

A talent for growth

How EPSRC is stimulating innovation through
the next generation of researchers



EPSRC

Investing in research for
discovery and innovation

A flying start

The Engineering and Physical Sciences Research Council (EPSRC) is the UK's main agency for funding research in engineering and the physical sciences, investing £800 million a year in research and postgraduate training.

EPSRC cultivates the next generation of world-class researchers and empowers and develops research leaders who have the knowledge and transferable abilities – the 'skills' – to do and lead the best research. This generation of research scientists and engineers from around the world is being fine-tuned in Britain's research-intensive universities.

Almost half of the 9,000 students being trained at any one time are working collaboratively with more than 1,000 industrial partners. The skills being harnessed give companies – both here in the UK and abroad – the innovative edge they need to succeed in a fiercely competitive global marketplace.

With a doctoral training portfolio including training of £4 billion, EPSRC is playing a key role in expanding and deepening the talent pool of the world's very best and brightest scientists and engineers.

Our vision is to ensure that the UK is the premier place to conduct science and engineering research. We are

doing this in a way that helps industry develop new products, improve productivity, innovate new technologies, and capture new markets.

But we can only achieve this in partnership and collaboration with the wider research community, universities, industry and government – both at home and abroad.

By bringing people together from across disciplines, by breaking down intellectual boundaries, and by working closely with private and public sector partners, our investments are already making an impact – from the development of new technologies and materials to improvements in medical diagnostics, and faster and more secure communications, our funding is changing lives for the better.

EPSRC invests in doctoral projects which provide students with challenges and expertise while also allowing companies to collaborate on challenges driven by industry. By encouraging companies to collaborate on doctoral training projects and providing a flexible route to do this at a range of levels they are able to build relationships with universities and work with students who may be prospective employees or future collaborators. This approach provides opportunities to explore novel research collaborations and strengthen current partnerships.

The case for British research

The single largest funder of doctorates in engineering and the physical sciences in the UK, EPSRC works with universities and companies to develop new ways of providing high quality research and postgraduate training, creating a new generation of world-class research leaders and a skilled workforce.

To ensure researchers develop the skills needed to tackle the big challenges of the 21st Century, EPSRC has three key pathways and partnerships for developing the talents of postgraduates:

- Industrial Cooperative Awards in Science & Technology (iCASE)
- Doctoral Training Partnerships (DTPs)
- Centres for Doctoral Training (CDTs)

While each pathway is distinct, the common thread is excellent research training to equip the researchers of the future with the skills and experience for world-leading research and innovative businesses.

Industry makes the CASE

Our investments in research are relevant to business. Our **iCASE awards**, for instance, enable industrial partners to select an academic partner with whom they will define a question that will develop new knowledge, methods or technologies and select the student they need for this challenging doctoral project.

Tim Embley, Group Innovation and Knowledge Manager at engineering solutions provider, Costain, says his firm's strategic relationship with EPSRC and the **iCASE** approach is enabling the company "to develop our future business leaders and to accelerate valuable innovation to market, making a positive impact on our customers' business performance."

The **iCASE** pathway takes the doctoral student on a challenging but rewarding training journey, with the guidance of a partner from either the private or the public sector, and funding provided jointly by EPSRC and the partner. Only

those companies aligned with our goal of driving economic innovation and growth and investing heavily in EPSRC research programmes are eligible to be partners which ensures good fit to our strategic priorities.

Doctoral Training Partnerships

Universities remain the engine room for training the research leaders of tomorrow. Our second pathway to research excellence – Doctoral Training Partnerships (DTPs) – are designed to provide universities with a flexible funding route that enables them to respond rapidly to emergent research opportunities and work with international, industrial and other partners to provide challenging research projects and a range of experience for doctoral students.

This flexible funding is based on the EPSRC research grants and fellowships to a university. DTPs allow institutions to be more responsive to student



"iCASE projects are a win, win, win – for industry, for academia and, of course, for students. Many of these bright people will be the research leaders and research directors of the future."

Dr Malcolm Skingle, Director of Academic Liaison at GSK



Around 40 universities receive Doctoral Training Partnership awards which range from £300,000 a year to nearly £9 million.

Dr Dewi Lewis, UCL

recruitment and retention issues, to target growth areas, and to vary the length of support (between three and four years) dependent on the project.

Centres for Doctoral Training

The industries of the 21st Century need a pipeline of excellent engineers, scientists and mathematicians who are able to work across traditional academic disciplines and have hands-on experience of working with private sector partners.

EPSRC has invested over £500 million to create a network of 117 new Centres for Doctoral Training (CDTs). Building on successful models, CDTs are based

in universities and chosen around disciplines, technologies and sectors that are of strategic national importance for industry, for core research and for future markets.

Over the next nine years more than 7,000 students will be trained in these diverse centres, forming the next generation of scientists and engineers who will drive the new industries and help create a more balanced and sustainable UK economy.

Initially attracting £450 million of leverage, increasing to £750 million over their lifetime, the centres, have the backing of some of the most important players in the UK economy. Partnering companies include Airbus, GSK, London Stock Exchange, IBM, Oxfam, BAE Systems, Siemens and Shell Global Solutions.

“BAE Systems is actively involved in a number of the Centres for Doctoral Training funded by EPSRC as we believe they will supply the future experts and leaders that the UK and the company needs in many key areas.”

Steven Harris, Head of External Partnerships and Brokering, BAE Systems

Accelerating discovery and innovation

Engineering and physical sciences impact on all key UK and international growth sectors. Our aim is to invest in future scientists that will rebalance the economy by building the manufacturing infrastructure of the future; that accelerates our lead in energy and healthcare technology; and that harnesses the talents of a burgeoning digital economy.

In addition to supporting their academic research EPSRC encourages the doctoral students it supports to develop entrepreneurial and business skills. Here are just three examples innovative ideas from EPSRC-supported doctoral students that became commercial reality:

- **Autonomy Corporation:** In 2011, Autonomy Corporation, a company founded in 1996 by Dr Mike Lynch to commercialise his EPSRC-funded PhD thesis in mathematical computing at the University of Cambridge, was sold for £7.1 billion to US computing giant Hewlett Packard. In just 16 years Autonomy became the UK's biggest pure software company, with nearly 2,000 employees in the UK.
- **Ultrahaptics,** a company formed to bring to market technology developed by EPSRC-supported doctoral student Tom Carter at the University of Bristol, has received £10.1 million backing from investors to grow its business globally. Using the magic of sound waves, the technology makes it possible to manipulate things without touching them.
- **Mark Cummins and James Philbin,** doctoral students at the University of Oxford, formed a spin out company, PlinkArt, to commercialise a smartphone app they created using technology developed as part of their PhD projects in robotics and search engine technologies. The app won \$100,000 in a competition run by Google, which later acquired PlinkArt and hired Mark and James, who relocated to California to work on the Google Goggles project.



“Jaguar Land Rover invests heavily in the UK research base and is involved in numerous research projects – including energy storage technology, lightweight alloys, liquid metal and virtual engineering – and are partners in seven of EPSRC’s new Centres for Doctoral Training.

The company’s investment of £1.5 billion in new aluminum models will create 1,700 jobs in the West Midlands and another 24,000 jobs in the supply chain.

The investment EPSRC makes in relevant research and postgraduate training in the UK plays a vital role in maintaining the supply of skilled people that will deliver the technologies of the future.”

Dr Wolfgang Epple, Jaguar Land Rover Director Research and Technology

People with smart ideas

Highly-skilled people are the most valuable return on our research investments.

EPSRC-funded students not only have exemplary research skills, they also have the ability to lead complex, multidisciplinary teams; to communicate difficult ideas across academic and cultural boundaries; and to make a seamless transition from academia to industry.

In addition to developing a new generation of industry-experienced doctoral students, the relationship between university and industrial sponsor provides academics with insight into industry that is not normally available; it also enables companies, sectors and policymakers to build links with academics and be informed by the results of their research.

EPSRC is currently investing in more than 9,000 doctoral students, of which 2,500 graduate each year with over a third going into industry or the public sector.

If you are a potential industry partner, our investment is producing the workforce of the future – people with the highest academic qualifications in the tough disciplines of engineering and physical sciences, who can transcend subject boundaries, who know how industry works, how they fit in to industry and what they can contribute.



“Many of our partnerships involve the EPSRC Centres for Doctoral Training network, resulting in the training and development of highly skilled individuals who make a significant contribution to the UK’s technology base.”

Mark Jefferies, Chief of University Research Liaison, Rolls-Royce plc



Env fuel cell motorbikes

Picture courtesy Intelligent Energy

Intelligent Energy

EPSRC-supported research at Loughborough University beginning in 1993 led to the development of a new generation of clean power systems based on advanced fuel cell technology.

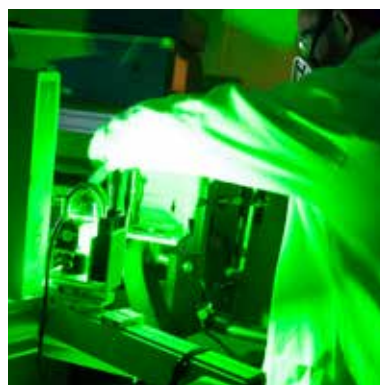
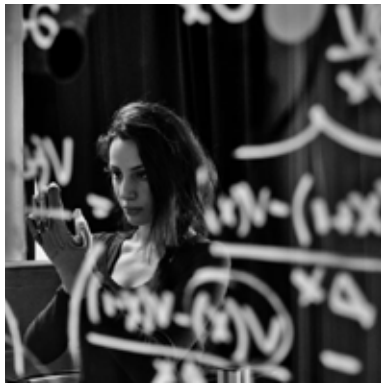
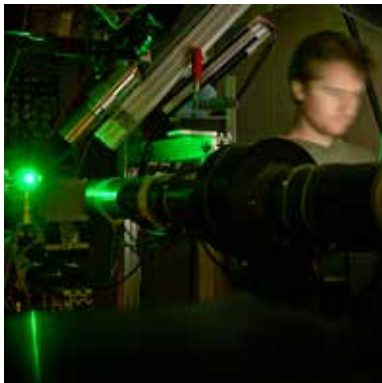
A spin out company, Intelligent Energy, was formed in 2001 to commercialise this research. The company has since grown into one of the world's largest independent fuel cell companies. It is now a \$500 million international organisation employing over 350 people – creating a new economic sector.

A core team of EPSRC-funded researchers from Loughborough University joined the company at its inception and to this day continues to lead its R&D, providing stability and insight into product development. The company retains close links with Loughborough and other major UK universities, and has a track record of taking on EPSRC-supported doctoral students.

With over 350 staff in its main operating site in Loughborough and offices in London, California, India and Japan; it has established major business partnerships including with the Suzuki Motor Corporation with whom it has formed a joint venture company.

Project partners in the development of mobile fuel cell power sources include Peugeot, Citroën, Suzuki, Boeing, Airbus and Lotus. Collaborative research led to the development of the world's first purpose-built motorbike with a fuel cell power source; fuel cell aircraft and zero emission road vehicles. Zero-emission taxis powered by the company's fuel cell technology shuttled VIPs during the 2012 Olympics.

In 2015 Intelligent Energy, signed a billion dollar deal to supply India with safe, sustainable power to 27,000 telecoms towers across the country.



Front cover: The Eureka moment, *Georgios Margelis, University of Bristol*

The photographs of researchers that illustrate this brochure were taken by EPSRC-supported researchers for the EPSRC Science Photo Competition.



About the Engineering and Physical Sciences Research Council

As the main funding agency for engineering and physical sciences research, our vision is for the UK to be the best place in the world to Research, Discover and Innovate. By investing £800 million a year in research and postgraduate training, we are building the knowledge and skills base needed to address the scientific and technological challenges facing the nation.

www.epsrc.ac.uk