

The Cutting Edge
Annual Report **2004**

Contents

Inspiring success	2
Research into action	6
International Cranfield	10
Underpinned by people	12
Community partnerships	16
Superb facilities	18
Honorary graduates and alumni	20



Cranfield University offers a highly specialised blend of research and education to fulfil its unique mission:

To create and transform world-class science, technology and management expertise into viable, practical, environmentally desirable solutions that enhance economic development and the quality of life.

Why are we unique?

Alone among UK universities we:

- recruit exclusively at postgraduate level
- focus on educating the next generation of practitioners in their individual disciplines
- are highly specialised, operating in focused areas where we command world-wide recognition.

Staff of the highest quality are essential to the achievement of our mission and we offer rewarding careers to ensure that all achieve their full potential.

Cranfield academics are experts, not only in their own disciplines but also in the practitioner sectors they serve. Our students are mature in outlook, often have considerable practical experience, and move smoothly into appropriate and fulfilling employment – thanks to the Cranfield ethos.

We are the university of choice for those seeking commercially relevant research. Why? Because we consistently focus upon excellence and practical relevance, while fostering an entrepreneurial culture.

Cranfield's aim:

To be a leading national, European and international institution for the generation, dissemination and application of knowledge in selected areas of engineering, applied science, manufacturing, management and medicine to both the civil and defence sectors.

As you read this report, you will see that in order to fulfil these aims we have:

- made great progress with our educational programmes
- introduced fresh approaches and courses to meet an evolving world
- consistently reaped the rewards of our heritage by winning repeat business from hundreds of satisfied research clients
- invested in excellent people and cutting-edge technologies to maintain our position at the forefront of our specific sectors.

For example, Cranfield has always been a major supplier to the defence sector, offering a depth of knowledge, again relevant and applied, which is second to none. Similarly, our expertise in research and teaching has brought practical benefits to companies, institutions and governments world-wide. In commerce, winning repeat business is a significant mark of success and it is no less so for Cranfield University.

Alumni are returning in significant numbers. Some come back to keep up with the latest innovations in their sphere of work; some place contracts of their own, while others offer to assist new students via the various alumni networking groups.

Underpinned at every stage by our inspirational staff, we have maintained our reputation both close to home and internationally, and have inspired a new generation of students to reach the practical goals to which they aspire.

Financially 2003 was a further year of strong growth, with consolidated income rising by 6.5% compared with the previous year. Income growth was led by research which increased by more than 10% – a significant achievement.

All this, coupled with some 21st century developments aimed at the needs of modern managers and technologists, made 2003 a particularly buoyant and exciting year for Cranfield.

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Cranfield is exactly
the kind of institution
that is a model of what
I am proposing.

Richard Lambert
Lambert Review of Business–University Collaboration



The core of Cranfield's mission in its teaching and research lies at the leading edge of knowledge, with particular focus on its transfer to practical application – producing new graduates who can go out and make a tangible difference, and creating opportunities for business and industry.

Key highlights of the year include:

- a sixth successive year of growth in the numbers of students coming to study for a Cranfield Masters degree as a foundation on which to build a successful and rewarding career
- the successful launch of eight new Cranfield Masters programmes
- being chosen by the Singapore Institute of Manufacturing Technology (SIMTech) as its partner in launching an Engineering Doctorate Programme in Singapore.

The vital role that Cranfield's research plays in creating new knowledge and transforming this into new market opportunities is demonstrated by:

- 27% growth in our research income from UK industry and 21% growth in industrial research income from all countries
- the development of new long-term partnerships with global companies including:
 - a university technology partnership with Rolls-Royce in surface coatings
 - designation by BAE SYSTEMS as their strategic university partner in aeronautical engineering and synthetic environments
 - designation by Boeing as one of their global research and development university partners

- recognition by the Engineering and Physical Sciences Research Council (EPSRC) that Cranfield is now the premier university in the UK for collaborative projects in transport, defence and aerospace
- membership of the winning consortia in:
 - Defence Technology Centres in:
 - data and information fusion
 - human factors integration
 - electro-magnetic remote sensors
 - Defence Towers of Excellence in:
 - guided weapons.

Success requires excellent staff. The university has invested significantly in new professorial staff to reinvigorate its academic leadership.

Over the past year we have recruited six new professors, including Professor Michael Osbaldeston as Director of Cranfield School of Management, while three current staff attained the maturity and external reputation to support their promotion to the professoriate. In addition, Professor Clifford Friend was promoted to the post of Deputy Vice-Chancellor.

Success depends on all staff achieving their full potential, regardless of their background, which is why we place so much emphasis on our diversity policy.

The quality of our students is also vital for success, and Cranfield has been highly successful in recruiting extremely able students from the UK, Europe and internationally – in the ratio of 60:20:20 respectively.

This year we have won the funds to invest more than £10m in new facilities and equipment. One is the new joint Cranfield-Cambridge high-performance computing facility, currently the 5th most powerful academic super computer in Europe. Another is software to enable all staff and students to access information held anywhere in the world in electronic format on any PC on our network, 24/7, creating a 'permanently open' library.

An international reputation for operating at the leading edge provides the platform for Cranfield to support its local regions, the East and South East of England. Examples are our help for manufacturers through the Eastern Regional Centre of Manufacturing Excellence and the Lean Manufacturing Initiative in the South East. Students and staff have much to offer locally and, with volunteer co-ordinators on each campus, these contributions are now far more effective.

Cranfield is a university fully delivering on its mission of transforming world-class science, technology and management into viable, practical, environmentally desirable solutions that enhance economic development and the quality of life.

Professor Frank Hartley
Vice-Chancellor

Inspiring SUCCESS



If you have
'Cranfield'
on your CV,
then the world
is your oyster.

Angela Mee
MSc Logistics and Supply
Chain Management



Changing the lives of students to ensure they are equipped to realise their career aspirations is part of the Cranfield way – an experience which brings together the latest teaching techniques and supports them with our own research. Student success often leads to the establishment of new enterprises, greater employment opportunities, and a lifelong relationship with Cranfield for networking, continued professional development and research. Ultimately, the wheel turns full circle – our alumni put something back. Many have responded to our invitation to further the work of Cranfield with financial and practical help, such as recommending students to us, and commissioning research and development.

New courses

In 2003 Cranfield introduced eight new MSc programmes:

- Environmental Management for Business
- Finance and Management
- Land Reclamation and Restoration
- Operations Excellence (in association with Rolls-Royce)
- Strategic Marketing
- Structures, Crashworthiness and Impact
- Systems Engineering for Defence
- Translational Medicine (clinical research for industry)

plus:

- a range of postgraduate diploma and certificate opportunities including the

Postgraduate Certificate in Learning, Teaching and Assessment in Higher Education (for university academic staff)

- a new variant of the EngD, delivered with institutions in Singapore.

The EngD has been offered by Cranfield for 10 years and some 10 people each year embark on the programme. The success of the present course is being built upon as we launch an EngD programme in conjunction with the Singapore Institute of Manufacturing Technology and the Agency for Science Technology and Research (Singapore's equivalent of the EPSRC). Like our other MSc courses, the MSc in Translational Medicine (clinical research for industry) was introduced as a direct response to the needs of major partners with whom we have close working relationships, and is intended to provide a variety of career opportunities.

Programmes for 'a new type of professional'

Cranfield's new MSc programmes have been developed to meet the demands of modern industry and commerce. As an example, the Land Reclamation and Restoration MSc was launched at the Land Reclamation 2003 conference where course director Professor Peter Leeds-Harrison outlined its purpose. Delegates heard that, with more than 300,000 hectares of contaminated land in the UK alone, there was an urgent need for a new type of professional to tackle the increasing challenges faced by public and private-sector industry due to land degradation.

Professor Leeds-Harrison said:

"Organisations have been particularly keen to provide placement projects and present visiting lectures, and have shown interest in sponsoring students or employing them after completion.

"This programme is designed to provide the skills and knowledge for a new type of professional, one who will be tackling the range of issues presented on the full spectrum of degraded sites."

Cranfield breaks new ground

The Environmental Management for Business MSc was being launched as a Professional Masters, a new form of Masters degree. Aimed at people in work who wish to further their personal and professional development by acquiring new skills and implementing these in the workplace, it incorporates a portfolio-based approach including reflective practice on candidates' existing experience. Attendance at workshops and key modules allows students to participate in the all-important 'Cranfield experience', while a thesis based on an in-company research project completes the programme. The whole package will allow Cranfield to widen participation and strengthen connections with industry and other organisations.



New teaching techniques

To inspire and stimulate students, Cranfield has developed a more flexible approach to teaching, integrating the benefits of animation, video, PowerPoint, CDs and the Internet to develop a bespoke approach to electronically enhanced education. Pro-Vice-Chancellor Professor Mike Sanderson said: "We need a very different approach because Cranfield isn't offering a standard university education. Our material evolves because of our research and the changing demands of our industrial partners."

Cranfield academics have developed intensive programmes enabling part-timers to benefit from short, focused learning experiences. Delivery times have been reduced by creating an access/catch-up programme for some areas so that students can move forward together on the main body of learning at a similar pace. Much of this work has been supported by the European Social Fund which has enabled many participants to study at a significantly reduced personal cost.

Developing people

True to its mission and as a result of an evolving educational programme, Cranfield is proud both to develop people to become practitioners in their discipline and for their work to receive appropriate acclaim.

One such was Dr Chris Saunders, who completed his Engineering Doctorate and was awarded the Shepperson Memorial Prize by the South East Midlands Branch of the Institution of Agricultural Engineers.

This annual prize is awarded for a thesis of a practical engineering nature likely to immediately help the farming community.

The benefit of Chris's doctorate on optimising the performance of shallow, high-speed mould ploughs is already being realised by his industrial sponsor, Kverneland (UK), which has manufactured a shallow plough inspired by the study.

Exemplary students

This year's Kings Norton Medal for the best postdoctoral thesis was awarded to Dr Sreenath Subrahmanyam, the recipient of one of 20 coveted Indian government scholarships for which he had to compete with over 1,000 other candidates. **(Image 01)**

Sreenath's thesis, entitled '*Design of molecularly imprinted polymers for sensors and solid phase extraction*', was externally examined by Dr Keith Brain from Cardiff University who is a pioneer in the field of molecular imprinting. An impressed Dr Brain said: "The results clearly constitute a significant contribution to new knowledge."

Sreenath proved an exemplary student: during his first two years at Cranfield he was, simultaneously, writing up his first PhD for which he studied in Madras, India. He also gave up his own time to work as a Residential Warden at the Silsoe campus for 12 months.

Since leaving Cranfield, Sreenath has accepted a position in the Department of Computer Science at the Bioinformatics Research Centre, University of Aarhus, Denmark.

The winner of the 2003 Henry Ford II Scholar Award presented by Cranfield School of Management was full-time MBA student Adrian Chan.

Adrian was awarded the £5,000 prize, sponsored annually by Ford, for achieving the highest overall mark on the programme during the 2001-2002 academic year.

After completing his MBA Adrian went back to Singapore where he was employed by their Ministry of Education. Having been unable to return to Cranfield for the presentation or his graduation due to the SARS epidemic, he received his prize from the school's Director of International Development, Colin Gordon, during an overseas trip.

Scholarship from the Football Association

The Football Association (FA) has provided a one-year scholarship to Cranfield's MSc in Sports Surface Technology, the only Masters course of its type in Europe, which aims to provide a scientific approach to the construction, specification and maintenance of sports surfaces.

The scholarship was awarded to full-time student John Lockyer, who previously worked in the golf industry in the UK and US as a golf course green keeper. John is working closely with the FA's National Facilities Manager, Steve Williams, on a range of projects, one of which is the durability and maintenance of new-generation artificial turf pitches.

www.cranfield.ac.uk

02



03



Business focus

Two former MBA students were inspired with the idea for their new business while studying at Cranfield.

Passionate football fans Jerry Scriven and Charlie Wardle have launched 'Click to Kick', a new interactive website offering football fans the unique opportunity to take part in a penalty shoot-out on the hallowed turf of their favourite club. It also enables fans to represent their clubs via the league tables and in a grand final shoot-out.

Charlie said: "Our experience of studying for a Cranfield MBA gave us the tools to set up and launch the business.

"Learning about the highs and lows of other entrepreneurs helped us avoid some of the common mistakes involved in a start-up. It also gave us access to a whole range of contacts and an understanding of the financial and legal implications of what we wanted to do. Understanding the ropes about how to get into the world of venture capital was invaluable."

Executive Doctorate student Stephen Giacchino and Cheryl Freeman were the first graduates of the current DBA programme. Current Executive Doctorate student Simon Wilson received two awards at the British Academy of Management Conference.

Jet2 joins the low-cost airlines

The ranks of the low-cost airlines were swelled by new start-up Jet2, where Cranfield's Julian Carr, who completed

his MSc in Air Transport Management last year, is in the key role of Business Development Manager.

Julian, who was sponsored throughout his MSc course by Jet2's owners Channel Express, has been able to quickly put into practice what he learned at Cranfield.

Jet2 began flights from Leeds Bradford (LBA) to Amsterdam in February, and now operates to 12 destinations in France, Italy, Spain, Portugal, the Czech Republic and Northern Ireland.

Professor Fariba Alamdari, Head of the Air Transport Group, said: "Hopefully, remembering from his studies that airlines can experience many ups and downs, Julian will be able to steer Jet2 on a path to long-term commercial success."

(Image 03)

Helping less developed countries

More than 330 graduate and postgraduate volunteers have been sent to more than 20 countries in the developing world as part of the ongoing activities of Silsoe Aid for Appropriate Development (SAFAD).

Applying knowledge gained during their studies, volunteers provide much needed technical assistance to less developed communities.

Nicholas Evans, who graduated with an MSc in Natural Resource Management from Cranfield, accepted a placement on SAFAD's Malawi Macadamia nut project last summer. He worked alongside both public and private bodies and was heavily

involved with planning and managing the project, offering technical advice, delivering training and developing future strategies. "This was an amazing opportunity to put the skills I learnt at Cranfield to practical use," said Nicholas.

SAFAD President Robin Farrington said: "SAFAD volunteers have left a legacy of information and techniques behind that continue to improve the welfare of some of the poorest communities on Earth.

"Over the last three decades, the hard work and dedication of our students has enabled volunteers to go abroad, improving thousands of lives by alleviating poverty and helping to create sustainable livelihoods."

Trekking expedition

For alumnus Jonathan Carrivick, his time at Cranfield studying for his first-class degree in Physical Geography was used to the full when he embarked on a gruelling expedition trekking across the Vatnajökull ice cap in Iceland making scientific observations.

Jonathan said: "The choice of modules at Silsoe helped me no end during my trek. Also, the year's work experience allowed me time and space to gain first-hand skills of organising my research, planning and undertaking rigorous and demanding fieldwork and communicating and collaborating with other scientists."

(Image 02)



04

The right to learn

MBA graduate Shaun Micallef-Green was so determined to help youngsters in their early school years that he gave up his job as an army education officer and came to Cranfield to learn the business skills required to deliver an educational service.

He has now launched Right2Learn Education Ltd – a visually appealing web-based educational tool for primary schoolchildren. This, via www.right2learn.co.uk comprises tests in Maths, English and Science, which are produced and validated by a team of teachers and head teachers.

Praise indeed

Cranfield's School of Water Sciences (SWS) was praised as an international centre of excellence by the Engineering and Physical Sciences Research Council while being announced a winner at the Gas and Water Industries National Training Organisation (GWINTO) awards ceremony.

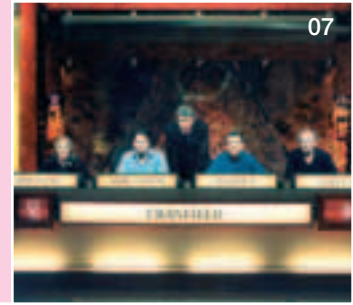
SWS was commended in the training provider category for its postgraduate programme which was developed, designed and delivered in response to the national shortage of postgraduate level engineers and process-literate scientists.

It is the first time GWINTO has offered awards to recognise and promote excellence in training within the water industry and Tim Balcon, Chief Executive, said: "It is gratifying to have received so many high-quality entries. I am heartened that the business benefits of training are being so widely recognised already."

(Image 04)



05



07



06

Fun as well as hard work

Learning should be fun as well as hard work, and a recent survey of students rated the MSc in Water Management as the most enjoyable course at Cranfield in 2003.

Not only was it fun, but the students were highly complimentary about the standard of teaching and supportiveness of the staff. The Water Management MSc goes from strength to strength, with more than 50 students again this year – making a total of almost 200 students from 24 countries since 2000 – with alumni who go on to a wide range of careers related to water for people, water for food and water for the environment.

Outstanding students in Africa

Dr Kerstin Danert joined Cranfield as a student in Water Management and then stayed on to work on a project in Uganda. Having obtained her PhD, she continued with post-doctoral research on the effectiveness of the Ugandan private sector in rural water and sanitation. Operating as an independent researcher and consultant, she has already contributed to the annual Joint Donor Review of the water sector, and to Uganda's Poverty Eradication Action Plan. She also worked with Professor Richard Carter on the sustainability of rural water supply systems. (Image 06)

Thanks to George Bagamuhunda, a 1999 graduate of the Community Water Supply MSc, the Kigezi Diocese Water and Sanitation Programme is now internationally recognised as one of the best in Uganda. (Image 05)

Prior to George's appointment, the leadership of this programme had been in the capable hands of a series of Cranfield graduates – Graham Piper, Tim Fowler, and James Webster – all of whom continued to contribute internationally to poverty alleviation and sustainable management of water resources.

Amsalu Negussie, an alumnus in Soil and Water Engineering, was, until recently, Country Director of Water Aid in Uganda and has made major contributions to the alleviation of poverty in his own country of Ethiopia, in Uganda, and beyond. This year he took up a senior position with Plan International, and is now based in Johannesburg.

So near and yet so far

Cranfield University narrowly failed in its bid for University Challenge glory, going down to Birkbeck College 155-180 in the final, following the thrills of the quarter-final victory over Durham and the semi-finals when Cranfield beat Leeds.

The Cranfield team – Joe Marden (Captain), Simon Arbutnot, Susan Brennan and John Corley, fought to the very end. As presenter Jeremy Paxman commented: "So near, yet so far..." (Image 07)

Research into action



Cranfield's reputation both for the outstanding quality of its research and for the relevance of that research is demonstrated by the many links it has with companies and institutions around the world.



Research at Cranfield University combines concern for academic rigour with a goal of practical application. This, in turn, provides the knowledge and relevance to underpin our teaching programmes. Consequently Cranfield enables individuals, businesses and society to reap a rapid, tangible benefit.

Quality is achieved because Cranfield operates in specific niche areas and recruits staff with practical experience who are fully conversant with both their academic discipline and the relevant sector they serve. Our very high levels of repeat business demonstrate the quality of our research in what is now a global research market. Developments in 2003 ensured that we transferred our knowledge into action, leading to growth and prosperity, a better quality of life and valuable experiences for all.

Cranfield Institute for Safety, Risk and Reliability (CISRR)

One of the ways Cranfield capitalises on the depth within its niche areas is to draw together research excellence into active networks of collaboration. A new institute was founded in 2003 to provide focus for trans-disciplinary and multi-sector approaches to our safety research, consultancy and teaching.

Offering organisations, academics and individuals access to our wide range of safety, risk and reliability expertise, CISRR is a 'virtual' organisation working with all major safety-critical sectors such as aviation, automotive, rail and health.

Risk assessment in the water industry

A US \$438,000 research grant from the American Water Works Association Research Foundation (AwwaRF), has enabled Cranfield researchers, together with the University of Alberta and a number of water companies from the UK, US, Canada and Australia, to address how risk analysis can improve decision-making in the water sector.

The contract brings together our considerable skills in environmental risk assessment and water and waste water processing.

Antibiotic resistance

Cranfield reinforced its position within the health and global welfare sector, and our research has resulted in a new level of understanding of the relationship between antibiotics and the environment.

With four other European institutions, this area was investigated through a project entitled '*Environmental Risk Assessment of Veterinary Medicines in Slurry*' (ERAVMIS), supported by the European Union's fifth Framework Programme. It identified factors which influence the behaviour and effects of veterinary medicines in the environment and results are being used to assist regulators and industry across Europe.

Project co-ordinator Alistair Boxall said: "When the ERAVMIS project started, very limited information was available. But we now have a better understanding of how antibiotics behave in soils, their potential to be transported to ground and surface water, and their impacts on the water environment." (Image 08)

Tuberculosis research

A World Health Organisation award was used to fund a one-year project directed at detection of tuberculosis, part of an on-going multidisciplinary programme of work at Cranfield investigating the utility of electronic-nose technology in healthcare.

DEFRA funding

Funding from the Mineral Industry Sustainable Technology (MIST) programme of the Department for Environment, Food and Rural Affairs (DEFRA) is being used to investigate the feasibility of introducing innovative restoration techniques in quarries using energy crops.

Cranfield will be working in partnership with the Minerals Industry Research Organisation (MIRO), Tarmac, Hanson, RMC and English Nature to develop ways of enhancing the socio-economic and environmental benefits of restoration and secure a sustainable restoration outcome.

Pesticides in the city

Cranfield has devised a model to make sure weed killers used on roads and railways do not harm the environment.

Sponsored by the Pesticide Safety Directorate of DEFRA, the model assesses the fate of pesticides in the urban environment.

John Hollis, a Principal Research Scientist, said: "This is an excellent example of how fundamental research can be applied to benefit society and the bio-diversity of our urban landscapes. It shows what can be achieved when Government, industry and researchers work in close collaboration."



08



10



09



No more tears

The days of tearful cooking may soon be over, thanks to Cranfield researchers Dr Leon Terry, Dr Steve White and Professor Phil Warner.

The trio began researching and developing a method of producing a 'no-more-tears' formula for onions, following an award made by DEFRA as part of its HortLINK scheme.

The three-year project focuses on the development of biosensors for improved quality control of onions. The end result will mean shoppers can be confident that, each time they purchase a British onion, the product will have the same strength, taste and consistency as the last time. **(Image 09)**

Soil conservation

Soil conservation at Cranfield has a long and distinguished history and staff have been working on exciting developments in the field. This has included collaboration with a multinational team led by Syngenta to investigate the feasibility of soil and water protection measures in northern and central Europe (SOWAP).

SOWAP aims to assess the viability of conservation-oriented agriculture and to demonstrate how EC environmental policy might be implemented, updated and developed in the future. **(Image 10)**

Analysing low-cost airlines

A new market analysis of low-cost airlines produced by Cranfield describes the evolution of the European charter and no-frills market since the first study in 2000. It highlights major trends and provides a detailed profile of each airline while predicting likely future developments.

Collaborative aircraft design

Cranfield is to play a significant role in a £70m European consortium led by Airbus and including more than 50 partners, all recognised names in the aerospace and IT industries.

The main result of Valued Improvement through a Virtual Aeronautical Collaborative Enterprise (VIVACE) will be an aeronautical collaborative design environment and associated processes, models and methods to design an aircraft and its engines.

BAE strategic partnership

BAE SYSTEMS and EPSRC collaborated to fund a £6m Cranfield research programme in aeronautical engineering.

Under the umbrella of the BAE SYSTEMS Strategic Capability Partnership Agreement, Cranfield will be co-ordinating 12 other universities and applying its knowledge and expertise in three areas; integration and demonstration, aerodynamics and manufacturing. The programme sets out to satisfy two 'grand challenges': developing an unmanned combat air vehicle and running a complex research programme between academia and industry.

Professor Peter Deasley, Director, BAE SYSTEMS Strategic Capability Partnership, said: "This is a significant development for Cranfield which acknowledges Cranfield's broad skills in aeronautical engineering and its ability to work with major companies in strategic long-term projects."

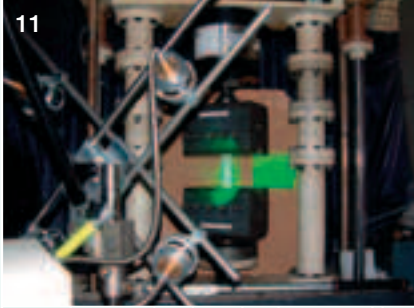
Sustainable training model

Working alongside the Ministry of Defence, Dr Thomas Mayr has been developing a sustainable training model management tool to assist in the planning and execution of future army training requirements at the Army Training Estate on Salisbury Plain.

Used for dry training and live firing, the plain's importance as a dry training area is paramount. Research includes developing models that rely on real-time soil moisture information, which is being provided through a network of soil moisture probes.

Thermal conductivity challenge

Thermal Barrier Coatings (TBCs) are applied to aero-gas turbine blades to enable increased engine operating temperatures. Research at Cranfield, under Rolls-Royce sponsorship, has developed new low thermal conductivity TBC systems. This research within the High Temperature Surface Engineering group, under direction of Professor John Nicholls has developed novel thermal barrier coating materials and microstructures offering half the thermal conductivity of current commercial materials. These new coatings can be used to increase engine operating temperatures by over 200°C, providing increased engine power and more efficient performance, resulting in a



Detecting strains

A laser and fibre optic instrumentation developed by the Optical Sensors Group was used in a project sponsored by EPSRC, Augusta Westland Helicopters and the Civil Aviation Authority.

The project seeks to develop a non-contact optical technique, called optical shearography, to detect strains, displacements and cracks in components in service on aircraft.

It aims to take this technique and measure its performance in detecting and sizing cracks in helicopters. Trials have already taken place under controlled laboratory conditions at Cranfield, where a titanium alloy test sample was used. The equipment will be taken to Westland Helicopters for trials in the company's testing laboratory. **(Image 11)**

Welded wings and pipelines

While extending our activities in the health sector and building on the establishment of our postgraduate medical school, we have also built on our original foundation – aeronautics.



The use of welding as an alternative to riveting in aircraft construction has been investigated as part of a project in collaboration with Airbus and British Aluminium. The ground-breaking EPSRC-funded project, known as WELDES, is explained by Professor Phil Irving who is leading the research:

“Welding is an attractive option; it reduces costs by removing labour-intensive hole drilling, and removes the holes which act as stress concentrators and reduce fatigue strength. But only recently has it become possible to weld the high-strength aluminium alloys used for aircraft.”

(Image 12)

Significant award

The Welding Engineering Research Centre was delighted to be a joint recipient of a prestigious Pipeline Industries Guild (PIG) award – ‘The 2003 award for a significant contribution to land-based pipeline technology’.

Presented at the PIG annual dinner, it was received by Mark Hudson, who completed research into girth welding of X100 linepipe as part of his PhD studies.

Director Steve Blackman said: “Given Cranfield’s philosophy of working closely with industry and providing strategic research to match industrial needs, this award from a professional society with strong industrial links is particularly important to us.” **(Image 13)**



A new sphere

Cranfield University signed a collaborative agreement with Cambridge-based Sphere Medical Ltd to exploit our extensive molecularly imprinted polymer (MIP) patent portfolio in the field of clinical diagnostics.

MIPs are an emerging class of receptors which mimic the selective properties of biomolecules like antibodies and enzymes. Made from plastic, however, they avoid many of the shortcomings associated with the use of biomolecules in diagnostics. The ability to tailor the properties of MIPs to the exact requirements of any particular system means that sensors which were previously impossible or impractical to produce will become a commercial reality.

Cranfield alumnus Dr Stuart Hendry, CEO of Sphere Medical, said: “We are delighted to have signed this deal with a world-leading institution such as Cranfield.”

Staying fresher for longer

Cranfield’s campus for life sciences at Silsoe is the location for research into the Australian geraldton waxflower – a popular filler in floral bouquets – which is prone to infection and disease that causes the flowers to fall. Improved understanding of how this flower defends itself from fungal attack will extend the vase-life of the waxflower.

The work has been made possible by a prestigious Anglo-Australian Postdoctoral Fellowship from the Royal Academy of Engineering and will assist in strengthening collaboration between the UK and Australia. **(Image 14)**



15



Management research

Cranfield's management research agenda is strongly influenced by the challenges facing managers and organisations and a number of key developments have been achieved by working closely with practitioners.

Notable is research unveiled by Secretary of State for Trade and Industry Patricia Hewitt demonstrating that women are gaining a fairer share of voice in the boardrooms of FTSE 100 companies.

A new report, *Creating Resilient Supply Chains*, commissioned by the Department of Transport, shows that companies are at greater risk to massive disruption than ever before. Single sourcing, outsourcing, just-in-time delivery and a raft of cost saving measures have injected a high dose of risk into supply chains. These industry trends, together with external threats such as terrorist attacks, labour disputes and the potential for natural disasters demonstrate how vulnerable companies are to disruptions which can lead to a substantial loss.

The largest Economic and Social Research Council programme yet, NEXUS, studying complexity across eight projects and five UK universities, is being led by Cranfield. Research is focused upon developing and applying complexity science to understand and improve the sustainability of socio-economic systems. Complexity science is a revolutionary way of thinking which leads participants, whether they be businesses, economies, or cities, to take a radical approach to future development, encouraging experimentation as a way to change, regenerate and develop.

Spin-out success

Two spin-out companies have been formed this year. The first, Decision Engineering Solutions Ltd, championed by Dr Rajkumar Roy, is commercialising software tools based on the university's intellectual property, aimed at improving the effectiveness of cost estimating in manufacturing companies. The first product, DECIDE-Cost, is currently being implemented in two engineering businesses in Birmingham and Luton.

The second, Water Innovate Ltd, has emerged under the leadership of Professor Tom Stephenson to commercialise intellectual property focusing on new products and processes to enhance waste water treatment in the water sector and in industrial processes. The portfolio of products currently numbers six, including a radical approach to dynamically forecasting odours emitted from sewage works.

Centres of excellence

A new **Centre for Ecological Restoration**, which will provide trans-disciplinary expertise, research and teaching in the area of land reclamation and restoration, has opened at Silsoe. Close industrial links are being established with organisations such as the Minerals Industry Research Organisation.

The Performance Measurement Association was established by the **Centre for Business Performance**, one of the world's leading research centres specialising in performance measurement in management.

Cranfield's Safety and Investigation

Centre in Air Transport is fully operational thanks to the appointment of Dr Graham Braithwaite as Senior Lecturer and Director. Graham, whose role includes overseeing the centre's evolution, said: "The investigation activities at Cranfield have always been the Holy Grail to me. Close collaboration with industry is a huge strength here, and was one of the biggest attractions." (Image 15)

Cranfield's **Centre for Sports Surfaces** is using funding from the England and Wales Cricket Board to launch a new research programme through the EPSRC Engineering Doctorate scheme.

Cranfield will apply its expertise in soil mechanics and soil water physics to determine the optimum conditions for cricket pitch preparation to improve cricket pitch performance and safety, from the village green up to the test arena.

International Cranfield



My time at Cranfield has been an excellent experience and a fantastic opportunity to meet international students. The strong alumni base provides great networking opportunities.

Sally Fenton
MBA



Cranfield has a long-standing international reputation, and 2003 saw the university continue to make a significant global contribution.

Through international partnerships with major industrial players, Cranfield continues to create the constantly evolving education and research opportunities that gives its graduates the best possible chance to succeed in their chosen careers.

Student profile

Students on taught courses originated from 98 countries; for example, the 146 students on the 2002-2003 MBA programme alone came from 36 countries, bringing with them a plethora of experience and cultures, while more than 180 students from nine different EU countries were undertaking a double-degree programme. This opportunity to acquire a degree both from Cranfield and from the home nation is now in its 22nd year. In November, as part of a visit to Chinese universities Tsinghua and Beihang (Beijing University of Aeronautics and Astronautics), a memorandum of understanding was signed for a new double-degree programme in manufacturing.

Cranfield's international standing in its niche sectors has seen us benefit from considerable repeat business, welcome numerous dignitaries and trade missions from around the globe, and be invited to contribute keynote addresses on a world platform. We have continued to work with numerous international businesses on research and consultancy projects, and have continued to see our research

projects, many in association with internationally known institutions, flourish across each continent.

We have also added further resource to our centre at Kitakyushu in Japan; Professor Jeremy Ramsden was appointed Director of Research and two full-time postdoctoral fellows started there in September to develop fibre optic-based sensors for biomedical applications.

Our alumni, an enviable network of men and women united by a Cranfield qualification, can be found from Abu Dhabi to Zimbabwe, and the year saw former students from 187 countries continue the relationship through our alumni activities.

Collaborations

Many new collaboration agreements were signed with prestigious institutions in countries including France, China, Malaysia and Argentina.

The long association between Cranfield and Tian Jin, one of China's top universities, resulted in the signing of a memorandum of understanding by Professor Ping Shan, its President and a former Cranfield researcher, and Professor Frank Hartley. **(Image 16)**

State-owned enterprises and ministries in China have benefited greatly from the expertise of Cranfield School of Management, due to the agreement between Cranfield, the UK Department of Trade and Industry, and the Chinese State Economic and Trade Commission.

High-potential Chinese managers from the public sector were able to take up places on the full-time MBA programme through a

scholarship scheme and, in addition to the annual three-week programme for Chinese senior managers, the university jointly organised a top-level seminar on supply chain management in Beijing with the Britain China Business Council.

Taking expertise home

Michael Assefa Dadi, the first Cranfield student to benefit from the Marshall Papworth Fund, received a certificate from the Duke of Gloucester.

Set up with a bequest from successful East Anglian farmer the late Marshall Papworth, the fund is targeted at students from outside Europe who wish to study for a year in the UK and then return to their countries to make a positive contribution. **(Image 17)**

Cutting coffee production costs

Unlike the tea industry, which is dominated by large estates, the Tanzanian coffee industry is based on production by thousands of smallholders who are reliant upon organisations such as the Tanzania Coffee Research Institute (TaCRI) to provide the latest technical advice.

With assistance from Cranfield's International Centre for Plantation Studies, TaCRI, once a moribund, inward-looking research organisation, embarked on a mission to transform itself to a customer-focused and demand-responsive one. Our team, led by Emeritus Professor Mike Carr and including Professor William Stephens and alumnus Professor Nuhu Hatibu, won and delivered on an EU contract to undertake stakeholder analysis and work with TaCRI to develop a Strategic Action Plan. **(Image 18)**



Rural water and sanitation

Following successful work in Uganda on private sector participation in low-cost well drilling, Professor Richard Carter won further Department for International Development (DFID) funding to take the work a stage further. He is now developing a working strategy to support the private sector operating in this field. The plan will incorporate an in-depth analysis of the private sector, paying particular attention to its operating environment and the support services available to it. **(Image 19)**

Dr Richard Franceys, Senior Lecturer in Water & Sanitation Management, won two DFID research projects to work on public private partnerships for the disadvantaged. He presented keynote papers at the first global water benchmarking conference in Perth, Australia and at the Asian Development Bank's workshop on the policies and regulation in urban water supply in Manila.

In Hyderabad, India, he led the session on international models of reform in the urban water sector for the 'Strengthening Urban Management' programme of the World Bank.

Earlier in the year, both represented Cranfield at the Third World Water Forum in Kyoto, where the university, in partnership with the Asian Development Bank, led one of the sessions, entitled 'Public Private Partnerships for the Poor'.

Sensors for diabetics

Cranfield is participating in the development of California-based Pelikan Technologies Inc, which has been set up to exploit novel integrated glucose sensors for use by people with diabetes. It displayed its first product at the American Diabetes Association meeting in New Orleans.

Other highlights

- The university hosted the first international conference on soil erosion and sediment redistribution, at which connectivity and communication was the guiding theme. The key challenge was bringing together scientists, practitioners, researchers and policy-makers to break down the language barriers that usually develop within disciplines and across nationalities. Delegates came from more than 16 countries including Canada, South Africa, Australia, the US and Russia, and spanned a range of disciplines, from soil science through to ecology and mathematical modelling
- In August, Cranfield ran an International Business Programme for 30 top Johnson and Johnson executives from Brazil, with Cranfield School of Management and Fundação Getulio Vargas running joint short courses in Sao Paulo
- Visits were made to a number of US business schools in September and Darden Graduate Business School in Virginia was selected as a partner. The key areas for co-operation are customised programmes, contributions to the modular Executive MBA, and exchange opportunities on the full-time MBA programme

- One of the highlights of the Executive MBA is the week-long study tour to either Japan, China, North America, Brazil or South Africa, and trips this year included one to Japan
- Professor Dick Godwin gave the keynote address to 250 members of the International Soil Tillage Research Organization in Australia on the fundamental work undertaken by Cranfield to improve the design of a wide range of tillage tools
- In October, Cranfield welcomed a delegation from partner university Chung Hua in Taiwan. The group was led by university founder Wang Rong-Chang
- A range of short courses for the Brazilian aircraft company Embraer led to extended group design projects involving weekly video conferencing sessions from Cranfield. Some 400 Brazilian engineers participated
- Professor Joe Morris visited Brazilian alumni to learn how techniques developed in the sectors of agriculture, natural resource and environment are finding a direct application
- The university ran the World Congress on Biosensors in Kyoto.

Underpinned by people



We can be a stronger, more dynamic and effective institution if we celebrate our differences...



Valuing people

Cranfield provides an environment where individuals can flourish. Whether staff, students or alumni, everyone is encouraged to develop a unique contribution for the benefit of students, clients, the organisation and themselves. Our expertise and diversity work together to foster a flexible, responsive approach, and our new appointments during 2003 underpinned this aim.

We further strengthened our commitment to developing and managing talent across the university.

In the autumn all staff were invited to participate in a comprehensive diversity and inclusion study to explore views on what it is like to work for Cranfield and to examine issues of gender, colour, race, age, sexual orientation, creed and disability.

The study is part of our diversity awareness programme. This, in turn, is part of an overall strategy, 'Valuing People', which has seen all staff recruitment advertisements carrying the strapline 'Valuing Diversity'. Each member of the senior management team made a personal commitment to continue to foster a culture at Cranfield where differences are welcomed and encouraged for the overall benefit of the organisation.

"We have learnt from other organisations that we can be a stronger, more dynamic and effective institution if we celebrate our differences and use them to maximum effect," said Deputy Vice-Chancellor Professor Clifford Friend. "With the recent appointment of a Diversity Manager, we are in a good position to take the diversity study's recommendations forward."

Promotions and appointments

Professor Clifford Friend was appointed to the role of Deputy Vice-Chancellor, succeeding Professor Ron Fletcher who retired after more than 30 years' service.

A graduate of the University of Surrey and a materials engineer by formal training, Clifford has held academic posts with Cranfield University since 1984, latterly as Head of Cranfield Postgraduate Medical School. His expertise is frequently called upon to assist commercial clients, professional institutions around the world and UK government agencies, ranging from DTI and EPSRC to MOD, and he has also written for broadsheet newspapers and magazines including New Scientist and The Financial Times.

At a reception to mark Ron's retirement, the Vice-Chancellor thanked him for his enormous contribution, remembering how Ron had joined Cranfield to help create a new postgraduate university – something new to the UK which many doubted was possible.

"Ron was at the forefront of the leaders who showed how universities could work with industry AND retain control of their own agenda," he said. "In every role Ron's impact on the academic work and reputation of the university has been enormous." **(Image 20-centre)**

Other internal promotions during the year included:

- Simon Judd, promoted to the Chair of Membrane Technology. He has conducted research into a wide range of membrane processes as applied to water and waste water treatment
- Rade Vignjevic, named Professor in Structural Mechanics
- Kevin Garry, appointed Professor in Experimental Aerodynamics.

Developing engineering

As part of its continuing development, the School of Engineering carried out a wide-ranging review of its mission and future direction. A resolution to strengthen and expand its research base and external reputation necessitated an injection of further talented staff. An action plan was, therefore, put in place and a major international search for talent begun.

This resulted in the appointment of a range of highly talented academic staff whose expertise and experience were carefully selected to dovetail into an effective and innovative research and technological capability.



Included were:

- Dr Graham Braithwaite, a Senior Lecturer and Director of the Safety and Accident Investigation Centre who has worked extensively in safety and human factors matters for aviation and rail organisations. Graham holds a PhD in Aviation Safety Management and his main research interests are in system safety, accident investigation, human factors and the influence of culture on safety
- Phill Stocking, who has 27 years' industrial experience and a Cranfield MSc in Aircraft Design. He joined the university in 1984 as a Senior Stress Engineer and is now Course Director for the MSc in Aerospace Vehicle Design. His main areas of interest are detail structural design, detail stress analysis, airworthiness and certification, aerospace materials and electronic learning
- Professor Dimitris Drikakis, who took up the Chair in Fluid Mechanics and Computational Science. His research interests include computational modelling and simulation in aerodynamics and gas dynamics; flow control; turbulent flows; shock waves; incompressible and low-Mach number flows; micro-flows; (computational) nano-science and transport processes in medicine and biology
- Professor Mark Savill, the new Chair of Computational Aerodynamics Design, who has taken on the role of promoting interdisciplinary linkages in the fields of aerodynamics, CfD and design within the context of the Cambridge-Cranfield High Performance Computing Facility and related eSCIENCE/GRID activities
- Dr David MacManus, who was appointed lecturer in the Department of Aerospace Sciences. A graduate of the National University of Ireland, he worked on most aspects of turbine aerodynamics at Rolls-Royce Derby. The focus of his work here is predominately external aerodynamics, and he maintains a keen interest in the exciting field of turbomachinery.

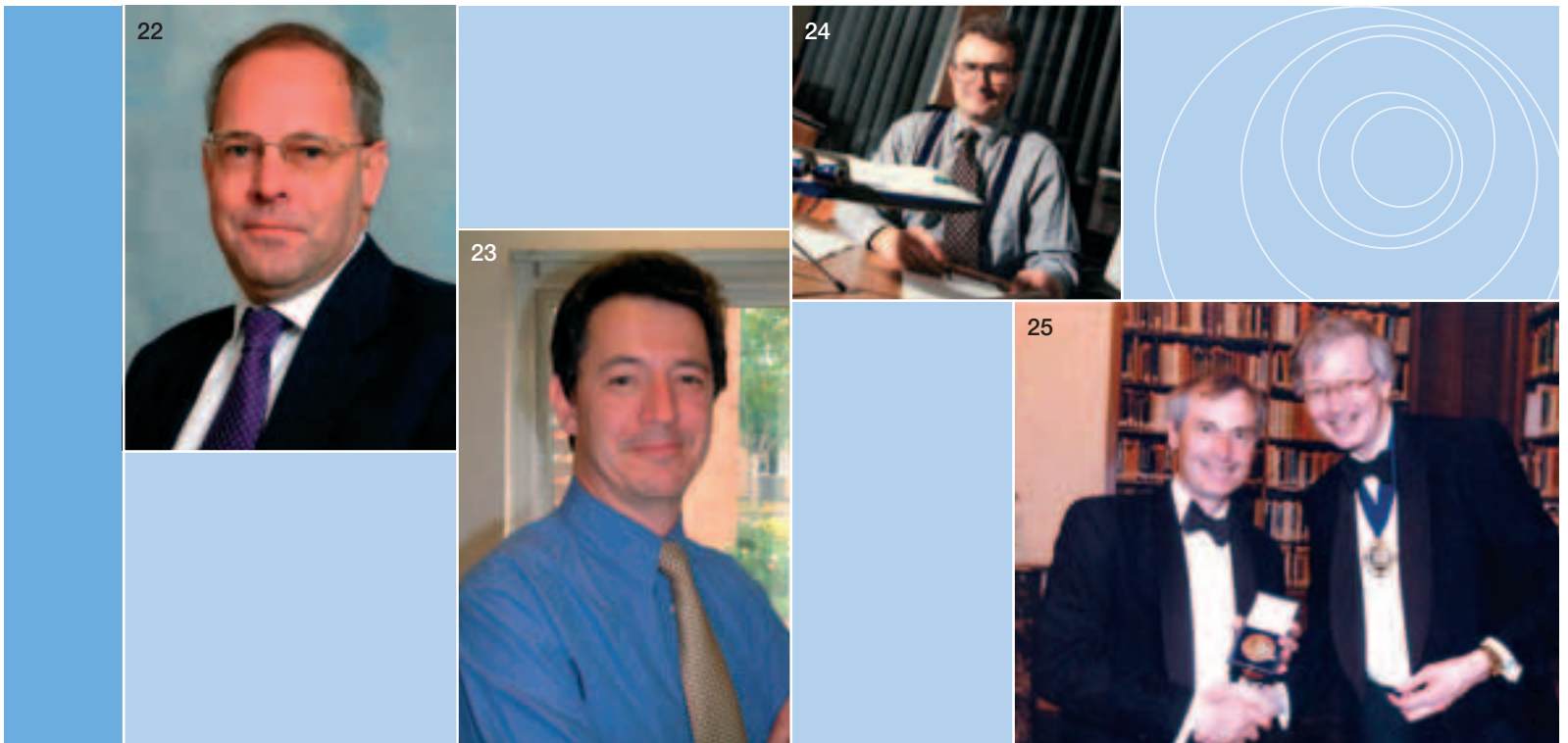
Talented newcomers

Professor Michael Osbaldeston took the helm of Cranfield School of Management in January, joining from Shell International where he was Head of Global Learning with particular responsibility for business school partnerships. Prior to that, Michael was CEO of Ashridge Management College, giving him the balanced business and academic background entirely consistent with the distinctive mission of Cranfield. **(Image 21-right)**

The university also said a fond farewell in May to Professor Leo Murray who had been the school's director since 1986 – the longest serving dean of any European business school. **(Image 21-left)**

During the year we were pleased to welcome to the academic staff:

- Professor Brian Collins as Professor of Information Systems; a man who, in his own words, "has been lucky enough to be in unique roles at exciting times." Brian has enjoyed a varied and high-profile career, including roles as Deputy Director of the Royal Signals and Radar Establishment when the first Star Wars programme was conceived in 1987, Technical Director at GCHQ in Cheltenham when the Soviet Block collapsed and IT Director for the Wellcome Trust when the Human Genome Project started
- Dr Andrew Gill, who was appointed as lecturer in Aquatic Ecology, has worked on a wide range of projects including the environmental impact of offshore wind farms on elasmobranchs – or sharks and rays to the cognoscenti. He has already won a prestigious British Ecological Society new investigator's award to study this subject and has also been advising the DEFRA
- Dr Matt Cook, lecturer in Planning and Environmental Management joined from Bedford Borough Council where he was principal economic development officer



- Professor Guy Kirk who joined us as Head of Soil Systems. The former visiting academic at Cambridge University and head of the soil and water division at the International Rice Research Institute now leads a group of more than 20 staff. He is taking forward research on spatial and temporal soil processes and soil chemistry
- Professor David Parker, who joined Cranfield from Aston University as Chair in Business Economics and Strategy, and brings an array of skills such as international-level research in privatisation, competition and regulation issues. He holds a number of external posts and is a member of the UK Competition Commission **(Image 22)**
- Dr Ruben Sakrabani who joined as a lecturer in soil chemistry from Bradford University where his PhD work was on sediment processes in sewers. He was formerly at Abertay University and Leeds University, where he held a Chevening scholarship
- David Simmons as European Development Director, who intends to increase numbers of management students from continental Europe and to ensure that we are always seen as 'premier league' when our potential customers are making course choices **(Image 23)**
- Richard Smith, a new lecturer who has spent the past 12 years working in the waste sector in a variety of technical, regulatory and policy-related roles.

Richard intends to raise the profile of waste management issues both internally and externally while also contributing towards the development and success of Cranfield's Integrated Waste Management Centre

- Alumnus Robert Wright, a Cranfield MBA, who returned to Cranfield as 'Entrepreneur' in Residence' after selling, for £75m, a company he bought for just £1. **(Image 24)**
- Key support staff appointed were:
- Ruth Altman, who joined Cranfield as Interim Human Resources Director. She and her team have been busy establishing a function that supports and helps the development of both academic and non-academic staff
 - Kevin Papworth, the first Disability and Learning Support Officer ever to be appointed by Cranfield. This important role requires Kevin to work alongside learning support officers from each school, and the Disability and Learning Working Group. The aim is to enhance provision for disabled students and to develop a consistent approach to disability support across the entire university **(Image 26)**
 - Ferhat Nazir-Bhatti, Diversity Manager, whose brief is to raise the profile of diversity within the university. Her key tasks are to promote and implement the diversity strategy, develop policies and procedures for staff, give advice on best practice and legislation, and develop links with the local community.

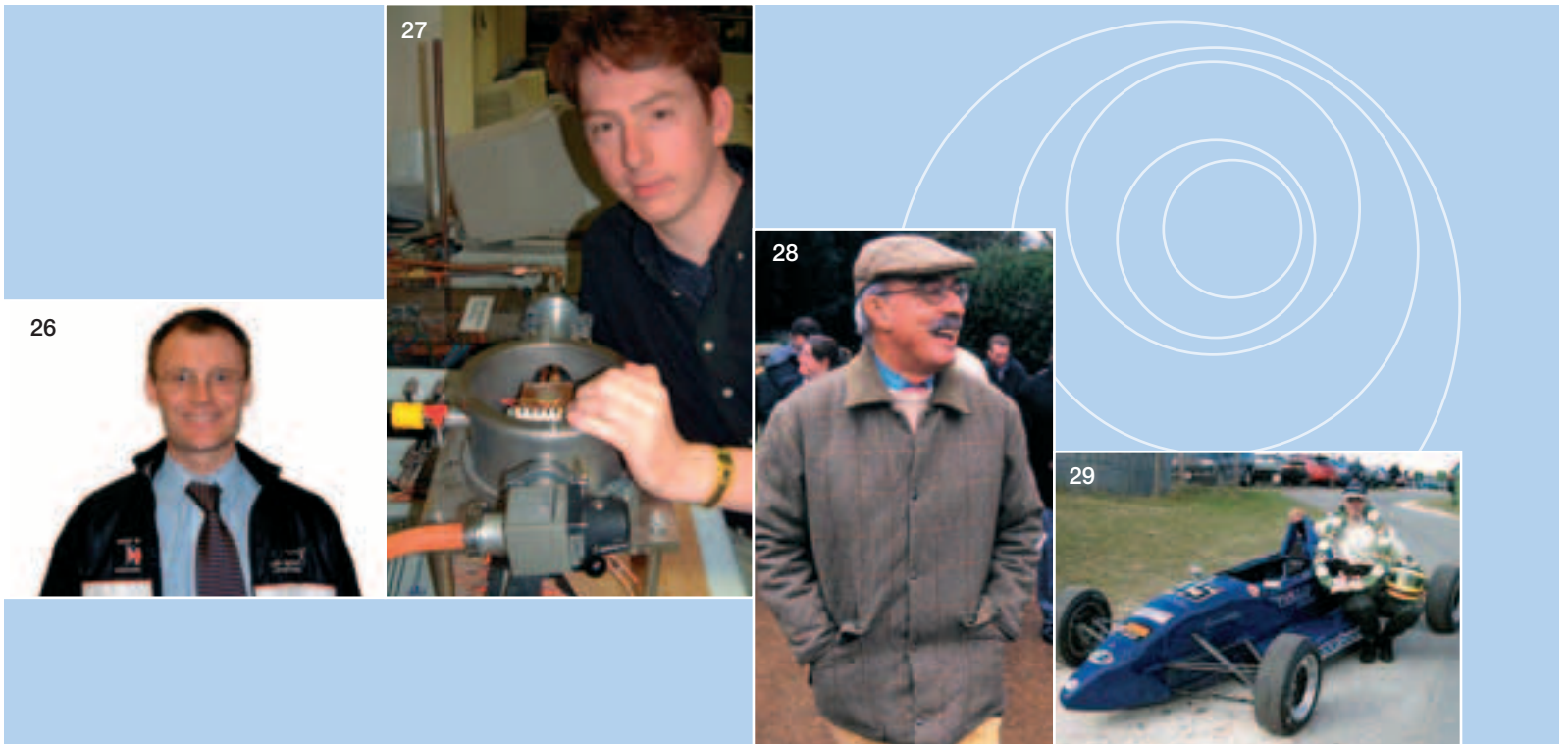
Excellence in their spheres

In addition to promotions, many Cranfield staff excelled in their areas and were commended for their achievements during the year.

For example Professor Roger Whatmore, Head of Nanotechnology, was awarded the Griffith Medal and Prize by the Institute of Materials, Minerals and Mining for his distinguished work on the applications of ferroelectric materials over the last 25 years. Roger also became a member of the Royal Society and the Royal Academy of Engineering's working group on nanotechnology. **(Image 25)**

Dr Robert Dorey, also of the Nanotechnology Group, was awarded one of the highly prestigious Royal Academy of Engineering/ EPSRC Research Fellowships. This will allow him to pursue research into the combined use of low temperature ceramic processing and micro-scale freeform fabrication for the production of new micro electromechanical systems, anticipated to be an area of significant technological growth in the near future. **(Image 27)**

Professor Andy Neely from the Centre for Business Performance was appointed Associate Director of the Advanced Institute for Management (AIM).



Professor John Bessant was awarded a Fellowship with the AIM and established the Innovation Leadership Centre.

Dr David Tighe-Ford, Director of the Warship Cathodic Protection Unit, was elected a Fellow of the Institute of Marine Engineering, Science and Technology, as well as being granted both Chartered Engineer and Chartered Marine Scientist status. This followed a Professional Review Interview at the institute.

Following the completion of the major Home Grown Cereals Authority-funded programme on improved management systems for cereal crops using 'Precision Farming' methods, Professor Dick Godwin was invited as a Visiting Fellow as part of the Enhancing Science Network Programme from the Chief Scientists' Office of the Department of Primary Industry of Victoria in Australia.

While there, he also gave a keynote address to 250 members of the International Soil Tillage Research Organisation on the fundamental work undertaken by Cranfield University to improve the design of a wide range of tillage tools.

Star of the small screen

Professor Richard Holmes, Co-Director and Professor of Military and Security Studies, again graced the UK television screens in his mini-series, *'Rebels and Redcoats: The American Revolutionary War'*.

Richard, who is famed for his previous series, *War Walks* and *On the Western Front*, was prompted to make the series because: "I was sick of the way that war has been distorted to fit in with the American popular mythology of 'patriots versus thugs and nincompoops'."

When free of his Cranfield teaching duties, Richard is kept busy making TV programmes, researching and writing the accompanying books, and answering the stacks of correspondence generated by the programmes. **(Image 28)**

Stars of the track

Motorsport Engineering and Management MSc student Ashley Edwards achieved great things on the race track during the year. Driving the Cranfield-backed Van Diemen RF00, Ashley not only captured the 750 Club Formula 4 and Formula Ford Championships, but established fastest laps at a number of UK race circuits and holds the outright lap record for his class at Cadwell Park. He expects to secure a position as a race engineer in Formula 3. **(Image 29)**

While Ashley was shining in modern motorsport, Cranfield staff member Clive Temple continues to uphold Cranfield's honour in historic motorsport. Season highlights included 2nd, 3rd and 5th places in Aston Martin Owners' Club events and a class win across the Channel at a French hill climb for historic sports and racing cars.

Major donation provides chair

A major donation to establish a chair in Entrepreneurship at Cranfield School of Management was made by 1969 alumnus Tim Bettany, who made his career in investment management and was a founder of Ashburton (Jersey) Ltd.

This will provide substantial and long-term funding to support a professor of high international standing who will build on the school's reputation for excellence in the field of entrepreneurship. Adding to existing facilities, it will further enhance the reputation of the university as a leader among its UK, European and international peers.

Tragically, shortly after the formal announcement of the donation, the university received the news that Tim, who had been ill for some time, had died.

Professor Michael Osbaldeston, Director of Cranfield School of Management, said: "This is a very sad end to an active life and I am very sorry that Tim will not be here to help us in the search and appointment of this new professor. I hope, however, that The Tim Bettany Chair in Entrepreneurship will provide a lasting memorial to a true friend and supporter of Cranfield School of Management."

Community partnerships



Young people living close to any of the university's campuses will have the opportunity to learn about the excitement of science, thanks to Cranfield.



We have a clear responsibility to our local regions in the East and South East of England where it is vital we support economic prosperity and foster a sense of community pride in our achievements. Our world-wide activities and reputation help in this.

We demonstrate our contribution through staff recruitment and local skills development, sound business ethics and environmental awareness. In particular, Cranfield has provided support for the manufacturing industry and new enterprises, while students, staff and alumni alike consistently help the voluntary sector.

During a productive year, the university helped its schools both to profit from their research and to strengthen their links with business and the region.

Notable among the successes were:

- forging stronger links with Cranfield Technology Park
- securing funding for a new incubator centre
- increasing the number of Knowledge Transfer Partnerships
- acting as agents for the Shell Technology Enterprise Programme (STEP)
- acting as East of England agents for industrial CASE awards
- concluding several technology licence agreements
- launching the Enterprise Fellowship Scheme with i10
- initiating a Regional Business Club
- the Oxford2Cambridge Arc
- encouraging the Central Innovation Network

- developing the Milton Keynes Enterprise Hub
- fostering European and national research activity and funding
- instigating a Web Portal for Business
- implementing the Investment Readiness Development Programme for business start ups.

Five days of science

Local young people had the opportunity to learn about the excitement of science when, armed with a bag of magical tricks and mind-boggling puzzles, TV presenter Johnny Ball helped bring science and technology to life for 3,000 schoolchildren during National Science Week.

In conjunction with SetNet, a national organisation which promotes the sciences to young people, the event has led to Cranfield becoming an influential partner. During the year every pupil from the local village schools had a chance to visit the Cranfield campus. **(Image 30)**

Corporate social responsibility

Cranfield is also helping others to set corporate social responsibility (CSR) objectives.

Academics spearheaded research into its evaluation, while the concept was diffused into the university's management programmes.

With pan-European organisation CSR Europe, we focused on the influence of business on communities and society, and how profitability can be achieved in a sustainable way. This led to the development of the Academy of Business in Society, while Professor

Simon Knox produced a report, 'CSR at the Crossroads', a practical framework for evaluating the effectiveness of CSR policies.

Voluntary sector scholarships

With The Cranfield Trust, the university launched a scholarship scheme on the Executive MBA for voluntary sector managers which will help support the drive to improve management skills in the voluntary sector.

Executive MBA graduate Claire Toombs, Finance Director of MacIntyre Care, believes the scheme offers voluntary sector managers a huge opportunity to revolutionise their working practices.

"Voluntary organisations are now often competing against and working with the commercial sector as service providers, and we need to be more efficient to function effectively," she said.

I spy with my little fly

Reaching out to a wider community audience, Cranfield opened a major exhibit featuring its micro air vehicle (MAV) at the 'Thinktank', Birmingham's museum of science and discovery.

"It's the kind of gadget you would expect James Bond to have – a unique, tiny flying machine, small enough to fit in the palm of your hand and as light as a hummingbird – that can fly, hover and navigate itself," said Professor Clifford Friend.

"MAVs could aid the emergency services, assist industrial inspection in dangerous environments and could even be applied to the movie industry, providing some memorable shots."



A complementary interactive 3D navigation game shows visitors its capabilities by letting them fly a computer-generated MAV around a smoke-filled building, searching for trapped people. **(Image 31)**

Computer and library services

Cranfield's computer centre and library have been working with Bedfordshire and Milton Keynes libraries to provide training sessions to help library staff gain the European Computer Driving Licence (ECDL).

An internationally recognised computer qualification, this allows people to gain the necessary knowledge and skills to use the most common computer business applications and is set to become the Europe-wide standard.

In addition to supporting military research and study, the Shrivvenham campus library now has another role – housing local historical archives.

Called the 'Shrivvenham and District Archives Group', this was formed from the collaboration of the RMCS Heritage Centre – organised by Rachel Daniels of RMCS Library – and the local Shrivvenham History Group.

At the heart of the local communities

Cranfield's long-running annual 'business game' competition for local sixth form pupils in Milton Keynes and Bedfordshire attracted a record entry.

Schools in Milton Keynes competed in the MK Schools Arts Business Challenge, while Bedfordshire pupils vied with each other in their own Bedfordshire Schools Challenge.

The resultant inter-county final saw Bedford Modern School emerge as overall 2003 winner.

The Cranfield University name has been regularly on show now that we sponsor two Bedfordshire netball teams, *The Nomads* and *The Swallows*. Both teams, the proud owners of Cranfield-donated track suits, did extremely well in their league. **(Image 34)**

Cranfield's support for good causes doesn't end with staff; many students have joined the university's volunteering programme to help with regional projects. For instance, MBA students have continued to run various half-marathons and fun runs, culminating in the Cranfield Centipede's outing in the London Marathon. **(Image 35)**

Shrivvenham students have been regular visitors to local schools through involvement with the Community Service Volunteers' Student Tutor Programme. Students and alumni continued to help people and organisations through SAFAD and The Cranfield Trust, while other student activities raised £15,000 for the charity, Shelter. **(Images 32, 33)**

Giving their time

Judith Fowler, Volunteer Co-ordinator at Shrivvenham, introduced a greater variety of programmes. "I would like to increase uptake among students and possibly involve family members and staff too," she said.

A volunteer herself, Judith works at Swindon Arts Centre Theatre, serving customers and collecting tickets.

Members of the university executive team, led by Professor Frank Hartley, were keen to participate as volunteers to assist local good causes, while Cranfield also sponsors sports activities such as a 5K run.

Local woodland

Thousands of trees planted at Rectory Wood on the edge of Cranfield Village will become one of the biggest woodlands in Bedfordshire.

Staff and student volunteers, took part in the two separate days of tree planting.

Sarah DaCosta, Cranfield's Volunteer Co-ordinator, said: "Over 800 trees were planted in one day, which was a tremendous achievement. Tree planting is definitely worthwhile; terrific exercise and really good fun." **(Image 36)**

In nearby St Albans thousands of new saplings were planted in a new forest development made possible in part by Cranfield's paper recycling policy.

Superb facilities



Cranfield's supportive environment and its close contact with industry creates a great place for research.

Sue Holt
PhD student



Knowing that cutting-edge research and inspirational teaching require the best possible facilities and equipment, Cranfield has developed an enviable learning and research environment. Much of our investment is matched or even underwritten by others for whom the resulting research will have a relevance, ensuring that equipment for academic purposes is state-of-the-art.

Our 2003 investments provided additions to the infrastructure which included new buildings, computer hardware, technology, classrooms and plant.

Vote of confidence

In a major vote of confidence, Cranfield was allocated £8.5m under the Government's second round of Science Research Investment Funding.

This funding will contribute towards the cost of six projects involving new-build, refurbishment, equipment and communication network facilities across the Cranfield and Silsoe campuses.

The School of Engineering is revitalising its research infrastructure and facilities through a programme of work involving a large extension and a total internal refurbishment.

The Advanced Materials department is developing a new centre dedicated to lightweight vehicles, adding new capabilities specifically for automotive research and design. The department has also been awarded funding to upgrade and extend its current nanotechnology facilities.

Cranfield Computer Centre is replacing and improving Cranfield's existing IT equipment and infrastructure across the Cranfield and Silsoe campuses.

At Silsoe the funding will be spent on a new off-road test facility, further enhancing an area of research that has successfully underpinned work at the campus for 30 years.

Also at Silsoe, the Institute of Bioscience and Technology will create a new in-vivo diagnostics laboratory equipping chemists and biomedical scientists with tools to verify entities at the heart of new diagnostics.

Flying laboratory

After more than 30 years of service, Cranfield's ageing Jetstream Mk 1 national flying laboratory is set to be replaced with a recently purchased Jetstream 31.

The new aircraft will have 18 seats, with flight data available on seat-back colour displays, driven by a fast computer mounted in the baggage area at the rear of the aircraft, and data will be collected from sensors mounted throughout. The standard PA system will provide communication for teaching so students will no longer need to wear headphones. **(Image 37)**

Work for welding centre

The Welding Research Centre moved to new premises, housing a wide range of robotic systems and high productivity tandem arc welding facilities. The official opening of the new welding laboratory was by Cranfield alumna Professor Luisa

Quintino. Of special significance was the naming of the laboratory after Professor Robert (Bob) Apps, who initiated welding activities in 1961 and ran the group for 28 years until his retirement in 1989. The following two days attracted many international experts and alumni to Cranfield for the second international conference on welding technology. **(Image 38)**

Super computing

The Cambridge-Cranfield High-Performance Computing Facility was finally complete and upgraded in July 2003, following the long and complex process of drawing up the system specification and the resultant selection of SUN-based equipment in mid-2002.

This world-class facility comprises a constellation of 10 SMP systems, with access at each site available from each institution. It provides Cranfield with the ability to attract excellent research staff and students in the areas of science and engineering requiring such facilities.

Icing tunnels

Two internally-linked icing wind tunnels were commissioned with £1.3m support from HEFCE, enabling Cranfield to carry out fundamental research on aircraft and engine icing. One tunnel has a novel vertical configuration unique to the UK and US, and has already attracted research challenges from NASA and CAA.



Rainfall, soil and more

At Silsoe, where rainfall simulators have been developed and used in experimental studies for more than 20 years, an impressive collection of different rainfall simulators including pressurised nozzle simulators and gravity-fed drop simulators has been established.

Simulating realistic rainfall intensity, drop size and drop velocity is very important in reproducing realistic natural rainfall and Cranfield's triaxial soil flume, the largest in Europe, enabled examination of the effect of slope form on sediment and phosphorus loss.

Soil scientist Dr Gavin Wood is exploring innovative ways of using an S25 3D laser scanner to model complex soil surface structure and to provide new insight on soil surface processes, including soil erosion and sediment transport.

This, in addition to the Inductively Coupled Plasma Mass Spectrometer, a useful tool in many environmental areas, extended the wide range of tools available to the Soil Diagnostics Laboratory.

Two new soil bins were also commissioned to provide the Engineering Group with the facilities to research and test equipment in submerged soil conditions.

Shield technology

Cranfield's new Imatek drop tower was used to great effect to test the efficiency of Viking shield technology – all in the name of a TV documentary about Viking weapons and armour. Taking part were Dr Ian Horsfall and Research Officer Celia Watson,

with Kim Siddorn, author of *'Viking Weapons and Warfare'*.

The team used replica axe heads, plummeting onto replica shields from the tower; force, time, velocity and displacement measurements from the impact were used to calculate their impact properties.

To complete filming, the effectiveness of different types of chainmail against spear attack was measured using a small air cannon to launch the spearhead against three different types of riveted chain mail mounted on a padded undershirt. **(Images 39, 40)**

Library services

Access to a vast range of library services was made available directly from each office and study bedroom. Activity focused strongly upon 24/7 access to an increasingly wide range of quality information resources.

New 'resource discovery' software (Metalib) now aids access by providing a single gateway to both local and remote resources, cross-searching across several resources simultaneously and providing automatic links to full text.

Under a parallel development, 'open access', Cranfield set up an institutional e-print repository containing theses, research papers and technical reports. These will be available on the Internet worldwide.

The library also plays a valuable role in supporting learning and teaching. For instance, Shrivensham's Media Services

supports the MOD in the production of distance learning course materials. University-wide, information specialists work closely with academic colleagues to embed important information resources into a range of e-learning programmes and virtual learning environments.

Learning facilities

For the second year running Cranfield Management Development Centre (CMDC) has been awarded the Meetings Industry Association Best Practice Award.

This award is the hospitality and meetings industry kitemark for venues upholding and practising high standards, and is one of six that CMDC has received, including the coveted Investor in People award. The centre is also a member of Conference Centres of Excellence, the consortium of conference and venue providers committed to raising standards across the meetings industry. **(Image 42)**

TV studio

A fully operational television studio is regularly used as part of the MBA programme to provide students with a flavour of how to handle a boardroom crisis.

Training sessions are manned by real journalists and the studio is transformed to simulate a press conference where students are quizzed while having to present key messages under pressure.

The studio also comprises an editing suite which is used for a variety of multimedia applications. **(Image 41)**

Honorary graduates & alumni



43



Former students get together

First-time alumni reunions in Los Angeles and San Francisco proved a huge success. Acquaintanceships from the 1950s were renewed and new links forged.

Both groups agreed to exchange and share information, a president emerged for the California association, and plans for future activities are under way.

Cranfield now has more than 20 active alumni groups relating both to its campuses and its courses.

Business challenge

An alumni dinner in Malaysia organised by Brigadier General Dato' Ariff was timed to coincide with a 'business challenge' run by John Handley and Karen Valverde of Cranfield Business Games.

The business simulation game puts teams in the position of starting a business to manufacture and sell a product into a competitive market. With limited capital and a fairly helpful bank manager, they must take fundamental decisions with the objective of building a profitable company.

The game was also run in Penang and Singapore.

Unusual challenge

Cranfield College of Aeronautics faced an unusual challenge – to put a design for a powered tri-plane, pre-dating the Wright brothers, to the ultimate test.

History might have shown that British pioneer Percy Sinclair Pilcher was the first to develop a manned aircraft capable of sustained powered flight. Sadly, however, Pilcher died in a tragic accident before he could demonstrate his aircraft.

A TV company challenged Cranfield to recreate the original under the scrutiny of the cameras. Alumnus Bill Brookes, who gained both an MSc and PhD at Cranfield in the 1980s and has racked up more than 20 years experience in microlite design, was chosen as a project co-ordinator and test pilot.

As the subsequent TV programme showed, after a false start and a few adjustments, the aircraft took to the skies over Cranfield Airport and made several sustained straight-line flights. **(Image 43)**

Honoured to accept a Cranfield degree

Cranfield honours its chosen ambassadors at three separate ceremonies, one on each campus. In June and July 2003 the Chancellor, The Lord Vincent of Coleshill, conferred the degree of Doctor of Science honoris causa on:

- Gordon Page, current Chairman of Cobham plc, a global company specialising in the aerospace and defence market
- Dr Timothy Walker, Director General of the Health and Safety Executive (HSE) and the first scientist and engineer to occupy this post
- Bill Alexander who has overseen, since 1994, Thames Water's growth from a regional water company serving London and the Thames Valley to one of the world's largest water companies
- Barry Baldwin, Cranfield's former Treasurer and a former Partner of Price Waterhouse, recently retired after a successful career in the world of finance

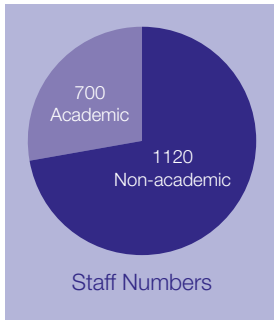
- Lord Stevenson of Coddanham, Chairman of Pearson plc and HBOS plc, who headed up the independent enquiry into Information Communication Technology in schools set up by the Rt Hon Tony Blair in 1997, and which resulted in the Stevenson Report
- Sir Andrew Turnbull, Secretary of the Cabinet and Head of the Home Civil Service since September 2002
- Rob Margetts, who took up his present chairmanships with Legal and General, NERC and BOC Group in 2000. He is also Chairman Europe of Huntsman Corporation, a non-Executive Director of Anglo-American plc, and a Governor and Fellow of Imperial College of Science, Technology and Medicine
- Eryl McNally, who has been a Member of the European Parliament (MEP) since 1994, initially representing Milton Keynes and Bedfordshire and later as one of the representatives for the East of England
- Alan Garwood, former Cranfield Executive MBA student and Head of Defence Export Services, Ministry of Defence (MOD)
- General Sir Michael Walker, Chief of Defence Staff, MOD and graduate of the 1976 army staff course.

The degree of Master of Science honoris causa was conferred on John Tetlow who, after retiring at 65, is still making a valuable contribution to the work of the university as consultant instrumenter.

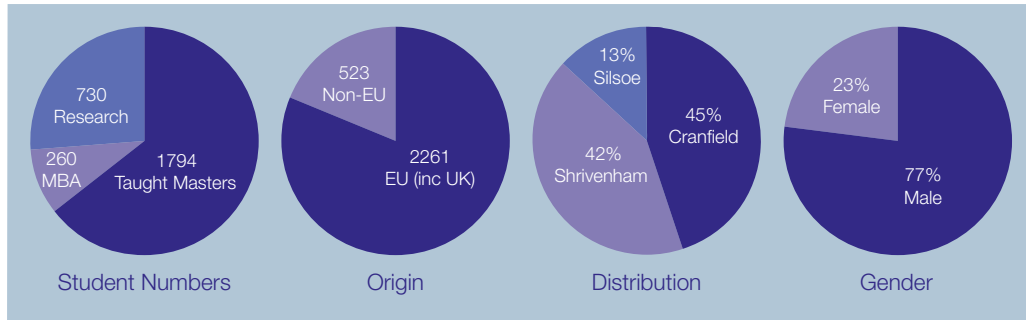
A new prize – the Annual Cranfield School of Management Distinguished Alumnus Award – was given to John McFarlane for outstanding career success and long-standing personal commitment to Cranfield School of Management.

Facts, figures and rankings

Staff



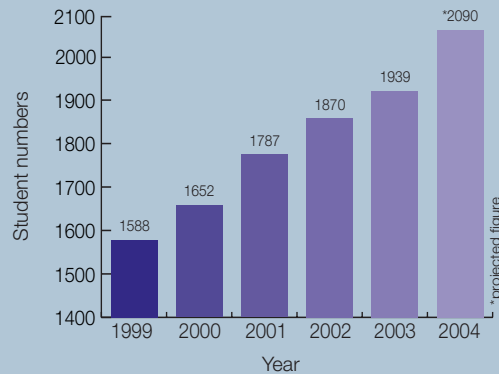
Students



We receive more awards of national student funding than most universities.

	2001/02	2002/03
Masters training courses	1	1
Manufacturing research grants	3	3
Engineering studentships	8	not yet known
EPSRC engineering research grants	7	8

The steady and significant growth in student numbers on our Masters courses demonstrates how effective, valuable and pertinent our educational programme is.



Research

Cranfield's research-intensive activity puts it at the top of many tables of excellence – a further reason why our clients and customers rate us so highly.

Research income as a percentage of total income puts Cranfield in the top 12 of UK universities.

In terms of research income earned from UK industry as a proportion of total income, Cranfield is the clear UK leader.

1. Cranfield University 11.9%
2. Imperial College 5.4%
3. Nottingham University 4.3%
4. Kings College 3.6%
5. University of Cambridge 2.9%
6. University of Oxford 2.8%

Recently published, the Lambert review remarks:

“A few institutions appear on the industry's list of favourites that are not featured in the other two (Research Council grants and HEFCE funding) – for example Cranfield. This suggests that the priorities of business may be rather different from those of the Government.”

Quality and value for money of the research output:

1. Loughborough University
2. Cranfield University
3. York University
4. Aberystwyth University
5. University of Oxford

Source: Research Fortnight – based on HEFCE data.

Cranfield produces just over 9% of the UK output of engineering postgraduates, more than any other UK university.

Cranfield produces 10% of the UK output of engineering doctorates (EngD and PhD).

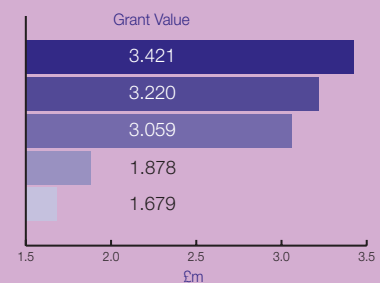
In 2003 short course delegates numbered about 10,000.

EPSRC sector reports

Recent EPSRC sector group reports in transport and aerospace and defence show Cranfield as number one in terms of collaborative research.

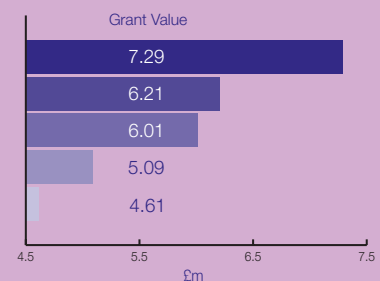
TRANSPORT

- 1 Cranfield University
- 2 Loughborough University
- 3 University of Cambridge
- 4 Imperial College
- 5 University of Leeds



AEROSPACE AND DEFENCE

- 1 Cranfield University
- 2 University of Manchester
- 3 University of Cambridge
- 4 University of Birmingham
- 5 Imperial College



Source: EPSRC

Cranfield campus
Cranfield University
Cranfield
Bedfordshire MK43 0AL

Silsoe campus
Cranfield University
Silsoe
Bedfordshire MK45 4DT

Shrivenham campus
Cranfield University
RMCS, Shrivenham
Swindon SN6 8LA

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