The research commercialisation office of the University of Oxford, previously called **Isis Innovation**, has been renamed **Oxford University Innovation**

All documents and other materials will be updated accordingly. In the meantime the remaining content of this Isis Innovation document is still valid.

URLs beginning www.isis-innovation.com/... are automatically redirected to our new domain, www.innovation.ox.ac.uk/...

Phone numbers and email addresses for individual members of staff are unchanged

Email : enquiries@innovation.ox.ac.uk

UNIVERSITY OF OXFORD

A better future

Engineering Science

Developing real-world applications

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Developing real-world applications

The Department of Engineering Science is ranked the number one engineering department in the country, according to the official UK-wide assessment of university research, REF2014. The Department has a long history of engagement with industry and translating world-class research into real-world applications.

Isis Innovation, the technology transfer company of the University of Oxford, works closely with Engineering Science researchers to help them commercialise the intellectual property arising from the substantial research portfolio within the Department and to engage in consultancy work with businesses from a range of industry sectors.

Here we highlight just a few of the technology transfer successes the Department has enjoyed in recent years.

Foreword

Professor Lionel Tarassenko CBE FREng FMedSci
Head, Department of Engineering Science

Oxford University seeks to be a leader in knowledge exchange and innovation, enabling the fruits of its research and teaching to have the best possible impact on society. One important way to create this impact is via technology transfer; the successful transformation of inventions by University researchers into new products and services.

This can be achieved by directly licensing technology to industry, but also includes the formation of spin-outs and start-ups based on University intellectual property. The Department of Engineering Science has long been active in turning the world-class research it undertakes into innovations that industry wants to commercialise and investors wish to support.

The benefits of successful technology transfer are not just commercial, although pleasingly the income generated from licensing Engineering Science innovations far exceeds the cost incurred in filing patent applications. Through consultancy by our researchers, businesses have established successful relationships with these researchers that have not only solved immediate problems but have also led, in some cases, to research collaborations. Other benefits, such as the promotion of entrepreneurship, are also highly prized. In addition, with advanced engineering in Oxfordshire supporting over 4000 high performance businesses, technology transfer activities with local companies provide a very tangible way for the Department of Engineering Science to embed itself in the local innovation ecosystem.

"The benefits of successful technology transfer are not just commercial".

I encourage my colleagues in the Department to engage in technology transfer activities through the University's wholly owned research commercialisation company, Isis Innovation.

I hope that the examples given in this publication will inspire both current and prospective Engineering Science students to engage in entrepreneurial activities, so that we can enable more great engineering ideas to flow from our Department into society.

A new generation of motors

In 2008, Professor Malcolm McCulloch, Head of the Electrical Power Group in the Department of Engineering Science and Dr Tim Woolmer, then a PhD student in the group, devised a highly novel electric motor. The motor was able to achieve a significantly higher torque and power for its weight, potentially meaning a smaller and cheaper motor for a given application.

Excited by the concept, Isis Innovation worked with the inventors to file initial patent applications, help build a business plan around the technology and secure both a management team and investment.

In 2009, Oxford YASA Motors was spun out of the University with £1.45m invested to develop electric motors for use in on-and-off road automotive, marine, aerospace, military and general industrial applications. Since then, YASA has employed over 40 specialist staff to deliver purpose-built motors to partners and original equipment manufacturers (OEMs) where torque, efficiency and low motor mass are critical ingredients to achieve a higher performance or cost effective drive solution.

YASA has very quickly become a world leader in this sector and is enabling a significant number of highly innovative, hybrid electric, all electric and power generation applications. YASA has set up manufacturing facilities, which will be capable of producing many thousands of motors per year by 2018, to meet the fast growing demand of its customers.

Koenigsegg, a manufacturer of high performance vehicles, recently unveiled the stunning Regera car at the 2015 Geneva Motor Show. The car uses three YASA motors and according to Koenigsegg, delivers the fastest acceleration of any production car. The motor produces over 1 megawatt of power from a highly compact power train.

"YASA has set up manufacturing facilities which will be capable of producing many thousands of motors per year by 2018".

Investing in biomedical engineering

The Institute of Biomedical Engineering (IBME), part of the Department of Engineering Science, provides state-of-the-art laboratories for research and collaboration between engineers, biologists and clinicians.

The IBME was completed in 2008 and financed in-part by London-based venture capital fund Technikos. The company provided £12m in return for half of the University's equity in new companies based on IBME intellectual property. The IBME-Technikos partnership has enabled some of the most promising academic research ideas to be translated successfully and quickly into commercially viable products.

One of the most recent spin-outs under the agreement, Oxsonics, was set up in January 2014 with the help of the University's technology transfer company Isis Innovation. Working with the research group, headed by Professor Constantin Coussios, Oxsonics is developing ultrasound-sensitive nanoparticles to treat cancer and back pain.

IBME Professors Lionel Tarassenko and Alison Noble provided the inventive vision behind the Institute's two 2012 spin-outs, OxeHealth (non-contact vital signs) and Intelligent Ultrasound (ultrasound image enhancement software).

In all, more than £10m in initial investment has been raised from early-stage investors to enable the formation of 11 spin-out companies based on IBME research. All of these companies are developing healthcare products, raising further external investment to expand their product range, creating jobs and sponsoring further research activity in the University.

A pan designed with ‘flare’

Professor Thomas Povey has extended his research from designing high-efficiency cooling systems for next generation jet engines to an everyday object which transfers heat – the domestic saucepan. Formed from cast aluminium, the Flare® pan has an innovative finned design which channels heat from the flame across the bottom and up the sides of the pan, resulting in highly efficient, even heat distribution. This means the pans heat up significantly more quickly and food cooks faster, saving time and using much less energy.

Isis Innovation worked with Professor Povey to protect his intellectual property, through both patent and design rights, with the team also winning a Design Council award to complete professional design work and to market the opportunity to kitchenware manufacturers.

The new heat-efficient cooking pan is currently being sold by UK company, Lakeland, following a licensing agreement with Isis Innovation.

“The Flare® pan uses 40% less energy than an equivalent traditional pan”.

Spin-out success

Department of Engineering Science researchers have an established track record of entrepreneurial activity through the creation of spin-out companies based on their research. Isis Innovation supports the preparation of business plans, helps to identify a management team and sources of investment, as well as managing the formation of the spin-out company.

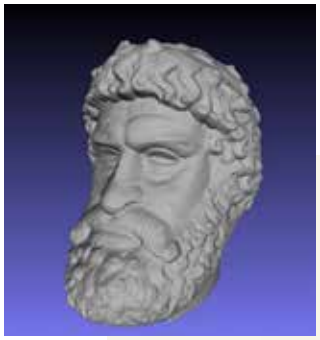
A diverse range of technologies have moved from the University laboratory into industry this way, including confocal microscopy products (Aurox), tidal energy arrays (Kepler Energy) and products for the strategic management of underground assets (OXEMS), to name just a few. The latest spin-out from the Department is Oxbotica, which will target new opportunities in robotics and autonomous systems (read more about Oxbotica on page 10).

Oxonica
Oxford MEStar
INTELLIGENT ULTRASOUND
Oxbotica
OXFORD NANOSYSTEMS
Aurox
Oxems
Mixergy
First Light Fusion
PowderJect Phamaceuticals
KEPLER
Oxyntix
Particle Therapeutics
RUN3D
Organox
Oxehealth
Mirada
FUEL3D
OBS MEDICAL
CN Bio Innovations
OxSonics
Deontics
YASA Motors

The changing face of 3D printing

3D printers make it possible to take a 3D design on a PC and print it out as a solid object. However, generating high quality 3D images for use in 3D printing can be time-consuming and is often expensive. Handheld 3D scanners are priced well above what most independent designers, engineers and artists can afford. A spin-out from the Department of Engineering Science, Fuel3D, is changing that.

Originally developed for the medical imaging sector by Professor Ron Daniel, Fuel3D's technology now brings the benefits of point-and-shoot 3D imaging to consumers and design professionals alike. It can be used by anyone who wants the ability to rapidly create 3D models with extremely high resolution mesh and colour information. Fuel3D licenses some of its technology from Isis Innovation, which protected the original intellectual property developed in the Department of Engineering Science.



Into orbit

Invented by Robert Stirling in 1816, the Stirling engine, unlike the internal combustion engine, uses an external source of heat. Advantages of this type of engine include high efficiency (up to 40% being achievable), as well as reliable, quiet and maintenance-free operation. With an active research group continuing to develop innovations in Stirling engine technology within the Department of Engineering Science, a broad portfolio of intellectual property in this area has been developed in recent years. The novel Stirling cooler designs from Oxford reverse the engine cycle and use an electrical input to generate a cooling effect at low temperatures. These specialised 'fridges' cool the infra-red sensors on orbiting telescopes in one particular application.

Isis Innovation has licensed a number of these technologies to companies operating in the satellite industry.

"Isis Innovation has licensed a number of these technologies to companies operating in the satellite industry".

Here come the robots...

"Oxbotica is one of Wall Street Journal's top 10 tech companies to watch in 2015".

The most recent spin-out from the Department of Engineering Science will target new opportunities in robotics and autonomous systems. Oxbotica was founded by Professor Ingmar Posner and Professor Paul Newman – leaders of the internationally acclaimed Oxford Mobile Robotics Group (MRG) and is led by Chief Executive Dr Graeme Smith.

Oxbotica will manage and expand the large and rapidly growing intellectual property portfolio created by MRG to realise the tremendous market potential of robotics and autonomous systems – recognised by the UK Government as one of the country's "Eight Great Technologies".

Oxbotica works as an IP commercialisation and technology transfer company, engaging with clients to help develop products, and license technology into markets as diverse as 3D imaging, autonomous vehicles, warehouse robots and even Mars rovers. The company has just been recognised in the Wall Street Journal's "Top 10 Tech Companies to Watch in 2015".

What is technology transfer?

Researchers from the Department of Engineering Science regularly work with Isis Innovation, the technology transfer company of the University of Oxford to identify inventions of potential commercial value. If commercialising the research is the eventual aim, then building defensible walls around these inventions is often essential to engage with investors or industrial partners.

Isis Innovation pays for filing and prosecuting patent applications, design rights and trade marks. In 2014, Isis Innovation filed 23 new patent applications based on research undertaken within the Department of Engineering Science.

Isis Innovation uses its networks, as well as leads from researchers, to identify potential commercial partners, then negotiates sensible commercial agreements, to transfer the technology to industry for further development. In other situations, Isis Innovation will help to secure funds for the development of a prototype or will manage the creation of a business plan that enables investment to be raised for launching a spin-out company.

Accessing Engineering Science expertise

The Department of Engineering Science actively encourages its researchers to work with industry through consultancy activity and over the last three years has been involved in over 200 projects with companies from a wide range of business sectors. This has included work with a variety of companies in renewable energy sectors like tidal and offshore wind turbines, batteries, fusion reactors, smart metering, electric vehicles and many more cutting edge fields.

The Department also has a host of highly specialised equipment that can be accessed by businesses through Oxford University Consulting (OUC), the division of Isis Innovation that specialises in facilitating consulting services.

OUC is often approached by businesses looking for advice in specific areas and using its knowledge of the Department of Engineering Science - OUC can act as the gateway into the wealth of expertise that exists to connect business to researchers.

Contacts

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UNIVERSITY OF OXFORD

ISIS INNOVATION