

# Regeneration man

From trainee aerospace engineer to successful biomedical inventor, to membership of EPSRC's governing body, Professor John Fisher CBE, Deputy Vice-Chancellor of the University of Leeds, has enjoyed a career bristling with variety and garlanded with achievements. He tells *Pioneer* about a life less ordinary – and a yearning for more hours in the day.

**I have had a very diverse career**

**path.** It has made me what I am today. After graduating from the University of Birmingham in 1976, I spent 12 years in industry – initially as a trainee automotive and aerospace engineer. A postgraduate course in design and manufacture en route to becoming a chartered engineer led me to work in the National Health Service as a biomedical engineer.

**My PhD, which involved industry, clinicians and academia, gave me great personal satisfaction,** and was transformational in my career. The knowledge I gained from it enabled me to successfully design and bring to market a new kind of porcine bioprosthetic heart valve, in 1990. The valve is still manufactured today by Vaskutec and has led to a wide portfolio of related products. Experiences such as these helped me understand the importance of multidisciplinary R&D at the academic/industry interface. The benefits for both academia and industry are mutual – in each case two plus two can be made to equal 10.

**My experience in academia, industry and the National Health Service** helped me to hone the leadership style I have used for the last 25 years at the University of Leeds, as faculty Pro Dean, Pro-Vice-Chancellor for

Research, and now as the university's first Deputy Vice-Chancellor.

It has given me great professional satisfaction to see the university's ranking move up from 25th to 13th as defined by the 2008 national Research Assessment Exercise. This was a major advance for the institution, and something I worked hard to achieve as Pro-Vice-Chancellor for Research.

**In my role as an educator,** I have presided over the training and graduation of over 100 PhD students, many of whom are working in industry and in healthcare systems across the world, making their own impact and contribution to improving the quality of life. I would like to think the multidisciplinary training and approaches and values they experienced en route to achieving their doctorates have contributed to their achievements.

**My early industry experience in mainstream traditional engineering has been very influential.** Engineering in its broadest form is simply the application of science with a defined purpose. I believe that to make progress and move beyond the basic science, beyond the test tube or the laboratory bench, you need to think like an engineer, and adopt professional engineering approaches within the research

area, which include simulation, modelling, design, manufacture, testing and evaluation.

You must also be prepared to create new solutions to problems and challenges that are important to society and industry. Your work should not simply be about generating new knowledge. I would like to think we have successfully incorporated this approach and philosophy at Leeds.

**I am proud to have worked with Professor Eileen Ingham for many years.**

In the 1990s we developed the Institute of Medical and Biological Engineering (IMBE) at Leeds into one of the leading multidisciplinary medical and biological engineering centres in Europe. The centre is recognised as a world leader in simulation systems for improved and longer-lasting joint replacements, in collaboration with industry partners across the globe.

Contrary to thinking at the time, we felt it was possible to implant biological scaffolds derived from animal tissue without rejection, as a regenerative scaffold, provided we were able to remove the cells and immunological molecules. This has been an important strand of our strategy over the last 10 years and led to the creation of spin out company Tissue Regenix plc.

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Team dynamic: Professor John Fisher with his colleague and co-founder of Tissue Regenix plc, Professor Eileen Ingham.

biological scaffolds for tissue regeneration (led by Professor Eileen Ingham); and enhanced quality and reliability of the things we make and use, such as implants, biomaterials and regenerative interventions.

We are addressing these challenges through seven major centres

and programme grants, including the EPSRC Doctoral Training Centre in Tissue Engineering and Regenerative Medicine; the EPSRC/Wellcome Trust-supported WELMEC Centre of Excellence in Medical Engineering; the NIHR Leeds

Musculoskeletal Biomedical Research Unit, in collaboration with Leeds Teaching Hospital Trust; and the EPSRC-supported Innovation and Knowledge Centre in Regenerative Therapies and Devices.

**I have been involved with EPSRC for many years** – sitting on panels, on advisory groups and, since 2010, as a member of its Council, the senior decision-making body responsible for determining policy, priorities and strategy, and for the stewardship of its budget.

**The strategic and policy role of Council** is critical if the UK is to compete in an increasingly challenging global environment. Emerging countries such as India and China are investing substantially in the physical sciences, technology and engineering – and are achieving accelerated research growth and impact as a result. In the UK we have to recognise we are a small provider in terms of global research and innovation (less than five per cent) so we simply have to be the best in terms of quality, benefits and impact.

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**Broadly speaking, everything we do at the iMBE** relates to the 50 Active Years after 50<sup>®</sup> healthcare technologies initiative. Driven by patient need, we have three main goals: longer-lasting joint replacements; acellular

## EPSRC CENTRE FOR INNOVATIVE MANUFACTURING IN MEDICAL DEVICES

The EPSRC Centre for Innovative Manufacturing in Medical Devices, launched in February 2013, focuses on transforming the way replacement joints and other medical implants are made – helping to improve the quality of patients' lives.

The £5.7 million EPSRC Centre brings together academics, industrialists and clinicians, and aims to address the major day-to-day challenges faced by manufacturers.

Instead of doctors ordering, unpacking and fitting implants, the aim is to personalise devices to meet individuals' needs, made in or near the clinical setting.

The Centre is based at the University of Leeds' Institute of Medical and Biological Engineering (iMBE), one of the UK's leading bioengineering research institutions. The iMBE, led by Professor John Fisher, has pioneered work on longer-lasting joint replacements, revolutionary spinal interventions and biological scaffolds for tissue repair that grow with the body. The Centre works with the EPSRC-supported Innovation and Knowledge Centre in Regenerative Therapies and Devices at Leeds, also led by Professor Fisher, which largely focuses on research translation and the development of new technologies to prepare for private sector investment.



Pictures courtesy Institute of Biomedical Engineering, University of Leeds

An immunology bioreactor heart valve used by Professor Fisher and his team.

## EPSRC COUNCIL

Professor John Fisher is a member of EPSRC Council, the senior decision-making body responsible for determining policy, priorities and strategy. It is also accountable for the stewardship of EPSRC's budget and the extent to which performance objectives are met.

There are currently 19 members of Council, which is accountable to Parliament, and membership includes senior academics and industrialists.

Council consults regularly with EPSRC's strategic advisory bodies, other advocates, key partners in those

universities which are the major recipients of EPSRC sponsorship, and key strategic partners in business.

The Secretary of State for Business, Innovation and Skills appoints Council members. Appointments are made on merit and with independent assessment.



**Being a member of EPSRC Council is a major societal responsibility.** It is not just about helping to formulate strategies and policies that support and sustain the UK research base. It is also about delivering future benefits to the UK – to industry, government, public bodies, universities, students and the UK taxpayer.

We encourage innovation and its translation into new technologies, products and processes, and foster joint investment from funders and sponsors as well as universities and industry.

This work goes hand-in-hand with ensuring EPSRC is at the forefront of training and development of the next generation of scientists and technical leaders, whose achievements we must strive to ensure rank with the very best in the world.

**When I look around the research landscape** there are many important and challenging areas to address: energy, sustainability, water, transport, manufacturing, information technology.

These challenges do not respect traditional academic disciplines. EPSRC has played a leadership role in developing multidisciplinary approaches and challenge-led research within Research Councils UK, and I hope I have contributed to this in a small way.

**I think I have the best job in the world.** I feel privileged to be an academic in the UK. It is a career full of opportunities and choices.

**Away from my work,** I try to keep healthy and fit; go to the gym; walk in the Yorkshire Dales. We also have season tickets at Old Trafford – my wife is a lifelong Manchester United supporter. I have a large garden which is an ongoing project – supporting the visiting wildlife while keeping moderate order, and a degree of tidiness – but I am not always in control of the balance. Most importantly, it gets me out of the house on a weekend.

**If I were to be granted one wish,** it would be to have more time. There is always much more to do.

## BIOGRAPHY

**John Fisher** CBE; FREng; FIMechE; FIPEM; Professor of Mechanical Engineering.

**Responsibilities:** Deputy Vice-Chancellor, University of Leeds.

Professor Fisher also provides leadership to over 200 academic researchers in medical engineering.

Positions at Leeds include: Director of the Institute of Medical & Biological Engineering (IMBE); Director EPSRC Doctoral Training Centre in Tissue Engineering and Regenerative Medicine; Director of the Centre for Innovative Manufacturing in Medical Devices; Co-Director Leeds Musculoskeletal Biomedical Research Unit; Director N8 Regenerative Medicine Centre.

**Research activities:** Joint replacement and substitution; tissue engineering; and pre-clinical simulation.

**Director:** Tissue Regenix plc.

## HELPING HUMANS REPAIR THEMSELVES

Tissue Regenix, a university spin out company specialising in human tissue regeneration products, is developing cutting-edge technology that could revolutionise medicine – in a global industry worth an estimated \$7 billion.

Founded in 2006 by Professors John Fisher and Eileen Ingham to commercialise their EPSRC-funded research at the University of Leeds, Tissue Regenix's first product – a vascular patch derived from pig tissue which repairs damaged human veins – gained its CE mark in 2010 and is now sold globally outside the USA.

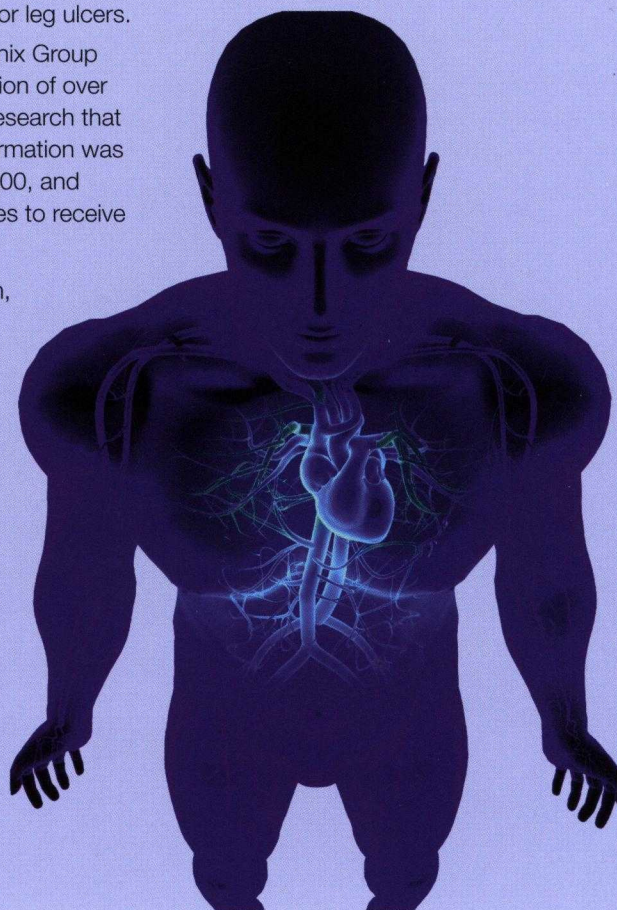
The company's proprietary dCELL® technology platform works by removing all cells from the animal tissue, allowing it to be used to replace worn out or diseased body parts – without the need for anti-rejection drugs. Because a patient's own cells can populate the new biological scaffolds, they are accepted by the immune system and can be repaired like normal tissue. The dCELL® process can be used to make 20-30 different products.

Potential applications for the technology, which has been licensed for use in tissue

banks in the UK and South America, include knee damage repair, heart valves and advanced wound care for leg ulcers.

Today, the Tissue Regenix Group has a market capitalisation of over £60 million. The basic research that led to the company's formation was funded by EPSRC in 2000, and Tissue Regenix continues to receive EPSRC support.

Professor Eileen Ingham, co-founder, says: "The support from EPSRC and other funders, including the Technology Strategy Board, over many years has been crucial in enabling us to pursue the basic technology and then drive forward its potential. We were able to use the grants flexibly, enabling continuity of employment for key researchers."



Picture courtesy Tissue Regenix plc