CONSULTING THE EXPERTS

Product analysis brings deeper insights

ENRICHING LIVES
Tactile tourist maps for the visually impaired

A GREENER FUTURE
Meeting the challenge of a greener future

ALSO IN THIS ISSUE:
MAKING AN IMPACT
A look at some University enterprises starting to fulfi their high growth potential.
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For more information about research, innovation and enterprise at the University of Edinburgh, visit the Edinburgh Research and Innovation website [www.research-innovation.ed.ac.uk](http://www.research-innovation.ed.ac.uk)
Over centuries the conundrum at the heart of our ancient Scottish universities has been that they have been seen as steeped in tradition, whilst consistently searching out the most distant frontiers of knowledge. That has been strongly so for the University of Edinburgh, as its professoriate and graduates have populated such frontiers to the extraordinary benefit of mankind. In its relatively short history, ERI has added significant energy to this purpose in its task of supporting the journey from concept to commercialisation. This is not easy rhetoric, as you will find, is brim full of achievement and challenge.

Firstly, whilst comparisons are always open to challenge, there is no doubt that ERI has helped place the University of Edinburgh in an elite group of UK Universities making the most significant contribution to beneficial commercialisation. This is not easy rhetoric, as it is based upon the recent independent BIGGAR Economics Review of the economic impact of the University’s commercial activity of May 2012. This assessment concludes that the domestic and international impact of ERI in 2010-11 amounted to £201.6 million of GVA (Gross Value Added) and almost 3,600 jobs. For the Scottish economy, licensing and company formation adds £141 million to the Scottish economy and supports 2,400 jobs. Just imagine the accolades that an inward investor would receive for the equivalent!

In 2011-12, a further 35 spin-out and start-up companies brought the total of new businesses created since the inception of a dedicated commercialisation office at Edinburgh to 246. Such achievements are strengthened by the high level of sustainability of the business created. This takes me to my second issue. 81 per cent of the University of Edinburgh commercial ventures are trading sustainably three years after inception. In addition, 89 per cent of these enterprises are still contributing to the Scottish economy. These are significant statistics, but what underpins their achievements is closest to my heart. Only through the continuous improvement of ventures such as those will the Scottish economy flourish. These are significant statistics, but what underpins their achievements is closest to my heart. Only through the continuous improvement of ventures such as those will the Scottish economy flourish. I offer this commentary as Chair of Quality Scotland, an organisation committed to making business excellence a national characteristic of Scotland. We and ERI have much to do.

Such sustainability is achieved also because ERI takes considerable care in their selection of suitably qualified and experienced non-executive directors for their spin-outs. This has added substantially to the confidence of many who have made the move from academia to industry. My third point is related. The fact that ERI and the University have recognised the value of additional funding sources, in the current climate of finance, is significant. Old College Capital created last year to offer mid and late stage investments into growing and developing companies spun out of the University can fill an important funding gap. In addition, the fact that the University through ERI has also established a strategic alliance with London-based venture capital fund managers, MTI, along with University of Manchester and UCL, (two of the other most significant research institutions in the UK) to create a significant venture capital fund, provides another funding string to potential investment in the commercialisation projects of the University. This is a bold but calculated initiative. I am sure these two funds, linked to the entrepreneurial spirit within the University, will serve future projects well.

My final observation relates to the quite excellent way in which the student community of the University is encouraged to come forward with concepts which may have commercial potential. In this edition of Infinite there is a fine reflection of the awards received by student entrepreneurs of the University. The encouragement of the next generation to act in an entrepreneurial way is an important element of education for today. If, by the support of ERI, an even greater number of those involved within the University in teaching and learning can appreciate the value of wealth creation, as opposed to making money, then ERI will continue to contribute even more substantially to the fortunes both of the University and of Scotland.

This edition of Infinite, as you will find, is brim full of achievement and challenge.
The University of Edinburgh has long been regarded as a centre of research excellence and, despite the many challenges facing the economy, we achieved a record value of new research awards in 2011-12 of over £250 million. This success reflects the strength and depth of high quality research that is carried out across the University, which is supported by our highly-skilled Research Support and Development teams.

Our Licensing and Company Formation activities have again delivered strong growth with a further 51 new licenses completed and 35 new companies created.

The economic impact of University commercialisation work is not normally a newsworthy topic, but when we invited an independent firm of economic consultants to undertake an economic impact study of our licensing and company formation activities, the final report revealed some very positive results. Over 2400 jobs in Scotland are supported by these activities which also have a Gross Value Add to the economy of over £140m each year.

We have always believed that our role is to provide our new companies with the best start we can, so we were particularly satisfied when this report revealed that 81 per cent of all of the companies we had produced since 1969 were still trading in 2011, with a further 51 new licenses completed and 35 new companies created.

Over the past 12 months, our company formation group has deservedly received many new research awards in 2011-12 of over £250 million. This success reflects the strength and depth of high quality research that is carried out across the University, which is supported by our highly-skilled Research Support and Development teams.

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Over the past 12 months, our company formation group has deservedly received recognition for encouraging enterprise at the University, LAUNCH.ed, ERI’s business support service for student entrepreneurs, won the EducationInvestor’s ‘Higher Education Innovation’ award for 2011 for encouraging student innovation. In addition, Brian Ballie, a Company Formation Executive at LAUNCH.ed, was heralded as Entrepreneurial Educator of the Year 2012 by the Scottish Institute for Enterprise for his ‘outstanding contribution to student enterprise’.

Although the commercialisation of the University’s research is very much a team effort within ERI, sometimes an individual receives the recognition they deserve for their inspirational activities that have delivered results. We were, therefore, particularly pleased when Dr Sonja Vujovic, our Business Development Manager for the Roslin Institute, received the KT (Knowledge Transfer) Achiever of the Year award at the PraxisUnico Impact Awards last summer.

I hope that you enjoy this edition of Infinite PraxisUnico Impact Awards last summer. There are some very interesting articles and interviews featured within these pages about the work of Brian Ballie, Becci Barr and Hilary Roberts at the Roslin Institute, as well as those of Derek Waddell, Chief Executive Officer, Edinburgh Research and Innovation, and Dr Sonja Vujovic, our Business Development Manager for the Roslin Institute.

The initiative has been put in place by Professor Lesley Yellowlees, the University’s Head of the College of Science and Engineering, who states: “Whilst we work with many clients on a large variety of specific projects, there is a real opportunity to develop these relationships beyond this, to a level where we can all benefit.”

**IN FOR THE LONG RUN**

**STRATEGIC RELATIONSHIPS WITH THE UNIVERSITY OF EDINBURGH EXPLORED BY WENDY NICHOLSON, ERI’S HEAD OF BUSINESS DEVELOPMENT**

A t Edinburgh, working closely with our clients is critical to achieving successful outcomes and helps to develop strategic partnerships that bring significant benefits. We want our clients to make the most of the University of Edinburgh’s world-class knowledge and expertise. In developing sustainable relationships we can create a platform for success, from solving problems in the short term to working together to create unique capability and opportunities for the future.

**A NEW DIRECTION**

In an exciting new initiative, the University has put in place a team focussed on building and maintaining strategic relationships with our key clients. The new Commercial Relations Team’s remit is to develop meaningful, long term partnerships with industry clients that will provide a sustainable platform for innovation and commercialisation.

Ian Sharp, Commercial Relations Manager, who is leading the programme, says: “We are in the process of building greater strategic relationships with our partners, working with them to utilise the University’s world leading expertise in order to meet their long term aspirations. We are establishing robust partnerships that will provide long lasting benefits for both parties.”

**RELATIONSHIPS MATTER**

The team’s approach will be to build on existing relationships and also develop new ones at a strategic level. This will allow our partners to build and sustain their knowledge-based capacities in partnership with University. These relationships will also provide an increased opportunity for staff development, support innovation and intellectual property (IP) development as well as creating mechanisms for both parties to work together on funding bids in areas of mutual strength.

**We are in the process of building greater strategic relationships with our partners.**

Derek Waddell, Chief Executive Officer, Edinburgh Research and Innovation

The initiative has been put in place by Professor Lesley Yellowlees, the University’s Head of the College of Science and Engineering, who states: “Whilst we work with many clients on a large variety of specific projects, there is a real opportunity to develop these relationships beyond this, to a level where we can all benefit.”

**WANT TO KNOW MORE? GET IN TOUCH WITH…**

Ian Sharp
Commercial Relations Manager
ian.sharp@ed.ac.uk
An Egyptian mummy, shrouded for over 2000 years, has given up its inner secrets never seen before, revealed in true 3D thanks to a unique collaboration between the University and Edinburgh-based 3D holographic imaging specialist Holoxica.

Originally excavated from a tomb in Thebes (Luxor) almost 155 years ago, the Rhind Mummy has been in the National Museum of Scotland’s collection ever since. Until recently, no one knew what was contained inside the mummy, but a series of CT scans carried around 10BC. She was holding a papyrus scroll in her right hand—the so-called ‘Book of Breathing’, with instructions to help her on her journey into the afterlife.

Virtual examination and analysis revealed that the mummy was an Egyptian female in her late twenties, 1.58m (5’ 2”) tall dating back to around 10BC. She was holding a papyrus scroll in her right hand—the so-called ‘Book of Breathing’, with instructions to help her on her journey into the afterlife.

Dr Elena Kranidi, a forensic anthropologist at the University, and Dr Martin Connell, a visualisation engineer at CRIC, believed they could retrieve more intricate detail on the mummy. The team have been working with Holoxica to assess the feasibility of making a 3D hologram to depict the mummy more accurately, using the 3D hologram imaging process developed by Holoxica.

Javid Khan, Managing Director of Holoxica explains: “This mummy will never be opened and will always remain intact, so the only way to look inside is to use state of the art scanning and visualisation techniques. The colour animated hologram is the best way to depict this artefact, which is lifesized and shows a level of depth, detail and realism that is difficult to demonstrate in any other way.”

Professor Auer said: “The energy and the fine grasp of the underlying science by STA’s Florian Reuter and SE’s Fergus McKenzie has been essential in realising this new opportunity in the field of label free detection technology. Initially, SESMOS is aiming to build a service business around this novel ultra-high throughput method of screening for both internal drug targets from the SULSA Universities, as well as for target proteins of customers based in the pharmaceutical sector.”

Edinburgh Research and Innovation were able to partner with Good Practice, providing supporting information for their client proposal and, once successful, structure a 6 year licence deal that would allow the company to publish targeted, sector-specific case studies, role plays, articles, learning resources and training packs that Graham had developed on the online portal for the National College for leaders.

Edinburgh Research and Innovation as part of the National College contract brings our expertise out to schools to an extent we would not be able to reach without this partnership.”

Peter Casebow, Chief Executive of Good Practice, said: “When we had the opportunity to bid for the National College for Leadership work, I wanted to be able to differentiate our response by adding the best teaching expertise that I could bring our expertise out to schools to an extent we would not be able to reach without this partnership.”

www.RESEARCH-Innovation.ED.AC.UK
MEETING THE CHALLENGE OF A GREENER FUTURE

Climate and energy policy in the UK and internationally depends heavily on capturing and storing atmospheric carbon dioxide. Yet political and public understanding of the suite of storage processes and technologies – which, in the broadest sense, comprises geological, chemical and biological storage of carbon dioxide – remains woefully low, despite growing business opportunities around the world.

The principle behind capturing and storing carbon dioxide is simple. All major countries have committed to limiting greenhouse gas emissions to try and ensure global mean temperatures do not rise more than 2 degrees Celsius above pre-industrial levels. Limiting concentrations of atmospheric carbon dioxide (a key greenhouse gas) can be achieved by reducing fossil fuel use; capturing and storing emissions of carbon dioxide in geological or chemical reservoirs; or by maintaining or enhancing natural storage of carbon dioxide in vegetation and soils (and potentially in the ocean). Each of these approaches has been recognised, and has resulted in a number of recent examples concerned with the captured carbon within formal carbon accounting frameworks; and managing risks – and public perceptions of risks associated with loss of the carbon storage.

Increasingly, then, the focus is moving beyond individual engineering technologies or the scientific understanding of biological processes. It is now on identifying how we can deliver the overarching package of financing, regulations, accounting and reporting frameworks to enable and scale carbon dioxide storage arising from technology innovation and scientific knowledge, in a way that is acceptable to the wider public and political realm. Also, how can we support innovative businesses to develop tools and services to meet market needs in this emerging space?

With this in mind, the Edinburgh Centre for Carbon Innovation (ECCI) works to bring together the public and private sector to tackle these complex challenges. Where specific expertise or skills are needed, ECCI starts with the business or Government policy problem and works back to identify where and what advice or knowledge from the University sector – whether science or engineering or social science – and/or skills training will contribute.

The Centre’s business innovation activity is organised into key clusters, including carbon finance, carbon accounting, green ICT, ecosystem services, sustainable transport and the built environment.

Recent examples concerned with biological storage of carbon dioxide include working with public and private agencies to explore use of bond markets to finance afforestation projects in Scotland, similar issues resonate with its deep peat soils. Research at the University of Edinburgh into mapping and monitoring carbon in the atmosphere, vegetation and soils is also internationally recognised, and has resulted in a number of University-supported spin-out and start-up companies, such as Ecometrica, ENDS Carbon, Carbon Masters and Carbomapping.

The Edinburgh Centre for Carbon Innovation (ECCI) aims to be a global focal point for low carbon networks, from business, finance and the public sector, coming together to deliver a low carbon future.

EXAMINED BY ANDY KERR, DIRECTOR OF THE EDINBURGH CENTRE FOR CARBON INNOVATION

These include:

- Developing appropriate regulatory frameworks;
- Providing fiscal frameworks to encourage the necessary financing by public and private investors;
- Measuring, monitoring and reporting the captured carbon within formal carbon accounting frameworks; and
- Managing risks – and public perceptions of risks associated with loss of the carbon storage.

The University of Edinburgh, through research leaders, like Professors Stuart Haszeldine OBE and Stefano Brandani, is internationally recognised for its work in this sphere, with geoscientists and engineers working closely with industry partners to support the understanding required for developing full-scale pilot CCS plants.

The role of biological storage of carbon dioxide rose to the top of the international agenda during international negotiations in Cancun, Mexico, in 2010. All major countries agreed to slow, halt and reverse forest loss and related greenhouse gas emissions.

Within Scotland, similar issues resonate with its deep peat soils. Research at the University of Edinburgh into mapping and monitoring carbon in the atmosphere, vegetation and soils is also internationally recognised, and has resulted in a number of University-supported spin-out and start-up companies, such as Ecometrica, ENDS Carbon, Carbon Masters and Carbomapping.

Common, complex challenges exist for enhancing or developing biological and geological storage of atmospheric carbon dioxide.

- More information: www.edinburghcentre.org

All major countries agreed to slow, halt and reverse forest loss and related greenhouse gas emissions.

The ECCI has three strands of work:

- Policy interface - including “ClimateXChange”, which is the Scottish Government low carbon and climate policy interface;
- Low carbon business innovation - working to support low carbon products and services from Scottish companies;
- Low carbon executive education and skills.

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Hosted by the University of Edinburgh, the ECCI is a partnership between Edinburgh, Heriot-Watt and Edinburgh Napier University.

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- Policy interface - including “ClimateXChange”, which is the Scottish Government low carbon and climate policy interface;
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- Low carbon executive education and skills.
UK government support for the development of carbon capture and storage (CCS) technologies announced earlier this year includes funding for research at Edinburgh that will bring university researchers and industry together to address one of the key questions - how liquids and solids used to capture carbon dioxide will stand up to long-term exposure to real combustion products from coal and gas power plants.

Packing the facilities of a university lab into a specially-built shipping container, the Advanced Carbon Testing in a Transportable Remote Operated Mini-lab (ACTTROM) facility is being designed and built at the University by Professor Jon Gibbins and his research team from the School of Engineering. At 6 metres long and 2.4 metres wide, ACTTROM is simple and easy to transport on a single lorry. This allows for off-site construction and testing at a range of host power stations, without the need for expensive pilot plant equipment to be set up at multiple locations.

The project is one of several advanced carbon capture facilities being developed for the newly formed UK Carbon Capture and Storage Research Centre, with funding from the Engineering and Physical Sciences Research Council and the Department of Energy & Climate Change.

ACTTROM is an important innovation because a wide range of new technologies, including liquid solvents, solid adsorbents and membranes, are being developed to separate carbon dioxide for storage. In-situ testing is a vital step, to determine their operating values under realistic conditions. ACTTROM test modules will operate for extended periods of time at minimal cost compared to a larger pilot plant rig. The capture materials will then be analysed in the University labs.

At 6 metres long and 2.4 metres wide, ACTTROM is simple and easy to transport on a single lorry.

Jeremy Carey, Technology Manager at Scottish and Southern Energy (SSE plc) said: “The ability of the ACTTROM mobile lab to provide data from a range of capture technologies, on a variety of flue gases and operating conditions, will be a hugely beneficial resource in planning future carbon capture plants and reducing the cost of the technology.”

Children as young as 18 months with autism could be helped to improve their social skills thanks to an iPad app developed by researchers at the University of Edinburgh in partnership with games developer, Interface3 Ltd. FindMe is a simple game designed for pre-school age children with Autism Spectrum Disorder, specifically those who are most severely affected by social and communication deficits, including children who are completely non-verbal with very limited social interactions or play skills.

The game was designed and developed through the University’s ‘CLICK-EAST’ research project, funded by the Nuffield Foundation. The project was led by Dr Sue Fletcher-Watson based at the School of Education, in collaboration with the Learning & Adaptive Environments Research Lab in Informatics and Animation studies from Edinburgh’s College of Art. The app allows the player to practice basic social skills in a safe and non-threatening way – namely, to follow social cues and prioritise social information in the environment. The app directs the child’s attention to a person on the screen who asks, “Can you find me?”. Using the iPad’s touch screen, players simply tap the character to move onto the next level. The game scenarios become progressively more complex introducing more distractor objects and scenes.

Interface3, a University start-up company, was approached by Edinburgh Research and Innovation as a potential commercial partner for the project and immediately expressed an interest. The award-winning Edinburgh based company was an obvious partner for the group, specialising in designing, developing and publishing collaborative and social learning educational games on touch surface and mobile media.

Kate Ho, Managing Director of Interface3, made the decision to license the software early in 2012, under terms that allowed Interface3 to publish a free trial version on the App Store. Given the potential global reach, the company made the game available with character voiceovers in many different languages, including French, German, Chinese and English (in British and American accents).

The product had a hugely successful launch, attracting the attention of international media and achieved more than 22,000 downloads in the first 7 months. Interface3 is now developing a premium version of the complete game, which they aim to launch by the end of the summer. The product had a hugely successful launch, attracting the attention of international media and achieved more than 22,000 downloads in the first 7 months. Interface3 is now developing a premium version of the complete game, which they aim to launch by the end of the summer.

Kate said: “The main reason we were so interested in this project is that it gives us an opportunity to use our experience and expertise to make educational games available to a group of children that could potentially really benefit.”

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FSB Enterprises Ltd is a social enterprise company created by Fife Society for the Blind to provide employment for blind and visually impaired people and promote awareness of their needs to commercial and public services. As part of this activity, they evaluate and supply technology products that add to the quality of life for blind and visually impaired people.

With funding support from the Scottish Funding Council’s Innovation Voucher Scheme, FSB have been working with the University’s College of Art for guidance in translating complex map designs of local tourist attractions into simplified tactile graphics for use by the visually impaired. Their initial challenge to Kate McLean, designer in residence, and Zoe Patterson, Programme Director, in the Graphic Design group was to produce a tactile map of Edinburgh Castle.

According to Kate: “Creating tactile maps is part science and part aesthetic – it is far too seductive to believe that you can simply take a visual map and simplify it. If you clench your fist and open your hand until a tiny hole appears and then use this hole to look at the map you will have an idea about how a blind person sees a tactile map - one tiny section at a time. There is no overview, just a piecing together of information from the tiniest extracts.”

Kate spent five hours undertaking initial research in the company of a test subject, David Ross, blind since birth and a keen explorer. For sighted people, research suggests that 80% of our daily information comes from visual stimuli. David builds his comprehension and awareness of our shared world using the other four senses.

For David, a tactile map of a tourist attraction like Edinburgh Castle is not something that he would use to negotiate the route independently. So, what is the function of a tactile map of Edinburgh Castle?

One is that it can serve as a reminder of the visit, a chance to ‘re-walk’ the route through the experience at a later date. The other is a chance to understand the relationship between the buildings on the site (there are many), their scale and the organisation of the buildings within the walls of the castle. This can then be related to the points of interest contained within either a braille or audio guide.

David tested two prototype maps of the castle. His responses identified some key areas that tactile maps need to focus on, such as recognisable textures, sense of depth, limited points of interest and suggested paths/routes. Kate revised the design elements and proceeded to create bespoke lines, icons and symbols using a readily available software solution. She tested this by creating a second map of a completely different tourist attraction and printing them using plastic raised printing.

Alan Suttie at FSB Enterprises said: “What Kate has been able to pilot are graphics that use the minimum of material, are effective in communicating concepts and are useful to blind and partially sighted people. This has the potential to contribute to equal opportunities, supplementing the minimal information that can be conveyed by speech and language alone. We will be taking this concept and using it through our social enterprise company to not only create meaningful graphics but to provide employment opportunities for blind and partially sighted people.”
In the last ten years, entrepreneurship at the University of Edinburgh has been transformed into a cornerstone of commercialisation and knowledge transfer strategy. That transformation has been affected both by Edinburgh’s commitment to build world-class enterprise support and by the enthusiasm of staff and students to be entrepreneurial. Together, they have made Edinburgh the sector leader in University enterprise in the UK within the last three years, surpassing the performance of Oxford, Cambridge and Imperial.

Fundamental to Edinburgh’s success has been the personal commitment of the Principal and his Vice Principals to building an enterprise culture. In the past five years, substantial funding has been allocated to increase enterprise awareness, to promote entrepreneurship and to build best practice in dedicated start-up support programmes for staff, researchers and students. All now have easy access to that network and can engage as they wish – first tentatively but then with confidence that they will be treated respectfully and supported fully.

Critically, Edinburgh’s network is not limited to formal support teams. Other elements of this successful ecosystem include peer-learning groups, societies, entrepreneurs-in-residence, networking events, idea exchanges, competitions and workshops. This organically evolving environment serves the needs of entrepreneurs holistically, providing immediate and individualised business support, as well as a network of potential mentors, business partners, investors and customers that links to the wider community. The experience is fundamentally enabling.

Edinburgh’s students have been the most enthusiastic participants in this transformation, supported by the University’s internationally renowned LAUNCH.ed student enterprise programme. For years, Edinburgh students have dominated Scottish business competitions, and are now making a demonstrable economic impact. Moreover, participation comes from every discipline; from history to medicine and from theology to physics, bright new entrepreneurs have emerged.

The enthusiasm generated by student entrepreneurs has spread to staff, where entrepreneurship is increasingly strong. Edinburgh’s growth in spin-out companies formed year on year has propelled it to the top position in the UK. For many academics, company formation is now seen as the default route to commercialise research and as an ideal career progression. Edinburgh’s employment policies now encourage entrepreneurial staff with sabbaticals, secondments, part-time commitments and revenue sharing arrangements – all enabling factors.

The message from Edinburgh is clear. Our commitment to enterprise will continue. Whilst there is pride in Edinburgh’s reputation, ambitions are still higher.

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perhaps the most significant news to hit the early-stage technology company sector in Scotland this year was delivered in February - by ERI. It was then that details of the ERI’s strategic relationship with the venture capital group MTI went public and the countdown began to the launch of Scotland’s first major new early-stage venture capital fund for more than a decade.

The Orion Fund will be a significant venture capital fund, managed by MTI, which will be invested primarily into new companies and commercialisation projects emerging from the University of Edinburgh, the University of Manchester and University College London. Fundraising for the Orion Fund began in the summer of 2012 with an ultimate target of £150 million and a ‘first-close’ planned for early 2013 expected to be in the order of £100 million.

Early 2013 will also see the arrival of MTI in Edinburgh with a small team headed by one of its senior partners. MTI has experience in managing a similar fund at the University of Manchester for the last five years. This experience has allowed MTI to build expertise and understanding of university commercialisation processes. This has also provided ERI with a chance to consider how MTI might best interact with early-stage technology companies emerging from the University of Edinburgh.

Notably though, the Orion Fund will have no exclusive rights to ERI’s deal flow – so any University project will be free to raise funding elsewhere if they wish to. This arrangement works both ways however, and MTI will be free to consider investments in early-stage technology companies throughout Scotland, from the University sector and elsewhere.

It would be one of the biggest venture capital fundraisings of recent years.

The target size of the Orion Fund is ambitious, especially in the current economic climate. It would be one of the biggest venture capital fundraisings of recent years. Critically, MTI is committed to invest alongside local investors as well as introducing their existing co-investment partners from the South East and the United States.

The announcement of the Orion Fund marked a further step forward in ERI’s efforts to increase the supply of investment funds to early-stage technology companies. As well as maintaining very close relations with Scotland’s many business angel syndicates and with the Scottish Investment Bank, ERI also led in the creation of Old College Capital, the University’s own investment vehicle for high-growth potential companies.

ERI’s work in 2012 has led to fundamental changes to the early-stage technology company scene in Scotland. However, its work in enhancing the availability of investment funds to those companies is far from over. Critically, MTI is also committed to that challenge and the impact on the whole Scottish economy promises to be game-changing.

Grant Wheeler, Head of Company Formation
grant.wheeler@ed.ac.uk
When a new company is formed at the university, this is not the end of the story as far as Edinburgh research and innovation is concerned. We take an active interest in following their progress as they fulfill the potential we saw in them. Here are some examples of how New University of Edinburgh enterprises are starting to make an impact.

**Mobile Acuity Ltd**

Mobile Acuity emerged from the School of Informatics in 2006, having developed innovative image recognition technology that now underpins Mobile Acuity’s software for camera phones linking offline advertising, such as billboards, with online promotions. The Edinburgh-based company now has a presence in North America and Asia and their client list reads like a who’s who of the corporate world, including the likes of Disney, Nike, Pepsi, Adidas, Vodafone and Tesco. An investment including the likes of Disney, Nike, Pepsi, Adidas, Vodafone and Tesco. An investment including the likes of Disney, Nike, Pepsi, Adidas, Vodafone and Tesco. An investment including the likes of Disney, Nike, Pepsi, Adidas, Vodafone and Tesco. An investment including the likes of Disney, Nike, Pepsi, Adidas, Vodafone and Tesco. An investment including the likes of Disney, Nike, Pepsi, Adidas, Vodafone and Tesco. An investment including the likes of Disney, Nike, Pepsi, Adidas, Vodafone and Tesco. An investment including the likes of Disney, Nike, Pepsi, Adidas, Vodafone and Tesco.

**Fios Genomics Ltd**

Fios Genomics was formed in 2008 to deliver better data analysis in the fields of genomics, backed by a management team with a proven track record in the fields of genomics, bioinformatics, biostatistics, pathway biology and data visualisation. Fios provides an extensive range of services, such as biomarker discovery, pharmacogenomics, SNP genotyping, predictive toxicology and DNA sequencing to researchers, pharmaceutical companies and CROs. In 2012, Archangel Informal Investment led an investment round into Fios Genomics, with a view to seeding a rapid scale-up in the company’s operations.

**Ngentec Ltd**

Ngentec’s permanent magnet generator technology offers a platform for the next generation of wind and wave powered renewable energy installations. The company emerged from the School of Engineering’s Institute for Energy Systems in 2009. Since then, Ngentec has recruited an impressive management team and secured investment in excess of £6 million. Ngentec’s latest prototype, a 6 megawatt stacked generator, was successfully tested in the summer of 2012 and work is now underway to offer a product that will break new ground in renewable energy.

**PureVLC Ltd**

PureVLC was spun out from the School of Informatics in 2010 and raised an initial investment from prominent Scottish angel groups to develop their revolutionary video analytics technology for the pre-clinical life sciences market. The last year has been particularly successful for the company, having signed an exclusive distribution agreement with a global market leader in behavioural research instrumentation, and securing follow-on funding to scale-up their international sales & marketing activities. The company is now poised to exploit their products in new markets and are currently embarking on an ambitious programme of growth.

**SenseWhere Ltd**

SenseWhere (originally called SATSIS) was a spin-out from the School of Engineering in 2010 to commercialise ground-breaking crowd-mapping technology that overcomes the technical challenges of indoor positioning to provide highly accurate location-based information to smartphones users. The company received a SMART:SCOTLAND R&D Grant in 2012 to further develop the technology for this growing and lucrative global market. SenseWhere have since launched a social media mapping app (snapp!) which links with Facebook, Twitter and FourSquare.

**DEMSolutions Ltd**

In October 2011, DEM Solutions was ranked in the top 50 fastest-growing technology companies in the UK. DEM emerged from the School of Engineering in 2003, where Dr John Favier, now the company’s CEO, led research into the behaviour of granular particles, which underpins DEM’s EDEM™ simulation platform. DEM’s prominence in the Deloitte Technology Fast 50 is due to its success in generating an 852% growth in revenue over the past five years, with sales to industry sectors as diverse as energy, mining and pharmaceuticals.

**SkoogMusic Ltd**

Skoogmusic was a spin-out from the University in 2009 that has successfully developed its prototype musical instrument (‘Skoog’) into a manufactured product, which they are now making and shipping across the globe. The company received an investment round in January 2012 and the Skoog featured in the 2012 Cultural Olympiad, as part of a specially commissioned piece called ‘Technophonia’, performed by an ensemble of young musicians with disabilities at the Southbank Centre’s New Music 20X12 weekend.
The University of Edinburgh’s knowledge transfer network focussing on electrical system design in renewable energy applications (RenewNet) continues to grow and expand its activity with Scottish SMEs, thanks to new funding, primarily from the Scottish Funding Council and European Regional Development Fund (ERDF).

RenewNet has now expanded the partnership, to include Heriot-Watt University and the University of Aberdeen alongside its existing core academic partner universities of Edinburgh, Glasgow and Strathclyde.

The RenewNet network moved into Phase II in August 2011 and has improved its knowledge transfer offering to Scottish SMEs, based on the experiences and feedback received from its industry clients from the initial successful Phase I programme that lasted for three years.

RenewNet has established a network of knowledge exchange fellows with technical expertise in electrical system design to provide support to SMEs and forge more effective communication links between small businesses in the renewable energy sector and the Scottish science base.

The RenewNet company interaction strategy has now developed into the following successful working model, involving a two stage delivery plan with each new company contact. The first stage involves scoping out a development plan that outlines clear objectives and a road map for the SME with the identified university partner. The second stage would then implement the agreed development plan with the SME over a period of up to three months activity.

“This project has encouraged us to forge closer relationships with academic institutions in the future.”

This later activity can be likened to a micro-Knowledge Transfer Partnership project. The intention after this two stage delivery plan would be that the SME and the university partner would then be in a better position to raise further funds for a longer term collaboration ultimately leading to product development.

This new model is exemplified at the University of Edinburgh through two successful RenewNet collaborations with Gaia Wind and Optimal Energies.

GAIA WIND LTD
Gaia Wind, one of the UK’s leading manufacturers of small wind turbines, needed expertise in wind-diesel hybrid systems to support their development of a new hybrid commercial system.

Through contact with Interface – the knowledge connection for business, RenewNet identified the appropriate expertise in Professor Markus Mueller and Dr Jonathan Shek of the Institute for Energy Systems at the University of Edinburgh.

Dr Shek worked with Gaia Wind as a Knowledge Exchange Fellow for three months on the new product they are developing. The collaborative nature of the project enabled the essential technical skills and expertise to be transferred and embedded into Gaia Wind’s engineering team, through working in close partnership with Dr Shek and Professor Mueller. This added value and impact way beyond the end date of the project.

The success of the project will lead to the development of the suggested systems as part of the company’s R&D strategy.

Johnnie Andringa, CEO of Gaia Wind, said: “This project has encouraged us to forge closer relationships with academic institutions in the future.”

OPTIMAL ENERGIES LTD
Optimal Energies approached RenewNet in August 2010 to assess the feasibility of a project to investigate the energy saving potential of a three-phase microprocessor-controlled ‘Energy Optimising Soft Start’ unit for driving a motor with variable loading under laboratory conditions.

RenewNet matched Optimal Energies with Dr Ewen Macpherson and Dr Jonathan Shek of the Institute for Energy Systems at the University of Edinburgh, where the institute’s ‘Machines Laboratory’ was ideally equipped for the project. RenewNet also provided funding to support this collaborative project.

The concept was straightforward: Optimal Energies would supply the Energy Optimising Soft Start units and the calibrated power meter; and the University would supply the motor, three-phase variable resistor bank and technical input.

Dr Shek worked with Optimal Energies as a Knowledge Exchange Fellow on a test programme and data analysis that provided the company with empirically based evidence that enabled them to advise commercial clients on how best to reduce the energy consumption of their installed rotating electrical plant.

Colin Hall, Operations Director at Optimal Energies, said: “We were pleased with the open minded enthusiasm of both RenewNet and the University of Edinburgh.”
Influenza (flu) is a major health threat to both humans and animals and causes productivity losses in pigs and poultry. Influenza is caused by an RNA virus which evolves rapidly, resulting in emergence of new strains and affecting the efficacy of vaccines and other treatments. In order to tackle flu, multiple approaches are needed, tailored to each species. Researchers at the University’s Roslin Institute are combining their knowledge of virology and mammalian and avian biology to come up with innovative ways to tackle these troublesome viruses.

**CONTROL OF BIRD FLU USING GENETIC MODIFICATION**

Flu is an infectious disease caused by viruses that infect both birds and mammals. The virus can be detected in many different species, but domesticated animals, such as poultry and pigs, tend to be the most common transmitters of new strains of flu to humans, occasionally causing particularly dangerous outbreaks, such as the worldwide H5N1 bird flu outbreak of recent years. Infectious diseases of livestock represent a significant threat to global food security and the potential of pathogens, such as bird flu, to jump to humans and become pandemic has been identified by the Government as a top level national security risk.

In a collaboration initiated by virologist Dr Laurence Tiley at the University of Cambridge, Professor Helen Sang at the Roslin Institute produced chickens genetically modified to prevent them spreading bird flu. The BBSRC-funded project developed genetically modified (GM) chickens that do not transmit bird flu to other chickens with which they are in contact. This genetic modification has the potential to stop bird flu outbreaks spreading within poultry flocks. This would not only protect the health of domestic poultry, but could also reduce the risk of bird flu epidemics leading to new flu virus epidemics in the human population.

A new gene was introduced into the chickens, which manufactures a small ‘decoy’ molecule that mimics an important control element of the bird flu virus. The replication machinery of the virus is tricked by the decoy molecule which interferes with the virus replication cycle. When the GM chickens were infected with bird flu, they became sick, but did not transmit infection to other chickens, even if the other chickens were standard (non-GM) birds.

Unlike conventional flu vaccines, which must be updated when the virus mutates, the decoy used in these GM chickens is expected to work against all strains of avian influenza, and the virus will find it difficult to evolve to escape the effects of the decoy.

**FLUPEP – AN ANTI-INFLUENZA PEPTIDE**

When it comes to combating influenza in humans, both vaccination and antiviral drug strategies are used. As the virus remains a major cause of global, pandemic-scale morbidity and mortality, the need for novel, effective and safe therapies is acute.

Vaccines are only partially effective because of the variety of different circulating strains of influenza at any one time. Current anti-influenza therapy options are also restricted in efficacy by the virus evolving and becoming resistant.

Over 80% of currently circulating influenza strains are already resistant to the market leading anti-viral drug. Therefore, treatments and prophylactics against the entire spectrum of influenza strains, and which are not subject to drug-resistance, are much-needed.

With support from the BBSRC Follow-on-Fund, Professor Tony Nash and Dr Bernadette Dutia in the Roslin Institute have been working on developing a new generation of broad-spectrum anti-influenza peptides with the scope to treat, as well as prevent, flu. They’ve named it ‘Flupep’.

Flupep works differently to currently available anti-viral treatments, as Professor Nash and Dr Dutia explain: “Currently used anti-virals allow the virus to enter the cell but then interfere with viral replication. Flupep is different as it blocks entry of the influenza virus into the cells they would normally infect. This mode of action differentiates the technology from currently available therapies and makes it less likely that the virus will develop resistance.”

Flupep has been under development for two years now and has been shown to be effective when tested in animal models of flu, as well as non-toxic. The research group are now working with industrial partners to develop the treatment further.

Dr Deborah A. O’Neil, CEO/CISO of NovaBiotics Ltd said: “Flupep is a genuinely exciting preclinical opportunity in the antivirals space; a much needed novel therapeutic candidate for a growing global market and a poorly served indication. With a solid platform of compelling data already underpinning Flupep’s anti-influenza potential, it will be exciting to track this compound as it develops further towards the clinic.”

With Flupep’s anti-influenza potential, it will be exciting to track this compound as it develops further towards the clinic.
TACKLING NEGLECTED DISEASES
HOW RESEARCHERS ARE KEEPING PACE WITH INFECTIOUS DISEASES BY ADOPTING A MORE PROACTIVE APPROACH

THE CRUCIAL LINKS BETWEEN ANIMAL AND HUMAN HEALTH
In areas like rural western Kenya the population survives by growing crops and keeping small herds of cattle, sheep, goats, pigs and chickens. These animals are the backbone of people’s domestic stability—providing essential food and nutrition, but they also serve as an investment, cashed in when the need for funds arises, which is often to pay for healthcare or school fees. It is for these reasons that diseases linked to animals are devastating for such communities.

Animal diseases make up 60 per cent of all human pathogens and have a significant impact on poverty. The diseases in question include: rabies; brucellosis; Rift Valley Fever; cysticercosis; bovine tuberculosis; and leishmaniasis. They are endemic, lingering diseases, originating from an animal source that mostly affects poor communities in remote rural areas, but also in slums in the developing world.

CIIE researcher Dr Eric Fèvre and his research group are tackling these zoonotic diseases through their ‘People, Animals and their Zoonoses’ project, funded by the Wellcome Trust and hosted in Kenya by the International Livestock Research Institute (ILRI) and the Kenya Medical Research Institute (KEMRI).

In parallel, Professor Mark Woolhouse from CIIE and others are investigating the infectious disease burden of East African cattle through an intensive longitudinal study. The teams operate a research laboratory in western Kenya undertaking several field activities in livestock and humans.

Dr Fèvre is also consulting for Vestergaard Frandsen, a Danish company seeking to test one of their disease containment products. He is working with the company to help set up field trials to evaluate impregnated netting for use on cattle sheds, with the aim of preventing entry of disease carrying tsetse flies and ticks.

In the vector system, the key antigens are the subject of a patent application and the team are working with Edinburgh Research and Innovation to improve cattle health and performance. As a universal carrier it could equally be used to carry other useful proteins or therapeutics to protect against disease or improve cattle health and performance.

The technique, using a parasite called Trypanosoma (Megatrypanum) theileri, offers a new approach to vaccinating cattle. Although a number of trypanosomes are significant causes of human and animal disease, some species, including T. theileri, are harmless.

The new approach involves inserting genetic material encoding the vaccine antigen into the parasite’s DNA. The manipulated parasite can be administered to cattle where it can continue to exist in the animal’s bloodstream, releasing small amounts of antigen slowly over time.

This vaccine delivery system works due to its global distribution in cattle and because, once established in the host cow, it is sustained at a low level throughout the animal’s lifetime.

NEW TARGETS TO PREVENT SEVERE MALARIA
Currently, between 10 and 20 per cent of people with severe malaria die from the disease, which is spread by blood-sucking mosquitoes claiming about one million lives per year.

Professor Alexandra Rowe has identified a key protein that is common to many potentially fatal forms of the condition. The protein has sticky properties that enable it to bind to red blood cells and form dangerous clumps, or rosettes, that can cause severe illness, including coma and brain damage.

These surface proteins are usually poor targets for treatments or vaccines because they are highly variable between different malaria parasite strains. Professor Rowe’s work has established that the surface proteins of rosette-forming parasites share similarities that may allow them to act as targets for treatments or vaccines because they are highly variable between different malaria parasite strains. Professor Rowe’s work has established that the surface proteins of rosette-forming parasites share similarities that may allow them to act as targets for treatments or vaccines because they are highly variable between different malaria parasite strains. Professor Rowe’s work has established that the surface proteins of rosette-forming parasites share similarities that may allow them to act as targets for treatments or vaccines because they are highly variable between different malaria parasite strains. Professor Rowe’s work has established that the surface proteins of rosette-forming parasites share similarities that may allow them to act as targets for treatments or vaccines because they are highly variable between different malaria parasite strains. The new approach involves inserting genetic material encoding the vaccine antigen into the parasite’s DNA. The manipulated parasite can be administered to cattle where it can continue to exist in the animal’s bloodstream, releasing small amounts of antigen slowly over time.

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As a universal carrier it could equally be used to carry other useful proteins or therapeutics to protect against disease or improve cattle health and performance.

The vector system is the subject of a patent application and the team are working with Edinburgh Research and Innovation to identify collaborative partners or companies wishing to evaluate the system.

The challenges in the combat against infectious diseases in the twenty-first century remain significant.
DEEPER INSIGHTS

PARTNERSHIP HELPS IMPROVE PRODUCT FORMULATION

The Mentholatum Company Ltd has a reputation spanning over 100 years in manufacturing some iconic healthcare products, including Deep Heat®, Deep Freeze and Deep Relief®, which they supply to markets in the UK, Europe, the Middle East and Africa.

The company is keen to embrace technology and innovation in developing new products. Mentholatum collaborates with several universities and technology companies, bringing together combined expertise to pioneer new techniques and resources not normally available to industry. This is seen as an excellent way to extend the life cycle of core products and introduce new technologies with a genuinely competitive edge.

Mentholatum has invested heavily in the development of a new £8 million processing facility at their East Kilbride base. With hi-tech manufacturing and packing equipment being installed in this new facility, the company was required to ensure that product made at the new scale would be identical to that from the existing facility. This required expertise in understanding the complex behaviour of materials under shear.

In 2011, Mentholatum identified that the Edinburgh Complex Fluids Partnership (ECFP) at the University of Edinburgh, which provides consultancy services in the formulation and processing of complex fluids, such as dispersions, emulsions, gels and liquid crystal composites, would be an ideal partner for this project. Professor Wilson Poon and his ECFP colleagues are internationally renowned for this type of work. ECFP houses state-of-the-art equipment for imaging the three-dimensional microstructure of products under shear, which allows the causes of material breakdown to be accurately identified. Such complex shear behaviour is important to understand since it not only dictates how processes must be employed when making a product, but it also affects the experience of the consumer when squeezing it out of a tube and spreading it on the skin.

Through this relationship with ECFP, the company has gained insights into the physical properties of their existing products, which will enable them to screen for new product development prototypes on the basis of objective evidence and hard data rather than subjective assessments alone.

Colin Brown, Director of Research & Quality Development at Mentholatum, commented: “ECFP has been able to identify solutions that could improve production processes such that the operational efficiencies can be realised in due course.”

Dr Tiffany Wood, who runs the Edinburgh Complex Fluids Partnership, said: “Working with Mentholatum has given ECFP an excellent insight into the development of formulations for optimising the experience of the consumer.

EXPLORING SOLUTIONS

Working with Mentholatum has given ECFP an excellent insight into the development of formulations for optimising the experience of the consumer.

Darcy Technologies Ltd, a design engineering company for the oil and gas industry, is collaborating with the University of Edinburgh to access geo-mechanical/rock mechanical expertise to explore the effects of their technology on wellbore stability and to further develop their product knowledge.

The Aberdeen-based company’s focus is on providing solutions to replace gravel packing, expandable and standalone screens, and to offer significant production benefits, as well as technical and commercial value. As the downstream environment has become more demanding, previously established sand control techniques may not offer the most efficient or cost-effective method of well completion. This factor allowed Darcy to move into the marketplace with their new technology, which addresses the challenges facing the sand control industry as global hydrocarbon extraction becomes increasingly more complex.

Darcy’s technology addresses the problem of sand mobilisation. This is a major concern within the oil and gas industry due to the substantial cost implications associated with sand entering the wellbore from unstable downhole environments. The technology works by applying radial forces to the near wellbore that causes a stress to be applied to the formation, referred to as “Positive Compliance®”. This positive compliance maintains both the wellbore and formation integrity, which in turn prevents the mobilisation of particles. This technology is unique to Darcy and the company hold a patent to protect their methodology.

In order to commercialise their technology, the company needed a comprehensive understanding of the extreme conditions under which their unique technology will function and of any limitations there could be. To date, there has been very little research undertaken regarding the formation of the wellbore region during oil and gas extraction. Darcy believed that specific research was imperative and looked to academic partners to undertake this research to enable them to understand the full extent of their technology’s range.

Darcy turned to Interface – the knowledge connection for business to find the necessary expertise for their project. The company were matched with Professor Ian Main, an international expert in rock physics and geo-mechanics, from the University’s School of GeoSciences. This project was funded through the Scottish Funding Council (SFC) Innovation Voucher Scheme.

Professor Main worked with Darcy, looking at the pre-existing research published within this field, providing a review of the geo-mechanical effects of the reservoir production and to determine what prior industry knowledge was available for deformation and its effects on petrophysical properties.

Due to the success of the initial feasibility study, the partnership has continued and the project has received continued funding support through an SFC Follow-On Innovation Voucher to deliver a verified working model for evaluating the petrophysical effects of positive compliance on near well-bore rock formations.

According to Professor Main: “Darcy Technologies Ltd has developed an innovative solution to the problem of unwanted sand production from oil wells. We have helped so far by reviewing the general subsurface mechanical environment that the new product would work under. However, we are looking forward to continuing the collaboration by looking more closely at how the system might perform close to the well.”

Dave Noblett, Completions Manager at Darcy Technologies, said: “The results of an initial study project, conducted by the University of Edinburgh on Darcy’s behalf, demonstrated the value to our company in having a relationship with a first class resource and knowledge pool. Following on from the initial study results, Darcy has continued to develop the field of interest and is now building its relationship further with the University by conducting a follow-on project.”

WANT TO KNOW MORE? GET IN TOUCH WITH...

Moira Boyd
Consultancy Manager
moira.boyd@ed.ac.uk

ACCESSING UNIVERSITY EXPERTISE LEADS TO NEW PARTNERSHIP

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Ecocreel Fayre Ltd has been working with the University to help develop the ‘Ecocreel’, a unique innovation with environmental credentials that will help the fishing industry.

The Ecocreel product is distinguished from others within its current market. It reduces the space required on deck, has an ease of surface presentation and recovery, minimises tangle, and allows vessels to carry up to three times the amount of creel, resulting in lower fuel consumption. Reducing rope lengths required and minimising tangle can potentially save lives, reducing rope lengths required and minimising tangle can potentially save lives.

Within the adaptability of the invention there are features that lend the Ecocreel for the spider crab fishing industry in the Barents Sea. The new shape of the Ecocreel design reduces the risk of ‘ice up’, thereby circumventing the previous health and safety dangers of vessel capsize encountered by vessels using the current ‘box shaped’ products within the market. The company were also aware of the product’s impact upon the environment and have, therefore, ensured that the new design has less contact with the seabed, resulting in less damage to Plankton life.

Douglas Bryden, head of Product Design, and his colleague Ingo Aurin, an industrial designer, within the University’s College of Art Product Design department. Funding to support this project was obtained through the Scottish Funding Council (SFC) Innovation Voucher Scheme.

The company did not have the required in house product development expertise to take the initial patented idea from concept to prototype form. They contacted Interface - the knowledge connection for business for help in identifying the necessary expertise for their project. Interface helps partner companies work towards a realisation of sustainable sea fishing in Scotland and worldwide. Everybody involved in product development discusses sustainability and plenty of case studies and pilot projects have been published, but only a few companies work towards a realisation of sustainable products.

The company are now looking to build upon their established relationship with the University with a view to developing the Ecocreel design and creating a 3D CAD model for a related product, which the company have also patented.

Ingo Aurin said: “We are fascinated by the effort Robert has put into the approach of sustainable sea fishing in Scotland and adapted well to client requirements.”

The Fincubator™ is targeted to provide 1,200 units as a life support system for the catch from the Ecocreel. It is ‘species adaptable’ and is designed to carry other crustaceans, bivalve molluscs and certain species of farmed fish. Further funding has been secured through an SFC Follow-on Voucher to allow the project to continue. The Fincubator™ is targeted to provide 1,200 units as a life support system for the catch from the Ecocreel. It is ‘species adaptable’ and is designed to carry other crustaceans, bivalve molluscs and certain species of farmed fish. Further funding has been secured through an SFC Follow-on Voucher to allow the project to continue.

Robert Johnston, Director of Ecocreel Fayre, said: “We discovered the inherent skills of Edinburgh’s College of Art through Interface’s introduction to that centre of learning and the Scottish Funding Council’s financial assistance arm. Edinburgh’s skills became apparent on a swift learning curve of the intricacies attached to the intellectual properties and adapted well to client requirements.”

The University of Edinburgh has supported business innovation within 30 organisations through the SFC Innovation Voucher Scheme since its introduction in 2006:

- Allander Print Ltd
- Biopla Ltd
- Blue Marmalade Ltd
- Cameron Communications
- Cellucmp Ltd
- Chop-Cloc (Scotland) Ltd
- Citizens Advice Scotland
- Clan MacRae
- Clarke + Spears International Ltd
- CPD Bytes
- Darcy Technologies Ltd
- Ecocreel Fayre Ltd
- Emotional Sciences Ltd
- FSB Enterprises Ltd
- Gientfinn Contracts Ltd (t/a AlbaTERm)

Edinburgh’s skills became apparent on a swift learning curve of the intricacies attached to the intellectual properties and adapted well to client requirements.
Working with Industry

Industrial Biotechnology

Industrial Biotechnology has the potential to help us meet the most urgent global challenges of sustainability, food security and energy provision in an era of declining fossil hydrocarbon sources for both energy and chemicals. Coupled to this is the need to reduce carbon emissions in response to environmental change.

This sector has considerable value to the UK economy, estimated to be between £4-12 billion by 2025. Unsurprisingly, the UK Government has, therefore, made ‘Industrial Biotechnology’ a key priority area for investment.

Industrial Biotechnology requires a set of cross-disciplinary underpinning technologies that make use of biological resources to process and produce chemicals, materials and energy.

Here at Edinburgh, researchers are working with industry on a diverse range of projects that are seeking to apply biotechnological solutions to develop and improve their products and processes.

**Development of Enzymes for Production of Pharmaceutical Intermediates**

Chemical compounds often exist in two forms – in effect as left- and right-handed versions. This property is known as chirality and it is important because the different versions can have very different biological activities.

Initiated through a BBSRC CASE Studentship, chemical company Chrotech have established a productive collaboration with Dr Dominic Campopiano of the University’s School of Chemistry.

Chrotech, a subsidiary of global pharma Dr Reddy’s Laboratories, supply pharmaceutical intermediates and active ingredients, and focus on the development of technologies that can produce chiral products. One of the company’s key commercial needs is to have robust and efficient technologies that can prepare chiral compounds. One means to achieve this is to use enzymes from biological sources in a ‘biontransformation’ process.

As one of Dominic’s research interests is in natural product biosynthesis, and in characterising and improving the activity of enzymes that generate these compounds, he has the right expertise to take this project forward whilst working with industrial partners.

Together with PhD student Scott Baxter, the team used evolution and selection techniques to improve the activity of a bacterial racemase enzyme that will enable the production of a range of key chiral intermediates. The team are currently seeking further BBSRC support to extend this process to other targets and scale up to a full industrial process.

Since completing his PhD studies Scott has taken a job with local company Ingenza Ltd (a spin-out from the School of Chemistry) who were also involved in the early stages of the racemase project.

**Exploiting the Carbon Sequestration Skills of Bacteria**

A three-year research project, led by Dr Bryne Ngwenya in the University’s School of GeoSciences, and involving researchers from the Universities of Granada, Lausanne, Neuchatel and Delft, and commercial partner Biomim-Greenloop, has been looking at a new way to capture and store carbon that utilises bacterial strains that naturally sequester carbon.

The discovery could lead to reforestation projects in tropical countries, and help reduce carbon dioxide emissions in the developing world. It has already been used in West Africa and is being tested in Bolivia, Haiti and India.

**Manipulating Plant Cell-Wall Polymers**

In collaboration with Bayer CropScience, Professor Stephen Fry of the Institute of Molecular Plant Sciences is investigating plant-derived enzymes that can be used to engineer plant cell wall components to have desirable properties.

Professor Fry is a plant scientist with a special interest in the biochemistry of plant cell walls. These walls are a rich source of unexpected enzymic activities, biochemical reactions and novel organic structures. Professor Fry is an expert at assaying the activities of these enzymes and probing their function. Bayer CropScience recognised this and was keen to work with Professor Fry to apply some of his results to their work to improve the properties of some of their crop seed products.

Aside from crops there are a number of other applications of this work. Modified plant cell wall components can be used in fabrics, adhesives, sizers for specialty papers and medical products requiring a material where properties can be changed at will.

The University has also been collaborating with companies in these areas of Industrial Biotechnology:

- Biocomposite materials - CelluComp Ltd
- Plant natural products - Unhwa Corporation
- Bacterial miners - Cleveland Potash Ltd
- Biomass processing - Ingenza Ltd
**GREEN INNOVATION**

**CLEAN SOLUTION TO A DIRTY PROBLEM**

Apsu Environmental Limited has been working with the University of Edinburgh for several years as it has grown from an embryonic start-up, through an earlier entrepreneurship scheme at the University, to become more established as a waste water treatment technology company.

The company’s pioneering surface water filtration systems technology is a joint development with the University to address the handling of Sustainable Urban Drainage Systems (SUdS) and road gully wet waste – a key challenge for road engineers and highways departments.

The system, known as Advanced Treatment Station (ATTS), offers large-scale reductions in the land needed by road engineers to build traditional SUdS by up to 80 per cent. Moreover, the technology helps to address the significant challenge faced by road engineers and highways departments in handling road gully and road sweepings waste.

**ATTS Treatment and Recycling Plant © Apsu Environmental**

The company’s proprietary technology, ATTS-TARP, provides a means of recycling road gully and sweepings waste in a Treatment and Recycling Plant (TARP). This technology allows the operator to use the recycled water to wash and refill the gully trucks, eliminating the previous practice of using drinking standard water.

The TARP separates ‘dewatered solids’ comprising mainly inorganic matter (for example, sand), which can be passed through a grit recovery system for reuse as a road fill material. Smaller organic materials, such as leaf mould and twigs, can be sent to a Mechanical Biological Treatment plant as a refuse-derived fuel or be composted as a soil improver. The remaining 2 per cent, consisting of inorganic materials, such as plastics, is the only element which goes to landfill.

The results for water treatment through the ATS are impressive, with removal of up to 76 per cent of total suspended solids, 99 per cent of hydrocarbons from oils/fuels and approximately 80 per cent of dissolved and heavy metals.

For Iain Robinson, Managing Director of Apsu Environmental, the entire concept was borne out of a need to find a collaborative academic partner to refine the water decontamination technology. He said: “This now gives us the platform to innovate and create the most robust Advanced Treatment Station applications for use in road engineering, highway construction and a number of areas where land reduction measures for SUdS and waste water recycling are critically important considerations to the construction planning strategy.”

Ian Murphy, ERI’s Head of Licensing, adds: “This world-class technology has the potential to transform the road construction industry. The University collaborated with Apsu Environmental over a number of years to bring it to a point where it is now ready to move forward commercially bringing tremendous national and international market opportunities.”

The company secured further investment to develop their growing business in 2012 from a consortium of investors, including Fibre-based private development and investment company Kapital Assets, The Scottish Co-Investment Fund and an injection of private investor cash.

**This world-class technology has the potential to transform the road construction industry.**

Sonja joined ERI in 2008 and provides dedicated business support to the world-renowned Roslin Institute and Royal (Dick) School of Veterinary Studies at the University.

From the outset, her approach has been to increase the number of Institute researchers involved in, and aware of, the added advantages of working with industry on a worldwide basis. Sonja placed this in the context of the changing world market need at the heart of all technology knowledge transfer activities conducted at the Institute.

In just over three years, this focused culture change has resulted in over 75% of the Institute’s group leaders becoming engaged in knowledge transfer associated activities.

Her industry-focused, client management-based approach has resulted in over 40 funding awards from various streams, the value of which exceeds £8 million, and underpinned the establishment of the five year multi-million pound EBCR Pfizer Partnership Platform in animal health.

The Roslin Institute’s Director, Professor David Hume said, “I am delighted that Sonja has received this award, which is just recognition for the dedication and innovation she has shown in her work at Roslin. Her enthusiasm and drive have been central to all that the Institute has achieved since she joined the University in 2008.”

**Sonja Murphy, ERI’s Head of Licensing**

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REAPING THE AWARDS
CONTINUED SUCCESS FOR EDINBURGH AT SCOTLAND’S PREMIER STUDENT ENTREPRENEUR AWARDS

In the recent past, University of Edinburgh students have proved extremely successful at Scotland’s premier showcase event for student entrepreneurs. After winning top honours in three out of the past four years, and with six of the 36 finalist places from Edinburgh, confidence was high when the 2012 awards came around.

The 2012 Scottish Institute for Enterprise (SIE) Awards are an integral part of SIE’s annual Enterprise Summit, which brings together hundreds of students from Scotland’s 19 universities who are interested in starting their own businesses. Leading entrepreneurs were invited to share their own experiences with the students attending the summit, including Jim McColl OBE, Chairman and Chief Executive of Clyde Blowers Capital; David Bunton, co-founder of Biopet; Lucinda Bruce-Gardyne, founder of Genius Foods; and Gregor Lawson, co-founder of Morphsuits.

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When the awards were announced, Edinburgh was able to celebrate its achievement in recent years at the SIE awards.

Meanwhile, further success came to the University with awards for two individuals who have supported student entrepreneurs during the past year.

Brian Baillie, Company Formation Executive at LAUNCH.ed, ERI’s free business support service for student entrepreneurs, was recognised as SIE Entrepreneurial Educator of the Year 2012 for his “outstanding contribution to student enterprise.”

Mhairi Naismith also picked up the prize for SIE Intern of the Year 2012. Mhairi is a final year design student at the University’s Edinburgh College of Art and part time interior designer. Mhairi was recognised for her outstanding contributions on campus and commitment to promoting enterprise and entrepreneurship to fellow students.

Ian Murphy, ERI’s Head of Licensing, commented: “No other university in Scotland can match Edinburgh’s fantastic run of achievement in recent years at the SIE awards. This success will undoubtedly encourage more enterprise amongst undergraduate and postgraduate students studying at the University. We want to keep this momentum going in the years to come, which ably demonstrates University of Edinburgh’s genuine entrepreneurial spirit.”

No other university in Scotland can match Edinburgh’s fantastic run of achievement in recent years at the SIE awards.

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Co-founder Paul Brennan said: “After a hectic few months working with the LAUNCH.ed team to develop our business strategy, it’s fantastic to win the Santander Universities competition. To be selected for the £20,000 first prize from the 60 best university start-ups in the UK is a great endorsement of the company and its strategy, but also the quality of the support we’ve received from LAUNCH.ed.”

Paul Devlin, Company Formation Executive at LAUNCH.ed, said: “eoSurgical have worked incredibly hard to move the business forward, winning recognition along the way. It’s been amazing to see them progress and be able to help them on their journey. It’s exactly the sort of progression we should help our clients make - from university, to Scottish, then UK and international recognition.”

EoSurgical’s win builds on Edinburgh’s success last year, where student start-up Speech Graphics won 3rd place and £5,000 in the postgraduate category.

The Santander Universities Entrepreneurship Awards is run by the Santander Universities Division: a global division of Banco Santander, established with the aim of supporting higher education through donations and specialised initiatives.

FURTHER SUCCESS FOR EOSURGICAL

Having won the SIE award, eoSurgical tasted further success in beating off stiff competition from across the UK to land first place in the postgraduate category of the Santander Universities Entrepreneurship Awards 2012.

In total, 35 universities were invited to participate in this year’s competition, which recognises the top undergraduate and postgraduate student entrepreneurs studying at the University. We want to keep this momentum going in the years to come, which ably demonstrates University of Edinburgh’s genuine entrepreneurial spirit.”

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eoSurgical Ltd, is developing surgical simulator tools to help surgeons to improve their operative skills.

They have designed two medical devices: EoSim, which enables surgeons to practice essential keyhole techniques; and EoSiO, which enables medical professionals, including nurses, vets, dentists, and chiropodists, to master suturing and knot tying skills.

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TAKING THE INITIATIVE

AWARD FOR ENCOURAGING STUDENT INNOVATION

This is an important moment for us as we’re seen as delivering the top innovation programme in the UK.

NEW CENTRE TO MEET INDUSTRY’S NEED FOR OFFSHORE RENEWABLE ENERGY TALENT

The University of Edinburgh’s Institute for Energy Systems is leading the newly-created £6.5 million Industrial Doctorate Centre in Offshore Renewable Energy (IDCORE) that brings together diverse areas of expertise to train engineers and scientists with the skills, knowledge and confidence to tackle current and future offshore renewable energy challenges.

This multi-disciplinary research centre involves the Universities of Strathclyde and Exeter, with participation from the Scottish Association for Marine Science and HR Wallingford, an independent research and consultancy organisation.

The Centre’s Director, Professor David Ingram, said: “If the UK is to meet its ambitious targets for renewable energy deployment in 2020 and 2050, we need to dramatically increase the number of highly trained engineers with expertise and understanding in resource assessment, project planning, device development, grid integration and environmental impact.”

The intention is to train 50 research engineers over the next nine years in the field of Offshore Renewable Energy. The first five research engineers joined the programme in January 2012 and are just beginning their industrially based projects with EDF, E-ON, Rolls-Royce, and NaRec, following an intensive period of multi-disciplinary training. They will also be trained to understand the needs of business, develop their entrepreneurial skills and transferable skills, such as project management, innovation management and team working.

They will spend the majority of their research time at the heart of industry, alongside global leaders from blue chip companies and key marine energy developers, such as Aquamarine Power Ltd, working on real life projects. After an intensive four year programme, the research engineers will be awarded an internationally leading Engineering Doctorate, awarded jointly by the three partner Universities.

The Centre, funded by the Energy Technologies Institute (ETI) and the Research Council UK (RCUK), was launched in August last year by the Business Secretary Vince Cable, who said: “Engineering skills are vital for the growth of a more sustainable economy and are in high demand from employers. This scheme will see industry working with universities to provide students with the training and commercial experience businesses want. Scotland has real strengths in renewable energy, wind, wave and tidal power, building on a strong tradition of Hydro. These students will have the chance to work with some of the leading engineering companies based here and tackle one of our biggest challenges - developing technology for a greener future.”

Grant Wheeler, Head of Company Formation and Incubation, said: “This is an important moment for us as we’ve seen as delivering the top innovation programme in the UK. It’s a fantastic achievement for the LAUNCH-ed team and all involved.”

LAUNCH-ed, Edinburgh Research and Innovation’s free support initiative for student entrepreneurs, was nationally recognised in November 2011 at the EducationInvestor Awards 2011 in London.

LAUNCH-ed won the award for ‘Higher Education Innovation’, beating off strong competition from other UK institutions, such as Cambridge Enterprise, Warwick Ventures, IP Group and Glasgow’s Easy Access IP Initiative.

LAUNCH-ed provides a range of formal and extra-curricular teaching, seminars and workshops, as well as on-site support for student entrepreneurs involved in setting up new businesses whilst they are studying at the University, or soon after graduation.

This initiative has been sector-leading and, in 2010-11, they supported the creation of 30 new start-up companies showing great promise. LAUNCH-ed has recently been working with Channel 4 on a connected TV motion-control play-along prototype for the successful ‘Million Pound Drop’ gameshow, which has led to further discussions about developing this technology for the growing connected TV market.

SPEECH GRAPHICS
Speech Graphics won the ‘Knowledge Transfer Champion’ prize at the John Logie Baird Award for Innovation 2010, a UK-wide innovation award for companies and entrepreneurs.

The company has developed a scalable technology that tackles the fastest growing challenge for the video game industry today - providing unprecedented lip synchronisation quality for audio-driven animation.

This gesture-controlled technology that has extraordinary potential for casual games, new media content and specialty design.

Peakabu has recently been working on real life projects. After an intensive four year programme, the research engineers will be awarded an internationally leading Engineering Doctorate, awarded jointly by the three partner Universities. The Centre, funded by the Energy Technologies Institute (ETI) and the Research Council UK (RCUK), was launched in August last year by the Business Secretary Vince Cable, who said: “Engineering skills are vital for the growth of a more sustainable economy and are in high demand from employers. This scheme will see industry working with universities to provide students with the training and commercial experience businesses want. Scotland has real strengths in renewable energy, wind, wave and tidal power, building on a strong tradition of Hydro. These students will have the chance to work with some of the leading energy companies based here and tackle one of our biggest challenges - developing technology for a greener future.”

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WAVES TEST CURRENT THINKING

UNIQUE UNIVERSITY TEST FACILITY WILL HELP ACCELERATE MARINE RENEWABLES TECHNOLOGY DEVELOPMENT

The revolutionary All-Waters Combined Current and Wave Test Facility, which is currently under construction at the University of Edinburgh’s King’s Buildings campus, is well on target to come on-stream during summer 2013.

The facility’s circular 25-metre pool is unique and will be able to accurately simulate normal and extreme conditions of waves and currents at between one-fortieth and one-tenth scales. Most importantly, it can combine overlapping waves and currents simultaneously and from any relative direction.

Fully fitted with gear and instrumentation, the Flowave tank is designed to be able to simulate wave and tide conditions found anywhere around the British and European coastlines, including the most challenging conditions of the Pentland Firth and Orkney Waters.

With a working test volume 17 metres in diameter and two metres deep, the facility is sufficiently large to enable testing of both individual devices and small arrays. At the appropriate scale, the facility could simulate very challenging real-sea conditions of waves up to 28 metres high and currents of up to twelve knots.

As the most cost-effective and best way to quickly, repeatedly and reliably replicate real-sea conditions onshore and, most importantly, before incurring the high costs of testing offshore, the world-unique test facility is expected to very rapidly become an internationally recognised asset for marine energy device testing and evaluation.

A significant new development for the project came in May 2012, when Stuart Brown was appointed as the first full-time Chief Executive Officer of Flowave TT Ltd, the University subsidiary company set up to manage the test facility.

Stuart Brown said: “The Flowave facility will enable simulation of various open water conditions quickly and at large enough scales to generate truly meaningful and bankable results. Proper testing at scale at Flowave should allow considerably improved device output performance, promote ‘right first time’ device deployments, and enable newer device developers to bring their devices to market more quickly and with reduced technical risk.”

“For more established device developers and owners of the first array sites, testing at Flowave should help them to reduce project uncertainty and maximise total annual energy yields, thereby reducing the cost of energy, and providing more comfort to potential lenders, investors and joint-venture partners.”

Since Stuart’s appointment the facility has continued through the civil works portion of the build phase, with the facility building, ground-works excavations and first concrete pour already mostly completed. The next major milestone will be finishing the structure for the main basin and a leak test. Barring unexpected surprises, the fit-out and equipment contractors expect handover of the basin several weeks earlier than originally planned.

Stuart said: “Being substantially ahead of programme than we had planned, there will be opportunities there for our future clients.”

Flowave TT’s test tank will be available for testing of devices where the most challenging real-sea conditions is required. Examples of other sectors expected to be interested in using the facility include the offshore wind industry and the general marine operations sector at large.

As the most cost-effective and benefit to UK science and help push forward renewable energy technologies.”

PROFILE

STUART BROWN
CEO, FLOWAVE TT LTD

In May 2012, Stuart Brown was appointed as the first full-time Chief Executive Officer of Flowave TT Ltd, the University subsidiary company set up to manage the new test facility.

Stuart has a professional background spanning more than 20 years, which includes both personal entrepreneurship and senior technical engineering roles working as working as Lender’s Engineer for major European offshore wind projects.

“The appointment of Stuart to this role, coming as it does a few months after the first ground-works at the site, provides confidence that the test facility is well on its way to actualisation. Furthermore, as the nascent marine renewables industry comes to fruition, this unrivalled test facility - and the University’s expertise that will be available to its users - will enable newer developers to both shorten their time to market and to reduce the technical risks associated with their new designs.”

WANT TO KNOW MORE?
GET IN TOUCH WITH...
Stuart Brown
CEO, Flowave TT Ltd
stuart.brown@flowavett.co.uk
IDEAS AT WORK

THE LAST FIVE YEARS HAS SEEN EDINBURGH RESEARCH AND INNOVATION COMMERCIALISE A HUGE AMOUNT OF INTELLECTUAL PROPERTY, AS WELL AS BUILD UP IMPRESSIVE LINKS WITH INDUSTRY.

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