Davies, Mr R G Dodds,
Prof P J Gregson, Prof S M Richardson

Panel 5 (Informatics)

Prof P A Bennett, Prof P Brook,
Mr M F Cowlshaw, Prof A Hopper,
Prof J A McDermid, Prof R C Nicol,
Prof J J O'Reilly, Prof I C Ritchie CBE.

Research and Secondment Schemes Committee

The role of the Research and Secondment Schemes Committee is to advise and be responsible to Council for the supervision of research and secondment schemes other than those concerned with education and training.

Chairman:

Prof W R Eatock Taylor FREng

Members:

Dr J W Arthur FREng FRSE
Prof H K D H Bhadeshia FREng FRS
Prof W N Dawes FREng
Prof R A Falconer FREng
Prof H D Griffiths FREng
Dr P J Hargrave FREng
Dr D M C Horsley FREng
Prof J V Kittler FREng
Prof A E Long FREng;
Prof M S Snaith FREng
Prof D E Winterbone FREng
Prof J G Yates FREng

Ex Officio:

Prof G R Tomlinson FREng

Committee Secretariat:

Mr A Eades

Academy Staff

Chief Executive
Philip Greenish CBE
Personal Assistant
Angela Chester

COMMUNICATIONS

Director
Tom McLaughlan
Manager, Communications
(Education)
Dr Claire McLoughlin
Manager, Communications (Policy)
Jane Sutton
Publications and Web Editor
Dominic Joyeux
Assistant Publications Editor
Catherine Jordan
Manager, Events
Salima Virani
Assistant Manager, Events & Awards
Clare Huddleston
Assistant Manager, Communications
Amy Abbott

EDUCATION AFFAIRS

Director
Dr Robert Ditchfield
Manager, Engineering Design
Education
David Foxley
Manager, Postgraduate and
Professional Development
Ian Bowbrick
Assistants, Postgraduate and
Professional Development
Anne Mahabal
Pauline Stillman
Secretary
Patricia Frome

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Director
Keith Davis
Secretary
Sylvia Hearn
Head of Engineering Policy
Brian Doble
Policy Advisors
Richard Ploszek
Dr Alan Walker
Julia Christie
Nicholas Wilson
Manager, Research Support
Rob Barrett
Assistant Manager, Research Support
Nathan Wood
Manager, Engineering Projects
Anthony Eades

DEVELOPMENT

Director
Sarah Philbrick

FINANCE AND ADMINISTRATION

Director
Ashley Thomas
Secretary
Janet Weekes
Manager, Finance
Margaret Stewart
Finance Assistant
Karen Russell
Manager, Membership
Joanne Wagstaff
Membership Assistant
Hema Lingham
IT Manager
Hakan Altinisik
IT Assistant
Barry Weekes
Facilities Manager
James Lucey

Facilities Assistants
Terry Woolgar
Ameur Boudoumi
House Services Manager
Nigel Palmer
Reception/Security
Paul Morant

BEST PROGRAMME

Director
Dr Matthew Harrison
Manager, Pre-University and
Undergraduate Programmes
Dr Peter Revell
Administrator, Education
Programmes
Sandra Palmer
Administrative Assistant
Joanne Page
Best Programme Scheme Leaders:
Engineering Development Trust:
Brian Tripp
*Engineering Education Scheme
England:* **Mark Williams**
*Engineering Education Scheme
Northern Ireland:* **Brian Campbell**
*Engineering Education Scheme
Scotland:* **Susan Andrews**
Engineering Education Scheme Wales:
Austin Matthews MBE
Engineering Leadership Awards:
Dr Peter Revell
Executive Engineers Programme:
Dr Peter Revell
Headstart:
David Ozholl
*Sainsbury Management Fellowship
Scheme:* **Ian Bowbrick**
Smallpeice Trust Courses:
Andrew Cave
The Year in Industry:
Roy Bromley
Young Engineers:
Stuart Ellins

Annex

INDUSTRIAL SECONDMENT SCHEME

Fifteen awards were made during the year:

Secundee	Nature of Secondment	Host
Dr G Aglietti	Satellite design	Surrey Satellite Technology
Dr S Armour	Control protocols	Toshiba Research
Prof P Das	Ship design & fabrication	BAE Systems
Prof J Davies	Microcontroller architecture	Freescale
Dr B Henson	Affective engineering	Masterfoods
Dr S Huang	Deep water risers	BP
Dr G Jamnejad	Regeneration engineering	ARUP
Dr A Korsunsky	Combustion systems	Rolls-Royce
Dr D Kudenko	Games industry requirements	Core Design Studio
Dr K McGarry	Data mining	Sage
Prof G Pender	Flood prevention	Halcrow
Dr K Renaud	Data rationalization	IBM
Dr M Saadat	Body panel techniques	MG Rover
Dr E Sorensen	Separation techniques	BP
Dr M Sterling	Train aerodynamics	AEA Technology

SENIOR VISITING FELLOWSHIPS IN COMMUNICATIONS

Twenty five awards were made during the year:

University receiving award:	To host:
Queen's, Belfast	Professor Jose Encinar, ETSI Telecomunicacion Ciudad Universitaria, Spain
Queen Mary's, London	Professor Victor Li, University of Hong Kong
Edinburgh	Professor John Anderson, Lund University, Sweden
Glamorgan	Professor Alexander Dudin, Belarusian State University, Belarus
Glamorgan	Professor Kamal Alameh, Edith Cowan University, Australia
Oxford	Professor James Dalziel, Macquarie University, Australia
Newcastle	Dr Stephane Le Goff, Sultan Qaboos University
Aston	Professor Chuang Lin, Tsinghua University, China
Brunel	Dr Oskar Juhlin, Interactive Institute, Sweden
Cranfield	Professor Hua Sun, Nanjing University, China
Durham	Professor Krassimir Atanasov, Centre of Bio-Medical Engineering, Sofia, Bulgaria
Leeds	Professor Georgy Kolev, Moscow Institute of Information Technologies, Russia
Edinburgh	Professor Harald Haas, International University of Bremen, Germany
Oxford Brookes	Dr Antonio Moreno, University Rovira I Virgili, Spain
Kingston	Mr Joseph Ternullo, Partners HealthCare, USA
Cardiff	Dr Tudor Palade, Technical University of Cluj-Napoca, Romania
Brunel	Professor Ping Zhang, Beijing University of Posts & Telecommunications, China
Robert Gordon	Dr Hans Myrhaug, University of Trondheim, Norway
Edinburgh	Professor Wolfgang Utschick, Technical University of Munich, Germany
Liverpool	Professor David Peleg, The Weizmann Institute of Science, Israel
Paisley	Professor Sufen Wang, Donghua University, China
King's College London	Professor John Unsworth, University of Illinois, USA
City	Dr Francesco Furfari, Institute of Information Science & Technologies, Italy
Imperial College	Professor Stefania Constantini, University of L'Aquila, Italy
Nottingham	Professor M Rasmy, Cairo University, Egypt

RESEARCH CHAIRS AND SENIOR RESEARCH FELLOWSHIPS

Four new Research Chairs and 8 Senior Research Fellowships, including the new Leverhulme Trust appointments, were appointed during the year, bringing the total number of awards to 34. The holders are:

Research Chairs in Innovative Manufacturing

(co-sponsored with the Engineering and Physical Sciences Research Council)

Name	Co-sponsor	Subject	University
Prof D Kehoe	EPSRC (IMI)	E-business modelling for manufacturing supply networks	Liverpool
Prof P Sharratt	EPSRC (IMI)	Innovative manufacturing for the process industries	Manchester

Research Chairs

Name	Co-sponsor	Subject	University
Prof S Biggs	BNFL	Particle science and technology	Leeds
Prof N Cowern	Philips/Applied Materials	Nanoscale materials processing	Surrey
Prof D Fisk CB FREng	BP	Engineering for sustainable development	Imperial College
Prof A Forsyth	Rolls-Royce	Electrical systems for extreme environments	Manchester
Prof C Garner	Perkins Engines/ Caterpillar	Applied thermodynamics	Loughborough
Prof S Grimes	SITA	Environmental waste management	Imperial College
Prof P M Guthrie			
OBE FREng	AEA Technology/ DETR	Engineering for sustainable development	Cambridge
Prof G Hankinson	Advantica	Pipeline technology	Loughborough
Prof R Kalin	Keller Ground Engineering	Environmental engineering	Queen's, Belfast
Prof M Johnson	Rolls-Royce	Power electronics	Sheffield
Prof C Lawrence	Schlumberger	Oilfield process engineering	Imperial College
Prof P Mawby	Welsh Development Agency	Power electronics	Swansea
Prof B Mulgrew	BAE Systems	Multi-sensor signal processing	Edinburgh
Prof M Newborough	Scottish Power	Energy and environmental engineering	Heriot-Watt
Prof R Raghunathan	Bombardier Aerospace	Aerospace engineering	Queen's, Belfast
Prof A Sheno	Lloyd's Register	Lightweight structures	Southampton
Prof J Torero-Cullen	BRE	Fire safety engineering	Edinburgh
<i>appointment pending</i>	ARM	Embedded microelectronic systems	Loughborough
<i>appointment pending</i>	BAE Systems	Service support engineering and management	Cambridge
<i>appointment pending</i>	BAE Systems	Systems engineering	Loughborough

Senior Research Fellowships

Name	Co-sponsor	Subject	University
Mr H Chivers	GCHQ	Large scale distributed computing	York
Dr H Ford	Daphne Jackson Trust	Fibre-optic based optical coherence tomography	Cranfield
Dr P Gardner	Microsoft	Active web data	Imperial College
Dr R Moore	ICI/Cytec Engineered Materials	Performance of polymeric adhesives	Imperial College
Dr A Sayma	Rolls-Royce	Large scale numerical simulations of air-breathing engines	Imperial College

Leverhulme Trust Senior Research Fellowships

Name	Subject	University
Prof J Cooper	Development of novel adaptive aircraft wing shape technologies	Manchester
Dr C Edwards	Sliding mode observers for fault detection, isolation and sensor fault tolerant control in micro/nano satellites	Leicester
Prof D Hills	A radically new quantitative procedure for designing against fretting fatigue	Oxford
Dr M Kraft	Modelling the flame synthesis of carbon nanotubes	Cambridge
Dr P Midgley	Electron tomography for materials science	Cambridge
Prof B Nuseibeh	Analysing and specifying the security requirements of computer based systems	Open University
Prof W Zimmerman	Systems biology and chemical engineering	Sheffield

RESEARCH FELLOWSHIPS

Ten new Fellowships were awarded during the year, bringing the total number of awards made to 38. The holders are:

Name	Subject	University
Dr M Booth	Adaptive nano-optics	Oxford
Dr E T Bowman	Mechanisms of granular slides	Cambridge
Dr M Bustard	Bio-electric systems – a novel bioprocess intensification strategy	Heriot-Watt
Dr S Calverley	Embedded electrical machines	Sheffield
Dr J Chew	Developing dynamic gauging as a surface layer probe	Cambridge
Dr R Clark	Enabling technologies for next-generation ICE variable-valve-timing systems	Sheffield
Dr R Dorey	Fabrication of functional ceramic devices	Cranfield
Dr H El Mubarek	Point defects engineering: a new method of dopant diffusion suppression in semiconductors	Southampton
Dr M Ghogho	Space-time processing for mobile communications	Leeds
Dr E Grace	Next generation DVD: chiral beams for ultra high capacity multiplexed optical data storage	Imperial College
Dr N Green	Integrated electrokinetic microsystems for bioparticle analysis	Southampton
Dr K Groom	Advanced semiconductor laser engineering	Sheffield
Dr J Hall	Handling uncertainty in coastal engineering systems	Bristol
Dr J Hastie	Visible and ultraviolet surface emitting semiconductor lasers for life science applications	Strathclyde
Dr M Jackson	Consolidation and behaviour of continuous solid state processing of titanium from emerging reduction methods	Imperial College
Dr J Jones	Development and optimisation of porous bioactive scaffolds for bone and cartilage regeneration	Imperial College
Dr E C Kerrigan	Robust control of constrained dynamic systems	Cambridge
Dr V Khomenko	Design and verification of asynchronous circuits	Newcastle
Dr I Kinloch	Nanotubes in advanced engineering materials	Cambridge
Dr A Kohn	Correlating microstructure and anti-ferromagnetic domains in thin films for spin electronic applications	Oxford
Dr P Lettieri	Fluidised bed processes for sustainable development	University College London
Dr K Miller	Improved imaging of brain function and connectivity	Oxford
Dr J Mackenzie	Efficient high power planar waveguide lasers	Southampton
Dr M McLoone	Cryptographic algorithms for system-on-chip	Queen's, Belfast

RESEARCH FELLOWSHIPS *continued*

Name	Subject	University
Dr P McSharry	Non-linear analysis of biomedical signals	Oxford
Dr M Migliorato	Atomistic simulations of the structural and electronic properties of semiconductor materials for nanotechnology	Sheffield
Dr I Miguel	An automated constraint modelling assistant	St Andrews
Dr A Morgans	Active control of combustion instabilities	Cambridge
Dr M Sahibzada	Combined chemical production and power generation	Imperial College
Dr F Simonetti	Super resolution sub-surface sensing	Imperial College
Dr S Speller	Superconducting metamaterials for near field NMR microscopy applications	Oxford
Dr E Stride	Characterisation and design of coated microbubbles for ultrasound imaging and cancer therapy	University College London
Dr A Taylor	Novel polymer-silicate nanocomposites	Imperial College
Dr K Teo	Next generation electronics using carbon nanotubes	Cambridge
Dr G Treece	Mitigation of imaging artefacts in 3D ultrasound	Cambridge
Dr R Wilcox	Vertebroplasty: innovations in cement application	Leeds
Dr R Willden	CFD modelling of the high mode vortex induced vibrations of long flexible pipes	Imperial College
Dr V Zarzoso	Blind signal separation for communications	Liverpool

GLOBAL RESEARCH AWARDS

During the year the scheme approved 15 research engineers for secondments. Award holders current during the year are:

Secondee	Employer	Project Title	Host
Dr C Allen	University of Bristol	Development of an unsteady, unstructured grid motion scheme for the EDGE code	Swedish Defence Research Agency (FOI), Sweden
Prof W Balachandran	Brunel University	An integrated micro-fluidic chip for DNA extraction and transport	University of California, Los Angeles, USA
Dr T Blakeborough	University of Oxford	Development of real-time testing of hybrid structures	University of California, Berkeley, USA
Dr P Carrillo	Loughborough University	Knowledge management within engineering organisations in North America	University of Calgary, Canada/Georgia Institute of Technology, USA
Prof Z Cui	University of Oxford	Cryo-preservation of stem cells; a mass and heat transfer study	Peking University Stem Cell Centre, People's Republic of China
Dr P Cumber	Heriot-Watt University	A fundamental computational technique for estimating the flame length of jet fires	University of Canterbury, New Zealand
Dr P Dong	University of Dundee	Morphological and ecological processes of the Yellow River estuary and adjacent coastline	East China Normal University, People's Republic of China

GLOBAL RESEARCH AWARDS *continued*

Secondee	Employer	Project Title	Host
Dr A Elfick	University of Durham	The role of serum bio-molecules in the lubrication of total joint replacement	University of California, Berkeley, USA
Mr M Every	University of York	Separation of musical instruments from mono recordings	Pompeu Fabra University, Spain
Prof D Hayhurst FREng	University of Manchester	Multi-functional materials and shape morphing structures; analysis, optimisation and design	University of California, Santa Barbara, USA
Dr R Harrison	Loughborough University	Technologies and methods for the lifecycle engineering of modular reconfigurable manufacturing automation systems	Schneider Automation, France/ Georgia Institute of Technology, USA
Dr D Jones	University of Wales, Bangor	Control and guidance of autonomous rotorcraft for power line inspection	CSIRO, Australia
Ms L Knight	University of Southampton	Finite element simulation of surface wear in total knee joint replacement	University of Denver, USA
Dr P Lee	Imperial College	Through-process simulation of cast aluminium components for automotive applications	University of British Columbia, Canada
Dr C Li	University of Dundee	Development of risk assessment models for corrosion affected reinforced concrete infrastructure	University of Newcastle, Australia
Mr P Li	Imperial College	Through process modelling of aluminium castings	University of British Columbia, Canada
Dr L Louca	Imperial College	Predictive modelling of damage in marine composite structures under shock loading	US Naval Academy, Maryland, USA
Prof A Macdonald	Glasgow School of Art	Inclusive design and assistive technology for an ageing population	Ritsumeikan University, Japan
Mr A Monk-Steel	University of Southampton	The development of a wheel-rail rolling test rig for investigations into railway curve squeal noise	TNO Institute of Applied Physics, Netherlands
Dr L Moreau	University of Southampton	Semantic descriptions and management policies for GRID services	Argonne National Laboratory, USA/ University of Florida, USA
Dr S Sangwine	University of Essex	Vector signal and image processing using quaternions	Laboratoire des Images et Signaux (LIS), France
Dr W Shen	University of Portsmouth	Impact integrity of pressurised pipelines supported by foundation	Shanghai Jia Tong University, People's Republic of China
Prof N Syred	Cardiff University	Underlying mechanisms of excitement and damping in unstable flow systems	University of Adelaide, Australia
Prof N Thornhill	University College London	Detection and diagnosis of distributed disturbances	ABB, Norway
Dr S Turnock	University of Southampton	Effective hydrodynamic design of underwater vehicles	Memorial University of Newfoundland, Canada
Dr Y Wang	University of Manchester	Using CFD modelling in performance based fire engineering selection of building lining materials	Lund University, Sweden

VISITING PROFESSORS IN PRINCIPLES OF ENGINEERING DESIGN SCHEME

The scheme now has 120 Visiting Professors at the following universities:

University of Aberdeen; Aston University; University of Bath; University of Birmingham; University of Bradford; University of Brighton; University of Bristol; Brunel University; University of Cambridge; University of Cardiff; University of Central Lancashire; City University; University of Coventry; Cranfield University; De Montfort University; University of Dundee; University of Durham; University of Glasgow; Heriot-Watt University; University of Hertfordshire; University of Hull; Imperial College; University of Kingston; University of Leeds; University of Leicester; University of Liverpool; University of Loughborough; University of Manchester; University of Newcastle upon Tyne; University of Nottingham; Open University; University of Oxford; Oxford Brookes University; University of Plymouth; Queen Mary, University of London; Queen's University Belfast; Royal College of Art; Salford University; University of Sheffield; University of Southampton; Strathclyde University; University of Surrey; University of Sussex; University of Ulster; The University of Manchester; University of Warwick

VISITING PROFESSORS IN ENGINEERING DESIGN FOR SUSTAINABLE DEVELOPMENT

Name	Subject area	University
Prof B Mould	The built environment	Brighton
Prof J Purseglove	Water and environmental management	Hertfordshire
Prof J Hulse	Chemical and process engineering	Newcastle upon Tyne
Prof R Booth	Renewable and sustainable energy	Oxford
Prof C Ainger	Sustainable construction	Cambridge
Prof D Bartholomew	Energy conservation in the built environment	De Montfort
Prof K Snowdon	Design manufacture and disposal of electronic products	Loughborough
Prof C Duff	Processing, recycling and dematerialisation	Surrey
Prof J McQuaid CB FREng	Energy and the built environment	Ulster
Prof J Lopez-Merono	Manufacturing and materials	Aston
Prof G Acres OBE	The hydrogen economy	Birmingham
Prof G Howarth	Product design and waste prevention	Bournemouth
Prof H Eccles	Contaminated land remediation	Edinburgh
Prof R Dodds FREng	Consumer goods	Liverpool
Prof D Welsh	Power generation in developed and developing countries	Bristol
Prof J Poole	Environmental protection	Cardiff
Prof B Carroll	Sustainability assessment of infrastructure projects	Glasgow
Prof R Venables	Sustainability of large infrastructure projects	Queen's University, Belfast
Prof J McDougall	Whole life engineering	Sheffield Hallam
Prof D Slater CB	Chemical processing	Manchester
Prof M Fletcher	Water as a resource	Bradford
Prof A Emery	Natural resource extraction	Bath
Prof S Halliday	The link between engineering and architecture	Strathclyde
Prof L Walker	Methods for assessing sustainability	Sheffield
Prof D Raffo	Product development	Leeds

VISITING PROFESSORS IN INTEGRATED SYSTEM DESIGN

Visiting Professors	University
Prof C Pearson and Dr I Shams	Brunel
Prof D Stupples	City
Prof R Hyde and Prof D Williams	Edinburgh
Prof K Robinson	University College London
<i>appointment pending</i>	Birmingham

ENGINEERING PROFESSIONAL DEVELOPMENT AWARDS

The companies receiving awards were:

Airbus	James Howden & Co Ltd	Rolls-Royce plc
Alcan Packaging	King Automotive Systems Ltd	Siemens VDO Automotive Ltd
Bentley Motors Ltd	Geo W King Ltd	Slack & Parr Ltd
BCMZ Precision Engineering Ltd	KRONE (UK)	Sortex Ltd
Cabletec ICS Ltd	Lightweight Medical Ltd	Severn Trent Water
Cadogan Consultants	LINPAC Automotive Dunstable	Smiths Aerospace
CCS Group	MESL	TEL UK Ltd
Cold Drawn Products	Messier Dowty	Tyco Electronics UK Ltd
Cosworth Technology Ltd	Marconi Wireless	Technical Support Associates
Crawford & Company	MITRAS Automotive (UK) Ltd	TRW Automotive
Cultech Ltd	MESL	TICO
Energy Solutions	Nereus Alarms	Vega Group plc
ETA Projects Ltd	Pace Micro Technology	Waterman BBT
J L French UK	PERA	Waterman Environmental
Grimley Smith Associates	Pratt & Whitney Canada (UK) Ltd	Waterman Partnership Ltd
Henry Technologies	Pathtrace plc	Zarlink Semiconductor Ltd
IMI Webber Ltd	React Engineering Ltd	
Invsat Ltd	RPS Kirk McClure Morton	

EXXONMOBIL TEACHING FELLOWSHIPS

During the year the scheme approved 15 research engineers for secondments.

Award holders current during the year are:

Recipient	University
Dr G Cunningham	Queen's, Belfast
Dr A Galindo	Imperial College
Dr A Harvey	Newcastle
Dr P Linke	Surrey
Dr A Miller	Manchester
Dr E Wynn	Birmingham

EXXONMOBIL HIGHER EDUCATION SUPPORT SCHEME

Recipient	University
Dept of Earth Sciences	Cambridge
Dept of Chemical & Biochemical Engineering	University College Dublin
Dept of Chemical Engineering	Imperial College
Dept of Earth & Ocean Science	Liverpool
Dept of Chemical Engineering	Newcastle
Dept of Chemical & Process Engineering	Strathclyde
Dept of Chemical Engineering	University College London

SAINSBURY MANAGEMENT FELLOWSHIPS IN THE LIFE SCIENCES

Six Fellowships were awarded in 2004, bringing to 43 the total number since the scheme's inception:

Recipient
Joseph Brennan
Burrinder Grewal
Adam Collier
Sergei Schorov
Graham Foxon
Sohail Sheikh

THE PANASONIC TRUST

Six new Fellowships were awarded during 2004:

Recipient	University
Penny Coombes	Cambridge
Steven Hunt	Cambridge
Stephen Li	Cambridge
Ian Richardson	Reading
James Robinson	Loughborough
Aaron Stevens	Loughborough

