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

UCSF

ISIS INNOVATION

Oxford University
Challenge Seed Fund

10 year report
1999-2009

CONTENTS

FOREWORD

As one of the first venture capitalists to establish a fund in the UK in 1981, I soon came to realise that our rich research base in the UK was failing to translate its discoveries into opportunities to create new products and new businesses. In the mid 1980s, I persuaded the University of Oxford to create Isis Innovation with the objective of bridging this gap. The success of Isis over subsequent years has been a testament to the level of innovation in the University and to some talented individuals who have driven its success.

By the mid 1990s it had become clear that there was still a gap, specifically in funding proof of concept to enable new products to emerge from research discoveries. In 1998, the new Labour Government was determined to make Britain's research capability more fertile ground for reinvigorating the economy and they responded very positively to my proposal to create the University Challenge Seed Fund in a partnership with the Wellcome Trust and the Gatsby Charitable Foundation. The concept was not only to provide the proof of concept funding required but to encourage university researchers to be much more receptive to commercial exploitation of their ideas.

In 1999 I chaired a distinguished committee whose task was to steer the allocation of the £40m provided by the sponsors. The new University Challenge Seed Funds, born out of the need to improve connections and understanding between universities, venture capital investors and industry were an experiment, which I am delighted to say, has been highly successful, as evidenced in this Report.

In addition to contributions from HM Government (£20m), the Wellcome Trust, and the Gatsby Charitable Foundation (£20m), the universities themselves were required to provide at least one quarter of the funds.

It is pleasing that the overall programme has received such positive publicity over the years, being referred to in one case as the best £20m the government ever spent. Whilst I do not expect everyone to agree with that view, there is no doubt the UCSF scheme was a timely injection of energy and liquidity and has made a substantial contribution to enabling the uptake of new technology based business opportunities.

We had no hesitation in supporting Oxford's strong original application and awarding Oxford £3m to create the £4m Oxford University Challenge Seed Fund, to be managed by Isis Innovation.

This report demonstrates admirably the success of the fund in meeting our original objectives and proving the concept. The Oxford and Isis team have made 102 investment awards, totalling £5.7m, with £1m investable cash at present – impressive from a £4m start. I am delighted that the Oxford University Challenge Seed Fund has proven so successful in meeting its original objectives.

One of the original challenges we set was for UCSFs to become 'evergreen' funds. Oxford has achieved this with great success in the first ten years of their UCSF. I wish the University and Isis Innovation further success in the decades to come.

Sir David Cooksey
Chairman, University Challenge Fund Steering Committee

Sir David Cooksey

"The purpose of the University Challenge Fund is to enable universities to access seed funds in order to assist the successful transformation of good research into good business."

Extract from the Scheme's first guidelines.

INTRODUCTION

Bernard Taylor

Tom Hockaday

"The success of the Oxford UCSF is based upon the quality of Oxford research, the enthusiasm of Oxford researchers to engage in commercialisation, and the professionalism of Isis staff in preparing and presenting strong applications to the Fund. It is now difficult to imagine university technology transfer without access to proof of concept and seed funds."

The Oxford University Challenge Seed Fund was established in 1999 and this Report celebrates its first, successful 10 years. The Fund is owned by the University of Oxford and run on behalf of the University by the Investment Advisory Committee (Membership shown on page 19) and Isis Innovation, the University's technology transfer company. The purpose of the Fund is to provide funds to assist the successful transformation of good research into good business.

The University Challenge Fund programme developed as a collaboration between the UK Government and leading UK charities Wellcome Trust and the Gatsby Charitable Foundation; grants were donated to successful universities, which themselves provided one quarter of the initial fund.

The Oxford UCSF held its first Investment Advisory Committee meeting in June 1999, with a starting fund size of £4m made up from: £1.4m from UK Government; £1.6m from the charities Wellcome Trust and the Gatsby Charitable Foundation; and £1m from the University of Oxford.

The University had formed the £1m Isis Seed Fund in mid 1998 and had already supported a number of projects by the time the Oxford UCSF was launched; the balance of the Isis Seed Fund contributed to the University's £1m allocation to the Oxford UCSF.

Isis Project Managers work with Oxford researchers to prepare applications to the Fund for amounts up to £250,000 to support initial proof-of-concept, pre-patent research, reduction to practice, commercial demonstration, prototypes, business planning support, and spin-out company investments (where the Fund always co-invests alongside private sector investors). Proposals are presented to the Investment Advisory Committee which makes the necessary investment recommendations.

By mid 2003 the UCSF had made 68 awards and was fully invested; new investments were put on hold until successful exits returned cash to the Fund in April 2006. Such was the impact and success of the UCSF to date, the University provided an additional £1m into the Isis University Innovation Fund, managed alongside the existing UCSF structures. The IUIF is still active, close to fully invested, having made 34 investments to date.

In 2004 Oxford collaborated with the technology transfer offices of Cambridge University, Imperial College and University College London and won funding from the UK Higher Education Funding Council for England to create a £1.8m Proof-of-Concept fund, shared equally amongst the four Universities. This fund made 19 awards in Oxford during its two year operation.

Many individuals have contributed to the success of the Oxford UCSF over the years. In particular we are grateful to the members of the Investment Advisory Committee, listed on page 19 alongside the Isis staff involved.

This Report describes ten cases of successful Oxford UCSF investment projects, followed by analysis and details of all the investment awards made.

Bernard Taylor
Chairman, Isis Innovation Ltd, and Chairman, UCSF Investment Advisory Committee

Tom Hockaday
Managing Director, Isis Innovation Ltd.

UCSF HIGHLIGHTS

The Oxford UCSF has accelerated the commercial development of many technology projects that benefit society and create opportunities for economic growth.

INITIAL FUND SIZE

£4m

- UK Government Treasury grant
- Wellcome Trust
- Gatsby Charitable Foundation
- University of Oxford

AWARDS

102

Average Award: £56,000;
Award range: from £1,700 to £250,000.

SPIN-OUTS

31

The number of spin-out companies formed as a result of work financed by UCSF awards

DEALS

51

Projects on which commercialisation deals have been signed

CURRENT LISTED SPIN-OUTS

3

Listed on AIM having received UCSF Award

CASH RETURNED TO THE FUND

£2.7m

TOTAL SUM AWARDED

£5.7m

CURRENT ASSET VALUE

£6m

CURRENT INVESTABLE CASH

£1m

INSTANT STEAM – OXFORD CATALYSTS

Amount Awarded: £124,500
Date: September 2001
Lead Researchers:
Professor Malcolm Green,
Dr Tiancun Xiao
Department: Chemistry
UCSF no. 66 / Isis no. 907

Dr Mairi Gibbs, Project Team Manager at Isis Innovation

What motivates you?

I get great satisfaction from building good relationships with the academics, it is a real privilege to be in the position of a trusted advisor to them.

What advice would you give to technology inventors?

Great ideas and quality basic science are only the start, it takes a lot of hard work and determination to demonstrate that the technology is really viable to an external partner and get a deal done.

What were the company's most important early successes?

The AIM listing of Oxford Catalysts was led by the investors (IP Group) and was a spectacular success, giving the company sufficient funds to see it through the early years. Before the spin-out, in the planning phase, it took us a long time to persuade the investors that we had a credible team for the business and this slowed the investment. The team is something I've paid serious attention to in subsequent spin-outs.

Oxford Catalysts was spun out of Isis in 2005, and listed on the AIM stock exchange four months later with a market capitalisation of £65 million.

This extraordinary time-line was the culmination of 19 years of research at Oxford's world-leading Wolfson Catalysis Centre, carried out by Professor Malcolm Green and Dr Tiancun Xiao, and also years of work by Isis Innovation in funding and commercialising the research to the point where the company was able to raise funds.

The UCSF invested £124,500 to fund the work needed to move beyond pure research. The inventor was able to begin optimising the catalysts for key industry processes, such as producing the sulphur-free diesel fuel from waste gas, and removing sulphur contamination.

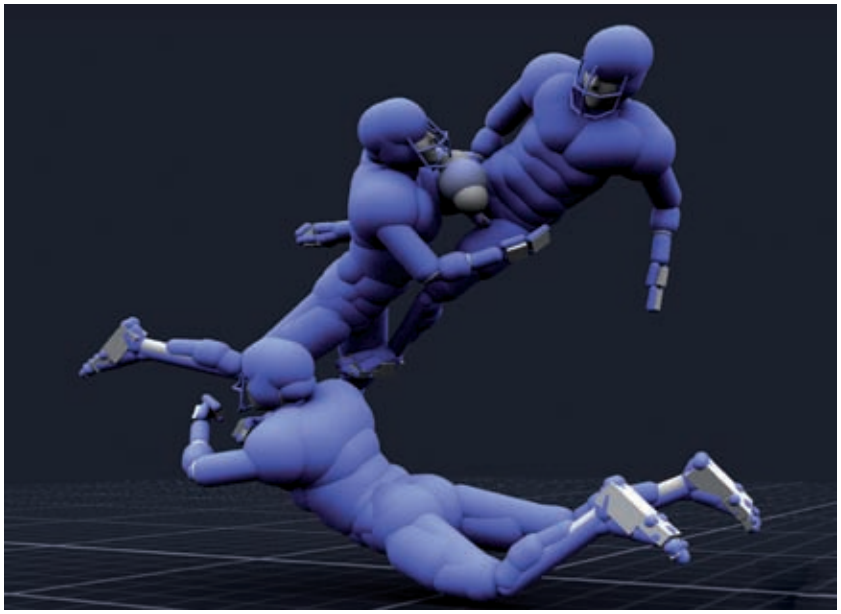
In preparing to spin out Oxford Catalysts, Isis Innovation was also supported by the Oxford University Begbroke Science Park, which awarded a Technology Enterprise Fellowship to Dr Xiao, funding him to support commercial development.

Oxford Catalysts Group is now a leading catalyst innovator for clean fuels, designing and developing speciality catalysts for the generation of clean fuels from both conventional fossil fuels and certain renewable sources such as bio-waste.

Oxford Catalysts' strategy is to license its catalysts for commercial application by entering into co-development partnerships with leading manufacturers, producers and suppliers in the petroleum, petrochemicals, biogas, steam applications and catalysis markets.

www.oxfordcatalysts.com

ADDING CHARACTER – NATURALMOTION



Amount Awarded: £23,500
Date: September 2000
Lead Researchers:
Dr Torsten Reil,
Dr Colm Massey
Department: Zoology
UCSF no. 38 / Isis no. 833

Torsten Reil, CEO of NaturalMotion

It would seem an unlikely place to find Oxford technology, but hugely successful video games *Grand Theft Auto IV* and *Star Wars: The Force Unleashed* are just some of the customers of 2001 Isis spin-out NaturalMotion. The company's software takes a starring role in giving the games' characters movement and personality.

The software, *euphoria*, enables characters to interact and respond to their virtual environment, taught by algorithms developed by NaturalMotion's CEO, Torsten Reil and his colleagues, as he was working on his D.Phil at Oxford's Zoology Department.

NaturalMotion has also been used in films such as *Poseidon* and *Troy*.

Now based in Oxford and San Francisco, the company markets, sells and supports its products globally to customers in the games, film, post production and broadcast markets.

"Setting up the company and negotiating the investment would have been impossible without Isis – they acted as a catalyst and enabler to get this done," says Torsten Reil, in reflecting on the beginnings of the business.

A University Challenge Seed Fund grant in 2000 provided the crucial funding to get the first programming started, and Isis also introduced the initial angels investors to the company.

At the time of the spin-out in 2001, Reil explained the advantages that NaturalMotion had over traditional methods of animation: "The advantage of NaturalMotion's approach is that we can produce realistic animations in a more cost effective way. In addition, NaturalMotion's animations are completely interactive because they are simulations of the "real thing". What you see on the screen is not just a hollow computer drawing of a character, it is the character. This gives the user complete freedom."

www.naturalmotion.com

Why did you think this idea had potential/what were your first impressions?

We saw fully interactive characters on the screen for the first time in the morning after an 8 hour overnight simulation was completed.

What advice would you give to other technology inventors?

Don't underestimate the difficulties of commercialising academic research. Try and find investors and shareholders who share your vision and help you through any potential crisis. They're worth gold.

What were the early mistakes and successes?

We underestimated the time it took to take our first product to market, and the difficulty of making the product work in a real film production environment. Our most important success was winning a large contract with Rockstar Games, makers of Grand Theft Auto IV.

How important was this project in your professional life and beyond?

Very – the UCSF money enabled the start of NaturalMotion.

CONTROLLING INSECTS – OXITEC

OXITEC
HEALTHY PEOPLE HEALTHY ENVIRONMENT

Amount Awarded: £228,775
Date: March 2001
Lead Researchers:
Dr Luke Alphey, Dr David Kelly
Department: Zoology
UCSF no. 53, 64, 68, 77 / Isis no. 992

Edward Mott, CEO of Oxford Capital Partners

Why did you think the idea had potential?

We felt Oxitec had powerful intellectual property, unique IP on the world stage. We were motivated by the potential of converting this knowledge into value and felt that there was a strong unique selling point. A strong team was coming together.

What advice would you give to other technology inventors?

There may be value in an invention, but it only becomes valuable when clients pay for it. We find that there is probably three times as much work, time and cost in commercialisation as in the invention. Emerging businesses must engage early with potential clients.

What were the company's early challenges and successes?

The first challenge was to address early the challenge of commercialisation and to partner with clients and regulators. The first successes were securing the support of the Gates Foundation and in 2008 being voted a Global Technology Pioneer at the Davos World Economic Forum.

Based on technology developed by molecular biologist Dr Luke Alphey and colleagues at Oxford University's Department of Zoology, Oxitec aims to reduce the size of insect populations responsible for causing disease and destroying crops.

Oxitec aims to be a world leader in the field of biological insect pest control by developing and introducing technology to improve the well-established Sterile Insect Technique (SIT). Potential improvements include enhanced effectiveness, reduced cost, a wider range of applications, and reduced environmental impact of this already very environment-friendly approach.

In 2001, during a crucial time in the company's development, Oxitec received four UCSF awards totalling £228,775.

Oxitec Limited was spun out by Isis in 2002, with investment from East Hill Advisors LLC of Boston, the University of Oxford (through the Isis College Fund), and later Oxford Capital Partners. It remains located in Oxford.

Oxitec's technology will have a significant beneficial impact on both agriculture and public health and will be a valuable tool in integrated pest management programmes. Oxitec has generated product candidates for four insect pest control markets, and has advanced its lead candidate to the final testing phase of the development pathway in the USA.

The company's approach to insect control was recognised by the Bill and Melinda Gates Foundation Grand Challenges for Global Health Initiative with an award as part of a $20 million consortium developing genetic strategies to control disease-carrying mosquitoes.

www.oxitec.com

CLEVER COATINGS – OXFORD ADVANCED SURFACES

oxford advanced surfaces group plc

Amount Awarded: £150,000

Date: May 2003

Lead Researchers:
Dr Mark Moloney, Dr Jon-Paul Griffiths

Department: Chemistry

UCSF no. 96 / Isis no. 505

Oxford Advanced Surfaces Group is commercialising a breakthrough surface modification technology. The advanced coatings are only a few molecules thick and can be used to produce dramatic changes in the surface properties of inert materials such as polyethylene, glass, Teflon and diamond. The coatings can change colouration, adhesion, and the biocidal activity of surfaces.

They can be applied as a wet coating by spin, dip, roll or spray and cured with either heat or irradiation. By selective coating using screen or inkjet printing, or selective curing, the technology can permanently change the surface functionality of an item.

"We could see the long term potential for the project. The coating technology was able to modify the surface properties of polymers, glass, and even diamond," says Isis Project Team Leader Dr Mairi Gibbs, who worked with the inventors for a number of years, building the business plan and identifying the first customers for the spin-out.

In 2003 the Oxford UCSF awarded £150,000 to the project to show the capability of this new technology and results of the work financed by the award completely changed the level of interest from the market.

The company was spun out by Isis Innovation in 2006, a culmination of many years of research by Drs Mark Moloney and Jon-Paul Griffiths of Oxford's Chemistry Department.

In 2007, the company listed on AIM through a reverse takeover of Kanyon Plc, forming the Oxford Advanced Surfaces Group.

The company aims to commercialise advanced materials and technology solutions across a range of markets including electronics, speciality fibres, textiles, laminates and composites, sterile surfaces, separation media and microarrays, biomedical materials and photovoltaics, solid state lighting and fuel cells.

www.oxfordadvancedsurfaces.com

Marcelo Bravo, Former CEO, Oxford Advanced Surfaces

What advice would you give to other technology inventors?

Only invest if you really understand the space and if you can leverage your experience or networks to deliver the opportunity. My ideal investment is the one where I can line up the customer from day one.

What were the early mistakes and successes?

We made and make a lot of mistakes. The important thing is to be nimble enough to surf through uncertainty, learning and correcting fast enough so as to stay on top of the wave.

Our early success was to get traction from major corporate partners early on and to use that to create excitement and raise finance. We are now in the long and hard slog of getting first technologies to market and getting those through the line will be our most important success.

What is your favourite aspect of being involved with entrepreneurs?

Entrepreneurs are passionate about what they do and ventures are about people going all out for something. That's the type of life I like to live.

PRESERVING LIFE – ORGANOX

Amount Awarded: £32,850; £10,000; £57,150; £150,000

Date: February 2007, December 2007, February 2008, September 2008

Lead Researchers:
Professor Peter Friend,
Dr Constantin Coussios

Department: Biomedical Engineering

UCSF no. 309, 322, 324, 334 / Isis no. 884

Dr Matthew Frohn, Director, Oxford Technology Management

What is your favourite aspect of being involved with entrepreneurs?

The founders of Organox, Professor Peter Friend, Dr Constantin Coussios and the CEO, Dr Les Russell, had all the characteristics that one hopes for in entrepreneurs – leading experts in their respective fields, able to apply advanced technology to real world problems, good communicators, tenacious and commercially minded.

Do you think entrepreneurship can be taught or learned?

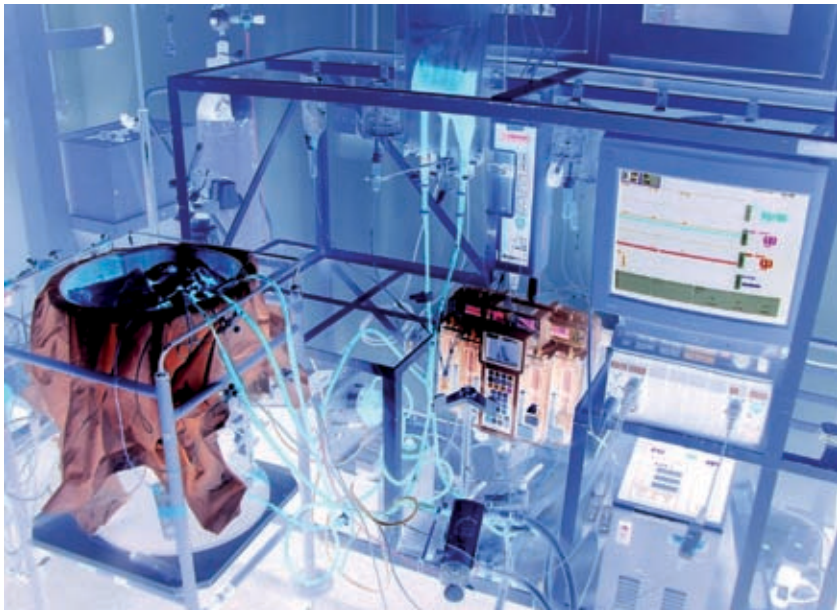
Entrepreneurship requires a certain stubborn, competitive personality from the outset, but with that spark, a little teaching and a lot of practice will probably take you a long way.

What motivates you?

Seeing science turned into technology, and technology turned into products which people are prepared to pay for – the profits from which can be turned back to generating more good science.

What advice would you give to other technology inventors?

Thoroughly understand the problem that your technology is solving and why the market would be prepared to pay for your 'solution'.



In December 2008, OrganOx Limited was incorporated and raised £1.5 million from Series A investors Oxford Technology Management Ltd and Technikos LLP. The Oxford University Challenge Seed Fund also participated in the round.

OrganOx is developing a device for sustaining organs outside the body using blood at normal body temperatures. The device was invented by academic founders Professor Peter Friend, a leading transplant surgeon, and Dr Constantin Coussios, a biomedical engineer. The intellectual property associated with the device centres on enabling an organ to self-regulate its blood flow, causing minimal harm to the vasculature of the organ.

A UCSF award of £32,850 in February 2007 was key to enabling the researchers to compare their prototype device to a modified version that did not enable the organ to self-regulate blood flow. The results of this both exemplified the patent application, and demonstrated the inherent value of the intellectual property to potential investors. As a direct result of this funding the US patent was granted.

A potential CEO for the business, Dr Les Russell, joined the project team and in December the UCSF invested a further £10,000, funding Dr Russell to deliver a business plan.

In February 2008, Dr Russell presented his business case to the UCSF board, inviting them to co-invest contingent upon a total of £1.5 million being raised. The UCSF board awarded the project a further £57,150, providing a platform for securing the funds from investors.

In September 2008, Technikos, Oxford Technology Management Ltd and two other investors agreed to invest £1.35 million. For the fourth time, an application was made to the UCSF to top up their previous commitment of £100,000 to £250,000. The application was successful, enabling OrganOx to close the round with a consortium of five investors.

MAKING SMART METERING SMARTER – ISE

Amount Awarded: £50,000; £9,000

Date: July 2007, June 2008

Lead Researcher:
Dr Malcolm McCulloch

Department: Engineering Science

UCSF no. 316, 332 / Isis no. 2871

Intelligent Sustainable Energy Limited (ISE) was formed in November 2008 having successfully raised £900,000 in equity financing. In order to reach the investment stage the company relied upon support from the UCSF to finance technology proof of concept and commercial development activities.

ISE is developing an intelligent energy monitor that delivers electricity use information to consumers so that they can make informed decisions about how they are using electricity. Initially aimed at the domestic market, the technology can provide detailed, by appliance, breakdown of electricity use throughout the building being monitored.

The system analyses the electricity supply at a single point (for example, the building's electricity meter) and calculates the power consumption of each appliance.

The technology was conceived by Dr Malcolm McCulloch, Director of the Electrical Power Group within Engineering at the University of Oxford.

The UCSF awarded the project £50,000 in 2007. Dr McCulloch used some of the money to employ a former student, Jim Donaldson, who joined the team as Chief Technology Officer and has subsequently joined ISE as CTO. The funding enabled the team to build a number of proof of principle systems, further develop the core technology and create interface presentation software. The result was an impressive live demonstration system that contributed enormously to securing investment. The team also used the money to deliver visualisations of what the smart-meter to human interfaces might look like. In mid 2008 the UCSF agreed to support the project with a further £9,000.

In collaboration with venture capital investors Swarraton Partners, the team identified Navetas Energy Management as ideal partners for the project. Navetas is headed up by Chris Shelley and Chris Saunders who share some 30 years of experience in the smart metering industry.

Ultimately, Swarraton Partners invested in Navetas, who then invested in ISE. Navetas also supplies commercial management to ISE. The UCSF converted its funding of £59,000 into equity at the first round of investment.

www.ise-oxford.com

Dr Jim Donaldson, CTO of Intelligent Sustainable Energy

Why did you think this idea had potential?

Lots of tech companies never succeed because they either have great technology, but a small market, or poor technology in a big market. Fortunately, I think that we have the best of both.

What motivates you?

The thought of doing something novel that can have a real affect on society.

What advice would you give to other technology inventors?

The technology is important, but only part of the picture – make sure that you invest heavily in your people and listen to your customers.

What is your favourite aspect of being involved with entrepreneurs?

Spending time with like-minded people who are energetic and enthusiastic about their day-to-day work.

LIGHTWEIGHT MOTORS – OXFORD YASA MOTORS

Amount Awarded: £75,000

Date: December 2008

Lead Researcher:
Dr Malcolm McCulloch and
Dr Tim Woolmer

Department: Engineering Science

UCSF no. 335 / Isis no. 3056

Nick Carpenter of Delta Motorsports

What is your favourite aspect of being involved with entrepreneurs?

The fascinating and stimulating process of kicking around the germ of an idea and turning it into something that "might just work".

Do you think entrepreneurship can be taught or learned?

There are many lessons that can be taught, mostly to do with the commercial aspects of entrepreneurship, but I believe that someone either has a natural ability to be an entrepreneur or they're never going to make it.

What advice would you give to other technology inventors?

If you can be the first person to identify a problem (or a missing product), you have an enormous opportunity to be the first person to find a solution.

What motivates you?

A challenge.

In September 2009, Oxford Yasa Motors secured £1.45 million from private investor Seven Spires Investments to take lightweight electric motors developed at the University of Oxford's Department of Engineering Science to market.

Dr Malcolm McCulloch, head of Oxford's Electronic Power Group and Dr Tim Woolmer, then a PhD student in the group, originally devised the electric motor for the 2008 Morgan Lifecar. The group received £75,000 in funding from the Oxford University Challenge Seed fund to build a prototype for use in high performance electronic vehicles.

Engineering firm Delta Motorsport is aiming to install the motor in their coupe for track tests in the second half of 2009. Delta's technical director Nick Carpenter said: "We believe electric motors are the only way forward for road cars. All road cars will be driven electrically, regardless of how the energy is stored in the vehicle."

Dr McCulloch said: "With Oxford Yasa Motors we'll be able to deliver a range of commercial products that will help the UK launch itself as a premier destination for electric vehicle development.

"The motor can achieve high torque for its weight, which ultimately means a smaller and cheaper motor. Torque is the twisting force that accelerates the car, and the peak torque we're aiming for is 500Nm from 25kg.

"We've optimised the materials and design, so that the motor is lighter and more effective, giving half the volume and twice the torque for the same power output. This electric motor technology will reduce fuel consumption and also help us move away from fossil-based fuels to alternative energies.

"Over 50 per cent of the world's electricity powers electric motors, so it's extremely important to improve the efficiency of motors. This motor can be adapted to achieve better performance in a whole range of applications."

THREE DIMENSIONAL TISSUE CULTURE – ZYOXEL

In July 2009, Zyoxel, a spin-out company commercialising microbioreactor technology to improve drug discovery and stem cell culture secured a £1 million investment from Hong Kong multinational CN Innovations Holdings.

The company also received a £110,000 investment from the Oxford University Challenge Seed fund. The deal marks the first time a Chinese investor has provided funding for a new Oxford spin-out.

"We estimate Zyoxel's TissueFlex microbioreactors can reduce the average cost of drug development by at least 10 percent, improving accuracy and time-to-market," said Dr Tim Hart, CEO of Zyoxel.

"Pharmaceutical, chemical and cosmetic companies need more reliable information when testing drugs and compounds. Using microbioreactors for 3D tissue culture to test chemicals on a range of lab-cultured human tissues will enable researchers to assess drug candidates more intelligently. The inability to detect toxicity early is estimated to cost the pharmaceutical industry around $8 billion per year."

The project had received £10,000 from the UCSF in January 2008 to support Hart in preparing the business plan and partnership management. Zyoxel will continue to develop partnerships with pharmaceutical companies and anticipates that the first product sales will take place within a year.

The microbioreactor technology was invented by Professor Zhanfeng Cui from the Institute of Biomedical Engineering, Dr Jill Urban from the Department of Physiology, Anatomy and Genetics and their colleagues.

Professor Cui said: "Cells function very differently when grown as tissues, in conditions closer to those of cells in the body. The microbioreactors are also individually perfused to mimic how cells in the body are constantly supplied with fresh nutrients and waste products removed via the blood.

"Our microbioreactor has an elegant multiwell design, using a gas-permeable polymer that is also transparent, to facilitate imaging and microscopy of complex cells and tissues."

ZYOXEL
ADVANCED CELL CULTURE SYSTEMS

Amount Awarded:
£10,000; £100,000

Date: January 2008, June 2008

Lead Researcher:
Professor Zhanfeng Cui

Department: Biomedical Engineering

UCSF no. 323, 327 / Isis no. 3358

Dr Tim Cook, member of the UCSF Board

Why did you think this idea had potential?

In nature cells grow in three dimensions, which this technique replicates and this is a way of replacing some animal tests.

What motivates you?

The function of the UCSF is to provide a stepping stone to help an idea get from the lab to a state where investment can be raised to advance its commercialisation. Participating in this process is very rewarding.

What advice would you give to other technology inventors?

Always be very clear on what the invention is (i.e. what it does and how it does it), what is its eventual market, how it will get from invention to cash generation (however distant this is) and what competitive techniques there are.

Do you think entrepreneurship can be taught or learned?

The essential skills of entrepreneurship can certainly be taught to some (but not all) people. What is more difficult to teach is attitude and confidence.

NEW TOOL FOR PROTEIN EXPRESSION

Amount Awarded: £10,000
Date: December 2008
Lead Researcher:
Professor Nick Proudfoot
Department: Pathology
UCSF no. 337 / Isis no. 3776

Dr John Wilson, Project Manager at Isis Innovation

Why was the UCSF funding important?

The results of the experiments have allowed us to exemplify the technology and the patent, and to attract commercial interest. We are putting in place six evaluation licensees with pharmaceutical companies, contract manufacturing organisations and protein expression specialists.

The companies will use our sequences in their own systems. Essentially what this means is they are providing the data they need to justify taking a licence for commercial use.

Will this be a spin-out?

Probably not, as there is more value to be added in setting up multiple non-exclusive licences.

What are the next steps?

By 2010 we aim to have 15-20 different systems evaluated with our technology, which will allow us then to go to the market with a broad package of technical data. Assuming the technology works well, it's not impossible that the Oxford Protein Expression technology could be very widely used in the industry with multiple licensees.

In 2008, researchers in Oxford's Sir William Dunn School of Pathology came to Isis with a new method for increasing protein production, with the potential to improve the efficiency of drug manufacturing by multi-fold increases in yields of therapeutic proteins.

The technology had been tested in standard mammalian cell systems, and early data showed yields of the hormone erythropoetin – a widely prescribed therapy with significant commercial value – were increased ten-fold.

"The biologics industry has developed a number of protein expression systems with fully-optimised promoters and poly-A sequences, providing enhanced protein yields," said Professor Nicholas Proudfoot, lead researcher in the group which made the finding. "Improvements in this area have slowed to incremental yield increases, which has frustrated many in the industry.

"We discovered that the part of the protein-expression process known as termination – generally considered unimportant in increasing protein yields, is in fact a driving force for optimal gene expression.

"We identified a new location in the DNA sequence which turns out to play an extremely important role in the termination process. To date this method has been successful in providing this further ten-fold increase in protein production in a range of cell systems."

The sequence is also in an area of the genome know as the "post poly-A", meaning the integrity of the protein expression sequence itself is well protected as no insertion of new sequences close to the actual protein sequence is needed.

Researchers used £10,000 from the Oxford UCSF to exemplify the technology in a standard plant expression system, broadening the patent and demonstrating that the technology was widely applicable.

AN EPIGENETIC APPROACH TO THERAPEUTICS – OXEPI

Amount Awarded: £131,500

Date: December 2006

Lead Researcher:
Professor Christopher Schofield

Department: Chemistry

UCSF no. 303 / Isis no. 3052

OxEpi is developing a new approach to the identification and progression of new therapies for oncology and metabolic disease. It uses a unique medicinal chemistry approach for the discovery and development of new antagonists of a major new class of enzymatic targets involved in epigenetic regulation.

OxEpi builds on Professor Chris Schofield's expertise in a family of enzymes involved in regulation of what is known as "epigenetics": the influence of mechanisms other than underlying DNA sequence on gene expression. This goes beyond disease caused solely by mutations in the genetic code.

In 2006 the Oxford UCSF awarded £131,500 to Professor Chris Schofield's research group to develop assays and identify small molecule inhibitors of human 2 oxoglutarate (2OG) dependent oxygenase enzymes that catalyse demethylation of DNA/histones (ABH or JmJ enzymes, respectively) or are involved in cell proliferation. Subsequent work has resulted in new patent filings on assays and composition of matter, which will form an important part of OxEpi's IP portfolio.

A number of the enzymes identified by Professor Schofield's team appear to be good potential targets for therapeutic intervention in cancer and metabolic disease. OxEpi intends to develop major programmes in both those areas.

One of OxEpi's lead programmes on the FTO gene (Fat Mass Obesity Protein) is at the forefront of clinical interest in transcriptional control of metabolic networks to enhance energy expenditure for the treatment of obesity and metabolic syndrome. The project has the potential to address a major unmet medical need for safe and effective anti-obesity drugs.

Dr Adam Stoten, Project Team Manager at Isis Innovation

Has the funding advanced the project commercially?

The UCSF money has gone into developing screens for compounds which inhibit the enzymes the team has characterised, and to progress compounds which may be good drug candidates.

We have also been able to leverage funding from external parties. An external funder has matched the UCSF funds, which really accelerates the programme.

Why hasn't external funding been secured for the whole programme?

This type of project is generally deemed too early for big pharma or biotech, although we have had some productive discussions. While epigenetics is attracting considerable commercial interest in the pharmaceutical sector, the chances of finding a partner are greatly improved if we have the type of data which should arise from the UCSF-funded work. In this case there is also sufficient critical mass around the IP to build a new business.

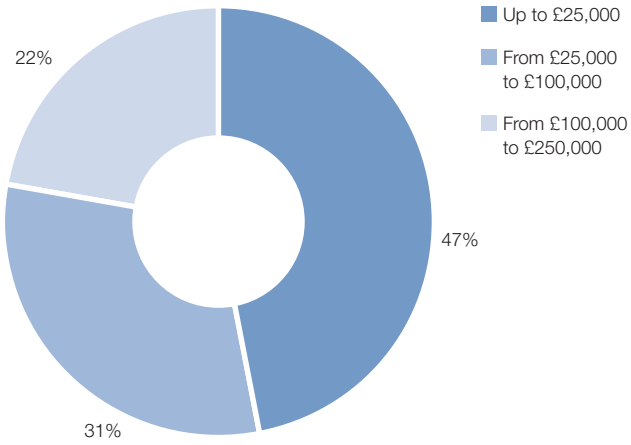
What are the next steps?

Isis is in discussions with investors to provide funding for a spin-out company to take the project forward.

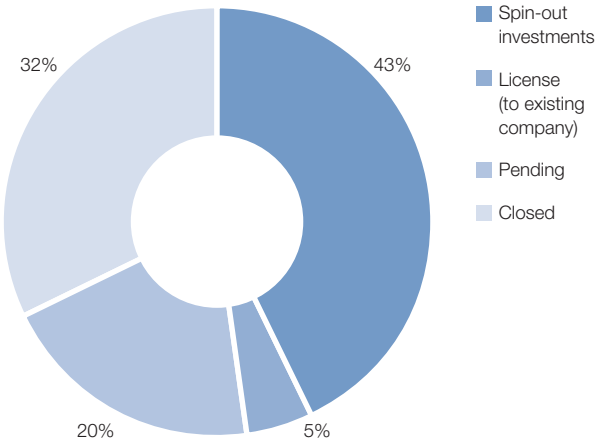
AWARDS

These charts show analysis for the 102 Awards made:

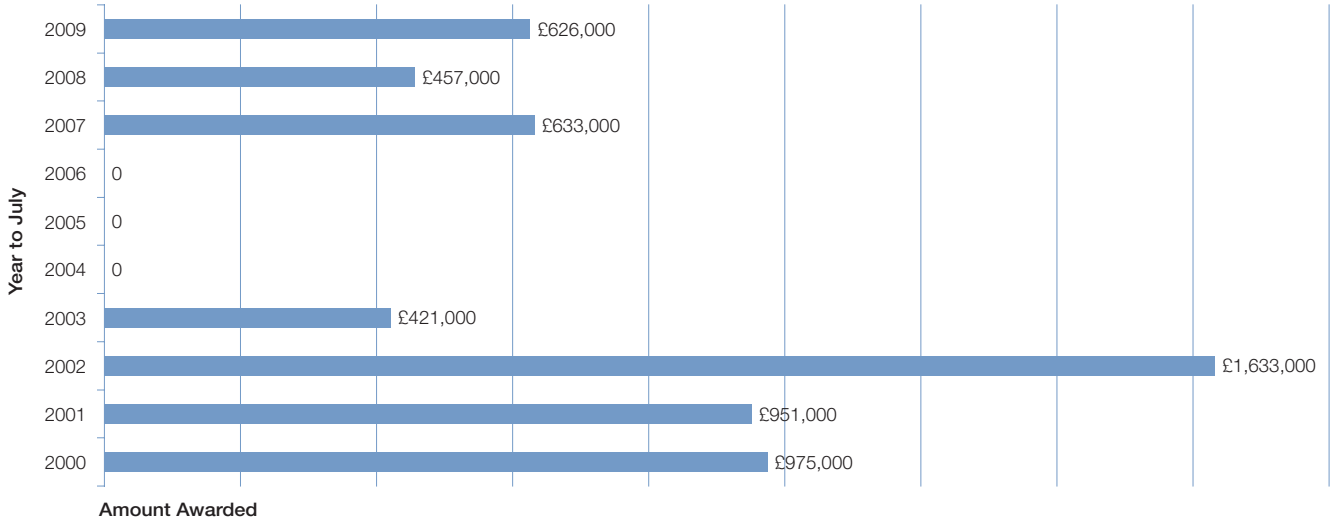
Investment Size



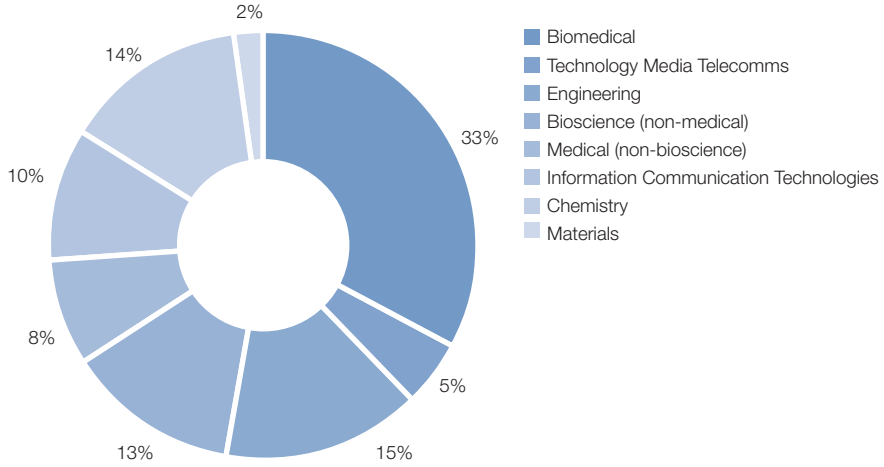
Outcomes



Annual Awards



Awards by Sector



Application date	Project title	Researcher applicants	Award
September 1999	**Doppler Measure System**	Prof Roger Ainsworth, Dr Steven Thorpe	£142,000
September 1999	**MindWeavers**	Prof David Moore	£2,500
September 1999	**NAT from TB**	Prof Edith Sim, Dr Mark Payton, Dr John Sinclair	£75,000
September 1999	**Diagn. & Therapy of Coleiac Disease**	Prof Adrian Hill	£58,136
September 1999	**Oxford Ancestors**	Prof Bryan Sykes	£5,000
December 1999	**Fluorescent sensors**	Dr David Vaux, Dr Mark Fricker	£37,000
December 1999	**ICOS Ligand**	Prof Simon Davis	£5,000
February 2000	**Dendritic Cell Immunosuppression**	Dr David Roberts, Dr Britta Urban	£24,910
February 2000	**Glutamine rich protein FoXP1**	Dr Alison Banham, Dr Jaqueline Cordell	£18,248
February 2000	**Insect parasitology**	Dr Jeyaraney Kathirithamby	£24,000
February 2000	**Oxford Biosignals**	Prof Lionel Tarassenko	£250,000
June 2000	**OxLoc**	Prof Andrew Briggs, Prof Christopher Perrins	£23,572
June 2000	**Video Data Manipulation**	Dr David Shotton	£10,000
June 2000	**Oxford Biosensors**	Prof Peter Dobson, Dr Peter Leigh	£250,000
June 2000	**MindWeavers**	Prof David Moore	£25,000
June 2000	**Bilirubin**	Prof Chris Schofield	£6,306
June 2000	**Novarc**	Prof Patrick Grant	£18,195
September 2000	**Tuberculosis Peptide Panel Assay**	Dr Ajit Lalvani, Dr Ansar Pathan	£23,100
September 2000	**Machine learning application**	Dr Ashwin Srinivasan	£75,981
September 2000	**Cell signalling proteins**	Dr Andrew McKnight	£49,692
September 2000	**Poly U Attenuation**	Prof George Brownlee	£11,515
September 2000	**Reproductive Biosystems**	Prof David Barlow	£10,500
September 2000	**Pollination improvements**	Mr Chris O'Toole	£23,450
September 2000	**Quantum computing**	Prof Andrew Briggs	£24,933
September 2000	**Web-based knowledge systems**	Prof John Geddes	£16,500
September 2000	**Games and animation software**	Mr Torsten Reil	£23,500
December 2000	**DNA-based services**	Prof Bryan Sykes	£23,501
December 2000	**Separation of Organics**	Prof Dermot O'Hare	£50,000
February 2001	**Beta 2M Fusion Vectors**	Prof Andrew McMichael	£32,552
February 2001	**Data communication system**	Dr John Singleton	£20,000
February 2001	**Pollination improvements**	Mr Chris O'Toole	£25,000
February 2001	**HIV-1 Neutralisation**	Dr William James	£24,200
February 2001	**Diagn. & Therapy of Coleiac Disease**	Prof Adrian Hill	£107,614
February 2001	**Fluorescent sensors**	Dr David Vaux, Dr Mark Fricker	£46,000

AWARDS

Application date	Project title	Researcher applicants	Award
February 2001	**Oxford ArchDigital**	Dr Gary Lock	£150,000
February 2001	**Novel Bacterial Polysaccharides**	Dr Paul Rainey	£4,700
June 2001	**Novel FBOX Protein**	Dr Alison Banham, Ms Jaqueline Cordell	£24,994
June 2001	**Trimerising Polypeptides**	Prof Kenneth Reid, Dr Hans Hoppe	£24,210
June 2001	**Oxitec**	Dr Luke Alphey, Dr David Kelly	£5,875
June 2001	**Photonic Crystals**	Prof Andrew Turberfield, Prof Robert Denning	£100,000
June 2001	**Microscope Slide Scanner**	Prof Tony Wilson, Dr Mark Neil	£24,013
June 2001	**Biaxially Textured metal tape**	Prof Chris Grovenor	£24,823
June 2001	**Insect derived immune modulator**	Dr David Vaux	£1,700
June 2001	**Oxitec**	Dr Luke Alphey, Dr David Kelly	£2,900
September 2001	**Controlled delivery of Biologicals**	Prof Geoff Hale	£67,606
September 2001	**Oxford Catalysts**	Prof Malcom Green	£124,500
September 2001	**Allergen derived cell epitopes**	Dr Graham Ogg	£25,000
September 2001	**Oxitec**	Dr Luke Alphey, Dr David Kelly	£20,000
December 2001	**Inhibox**	Prof Graham Richards	£200,000
December 2001	**Light Retro reflectors**	Prof David Edwards	£49,741
December 2001	**Novel cement for bone reconstruction**	Dr Afsie Sabokbar	£20,000
February 2002	**Recombinant Virus production**	Prof Adrian Hill	£24,844
February 2002	**Synthetic Silk**	Prof Fritz Vollrath, Prof David Night	£99,937
February 2002	**Oxitec**	Dr Luke Alphey, Dr David Kelly	£200,000
February 2002	**Novel platinum complexes**	Prof Gordon Lowe	£150,000
February 2002	**Therapeutic monoclonal antibodies**	Prof Geoff Hale	£20,000
February 2002	**X-ray micro tomography**	Prof Peter Rockett	£10,000
February 2002	**Structural modification of proteins**	Prof Chris Dobson	£150,000
February 2002	**Alzheimer's disease diagnostic**	Dr Zsuzsanna Nagy	£25,000
February 2002	**APES Software**	Dr Ed Mitchell, Prof John Krebs	£20,000
February 2002	**Ischaemia Therapeutics**	Prof Peter Ratcliffe	£180,000
June 2002	**Breath analysis**	Prof Graham Hancock	£90,180
June 2002	**Micromachining of PFTE**	Dr Carl Sofield	£5,875
June 2002	**Sugar chemistry & protein glycosylation**	Prof Ben Davis	£100,000
June 2002	**APES Software**	Dr Ed Mitchell, Prof John Krebs	£50,000
September 2002	**Reproductive Biosystems**	Prof David Barlow	£171,110
June 2003	**Crysalin (1)**	Dr John Sinclair	£100,000
June 2003	**Polymer Functionalisation**	Dr Mark Moloney	£150,000

Application date	Project title	Researcher applicants	Award
December 2006	**Universal Fluorescent Sensor**	Dr David Vaux, Dr Mark Fricker	£42,292
December 2006	**Visible Light Photocatalyst**	Prof Peter Edwards, Dr Tiancun Xiao	£83,500
December 2006	**BiRox**	Prof Chris Schofield	£131,500
December 2006	**Wet Floor Detector**	Prof Peter Dobson	£53,000
February 2007	**Receptor Modulators**	Prof Simon Davis	£23,700
February 2007	**GTPCH1 as Cancer Target**	Dr Shijie Cai	£69,460
February 2007	**Extracorporeal Organ Perfusion**	Dr Constantin Coussios, Prof Peter Friend	£32,847
February 2007	**High Sensitivity Logarithmic Camera**	Dr Steve Collins	£18,259
April 2007	**Crysalin (2)**	Dr John Sinclair	£15,000
July 2007	**Fast Pixel Shutter Imaging**	Dr Gil Bub, Dr Peter Kohl	£36,700
July 2007	**Cellular Particle Separation**	Prof Phil Ligrani, Dr Karl Morten	£31,500
July 2007	**Neutropenia Home Test**	Prof David Kerr, Dr David Anderson	£3,500
July 2007	**Sugar Coated Vaccines**	Dr Kerry Fisher, Prof Len Seymour, Prof Ben Davis	£41,600
July 2007	**Geni-E Meter**	Dr Malcolm McCullough	£50,000
September 2007	**Cancer Biomarker Screen**	Prof Nick La Thangue, Prof David Kerr	£78,500
September 2007	**Tidal Turbine**	Prof Guy Houlsby, Prof Martin Oldfield, Dr Malcolm McCulloch	£48,220
December 2007	**Proxigen**	Prof Peter Donnelly, Prof Rory Bowden	£24,000
December 2007	**Organox**	Prof Peter Friend, Dr Constantin Coussios	£10,000
January 2008	**Neotest Business Planning**	Prof Zhanfeng Cui	£10,000
February 2008	**Organox II**	Prof Peter Friend, Dr Constantin Coussios	£57,153
February 2008	**Multicomplex Drug Screening**	Dr Thomas Harder, Dhaval Sangani	£20,000
June 2008	**p450 Scale-up**	Dr Luet Wong	£100,000
June 2008	**ISE II**	Dr Malcolm McCulloch	£9,000
September 2008	**Neotest II**	Prof Zhanfeng Cui	£100,000
September 2008	**Organox III**	Prof Peter Friend, Dr Constantin Coussios	£150,000
December 2008	**Light Motor**	Dr Malcolm McCullough, Dr Marcus Leong	£75,000
December 2008	**GTPCH1 as Cancer Target II**	Dr Shijie Cai	£78,788
December 2008	**Plant expression terminators**	Prof Nick Proudfoot, Dr Steve West, Dr Mick Dye	£10,000
February 2009	**Oxford Contrast II**	Dr Daniel Anthony	£15,000
February 2009	**Universal influenza vaccine**	Dr Sarah Gilbert	£100,000
June 2009	**CCR4 antagonists for vaccine**	Prof Peter Beverley	£18,000
June 2009	**Drug-based therapies for TB**	Prof Fran Platt	£16,000
June 2009	**Acousto- Electromagnetic Imaging**	Prof David Edwards	£109,500
June 2009	**Pentalenes**	Prof Dermot O'Hare	£53,874

SPIN-OUTS FUNDED BY UCSF

Diagnostics	
Cytox	Pre-symptomatic diagnosis of Alzheimer's Disease
Oxford Biosignals	Interpretation of complex signals (two markets: medical and industrial)
Oxford Immunotec	Diagnosis and monitoring of infection (initially TB)
Med tech	
Oxford Biomaterials	Variety of applications derived from knowledge of the nature of spider silk
Organox	Portable device to preserve livers for transplantation for up to 3 days
Pharma Tools and Services	
Crysalin	Analysis of protein structures for proteins which cannot be easily crystallised
Zyoxel	Microbioreactor technology to improve drug discovery and stem cell culture
Drug Discovery	
Glycoform	Expertise in carbohydrate chemistry to improve therapeutic proteins and other molecules
Inhibox	Broad range of computational chemistry and molecular modelling services
ReOx	Treatments for disease by modifying the effects of hypoxia
Pharminox	Small molecule anti-cancer drug discovery company
Industrial applications / cleantech	
Intelligent Sustainable Energy	Smart electricity meter offering fully itemised energy billing
Oxbridge Pulsars	Data communications systems using polarization synchrotron technology
Oxford YASA Motors	Lightweight electric motors for transport, aerospace and industrial applications
Other technology (inc. software)	
Mindweavers	Software that applies neuroscience to harness the dynamism of the human brain
Minervation	Software and web site developer specialising in health information
NaturalMotion	3D character animation software for movies and games
Oxford Ancestors	DNA-based services for personal ancestry research anywhere in the world
Oxitec Ltd	Effective and environment-friendly techniques to control insect pests
Oxford Risk Research & Analysis	Helps clients improve results by enabling them to make better informed decisions
AIM listed companies	
Avacta *(acquired Oxford Medical Diagnostics)*	Detection and analysis of biological materials and chemicals
Oxford Advanced Surfaces	Advanced materials and technology solutions using novel surface modification technology
Oxford Catalysts Group	Catalysts for use in production of clean fuels and other renewables

UCSF DETAILS

Chairmen of the Investment Advisory Committee

Sir Peter Williams (1999-2002)
Bernard Taylor (2003-present)

Investment Advisory Committee members

Professor Sir John Bell (1999-present)	*Regius Professor of Medicine, University of Oxford*
John Clements* (1999-2004)	*Finance Director, University of Oxford (retired)*
Rt Hon Lord Drayson (1999-2003)	*Minister for Science and Innovation*
Professor Graham Richards (1999-2008)	*Emeritus Professor of Chemistry*
Bernard Taylor (1999-present)	*Vice Chairman, Evercore Partners*
Sir Peter Williams (1999-2003)	*Treasurer & Vice-President, The Royal Society*
Phillip Smith* (2004-2008)	*Deputy Director of Finance, University of Oxford (retired)*
Giles Kerr* (2004-present)	*Finance Director, University of Oxford*
Dr Tim Cook (2006-present)	*Oxford Gene Technology, Lombard Medical Technology*
Nigel Keen (2006-present)	*Chairman, Oxford Instruments*
Ann Hacker (2008-present)	*Proven Health VCT, Frimley Park NHS Foundation Trust*
Professor Sir Mike Brady (2009-present)	*Professor of Information Engineering, University of Oxford*
Professor Steve Davies (2009-present)	*Chairman of Chemistry, University of Oxford*

Isis staff

Tom Hockaday (2000-present)	*Managing Director, Isis Innovation Ltd*
Linda Naylor (2005-present)	*Head of Technology Transfer Group, Isis Innovation Ltd*
Andrea Alunni (2007-present)	*Seed Investment Manager, Isis Innovation Ltd*
Dr Tim Cook (1999-2006)	*Managing Director, Isis Innovation Ltd (retired)*
James Mallinson (2002-2007)	*Portfolio Manager, Isis Innovation Ltd*

Report preparation

Andrea Alunni	*Seed Investment Manager, Isis Innovation Ltd*
Renate Krelle	*Business Relationship Manager, Isis Innovation Ltd*

* Representing the University at Investment Advisory Committee meetings

FURTHER INFORMATION

For further information on Isis Innovation please visit the Isis website: www.isis-innovation.com

The Isis website also contains more information on the following:

Isis Annual Reports	*2007, 2008, 2009*
Isis Newsletter	*published thrice yearly*
Technology Updates	*e-mail updates about new technologies*
Isis E-News	*quarterly e-mail news*

For general enquiries please contact us at:

Isis Innovation Ltd
Ewert House, Ewert Place
Summertown, Oxford OX2 7SG UK

T +44 (0)1865 280830
F +44 (0)1865 280831
E innovation@isis.ox.ac.uk

The Isis booklet “Guidelines to Researchers: University Proof of Concept and Seed Funds” is available from Isis and at www.isis-innovation.com/researchers/UCSF-AboutIsis.html

UCSF

Oxford University Challenge Seed Fund
10 Year Report 1999-2009

Design: Franks and Franks Printed to meet ISO 14001 standards, using a 50% recovered fibre and 50% virgin fibre product with FSC certification