

Quarterly Journal - October 2014

NEWS COMMENT and ANALYSIS on SPINOUTS from UK HEIs

Storytelling

Commercialisation of ideas emerging from research at our universities, HEIs, and research establishments is ‘a good thing’, and needs to be widely celebrated.

It is often difficult to determine whether a company emerging from a university or HEI is a spinout, a start-up, or something else. Spinouts UK uses the same definitions as the HEBCI survey, where spinouts are defined as companies started to commercialise Intellectual Property owned by a university.

However, although they are important for analysis, it is difficult to capture the full range of activity in this area by focusing exclusively on these categories. At Spinouts UK, we believe there is considerable value in company creation wherever it originates in a university.

Why is this important? Most spinouts and start-ups will begin with small staff numbers, but most of the people they employ will have potentially high value jobs, and will be learning (very quickly) what it means to work in a commercially focused business where every decision has immediate consequences. Spinouts and start-ups are high-risk ventures - many fail to realise their promise due to uncertainties unforeseeable by their founders or investors - but working in a spinout or start-up gives a practical business outlook which will be valuable to a future employer, or to another new venture. And besides this valuable experience, spinouts and start-ups even if shortlived pay taxes, engage with other companies in the supply chain, and contribute to the UK’s employment statistics. All that, even before the companies start to make a difference with new

products and disruptive technologies.

As we have previously commented, the usual metrics used to compare universities pay scant attention to the impact of innovation and technology transfer. Global University Venturing, in a bid to rectify this, has created a combined listing to compare technology transfer activities globally – their discussion and conclusions can be found [here](#).

This activity is not well understood by the public at large, no doubt under the impression that the definition of a successful spinout is a webtech business started in a garage in California and floated for hundreds of millions of dollars, without realising that such companies are extremely rare. As Bindi Karia from Silicon Valley Bank pointed out at the Young Company Finance conference last month, entrepreneurs in the USA find fundraising much more competitive than those in the UK.

Several universities, and organisations such as PraxisUnico and the Research Councils UK, are already actively ‘storytelling’, to spread the word about successful technology transfer from UK universities, and the sector needs much more of the same.

For a different take on storytelling - how creating and telling stories shapes how entrepreneurs understand their own technologies - see Dr Adam Bock’s article about tech transfer in regenerative medicine on p8.

- Jonathan Harris, Editor

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Recent exits

Besides one trade sale (value not disclosed), there have been three IPOs of university spinouts since our previous Quarterly Journal, raising £80 million.

Reinnervate

Reinnervate (reinnervate.com), which develops, manufactures and sells products for 3D cell culture has been acquired by Reprocell, of Shin-Yokohama in Japan.

Reprocell supplies iPSC-derived hepatocytes, neurons and cardiomyocytes as well as a range of media and reagents for stem cell culture. Reprocell intends to combine its iPSC-derived cells with the Alvetex range of 3D cell culture products to produce and sell tools for drug toxicity testing, neuroscience and cancer research.

Reprocell also announced the acquisition of BioServe Inc of MD, USA, a supplier of human tissues and other biological samples with one of the largest commercial biorepositories in the world.

Intelligent Energy

In the largest technology flotation of the past five years (excluding online retailers), Intelligent Energy (www.intelligent-energy.com) was admitted on 9 July to trading on the London Stock Exchange's main market. The market capitalisation of £639 million on admission took the company directly into the FTSE 250.

8.76% of Intelligent Energy's issued share capital was offered at the IPO, raising gross proceeds of approximately £55 million.

Intelligent Energy partners bluechips, OEMs and public research programmes, to accelerate the global deployment of clean technology for the automotive, consumer electronics and distributed power and generation markets. An IP rich company with over 25 years in R&D, resulting in over 550 patents (granted/pending), Intelligent Energy has its global headquarters on Loughborough University Science and Enterprise Parks, and has a workforce of over 350.

Intelligent Energy's milestones include the world's first fuel cell powered manned flight (2008); spearheading a consortium to bring fuel cell electric black taxis to London (2012); launching Upp™, a personal energy device; and providing cost-efficient clean power for India's telecom towers (2014).

Dr Henri Winand, chief executive officer of Intelligent Energy Holdings plc, commented "I am pleased to be announcing the successful completion of our IPO. We have been delighted with the level of investor support throughout the IPO process and we welcome additional high quality institutions to our share register. With a total capital raised in excess of \$120 million, including the exercise of warrants by GIC, we are very well placed to capitalise on the exciting opportunities presented to us in our consumer electronics, distributed power & generation, and motive divisions. We are proud to be listing in London, as a home-grown UK technology company that has developed from its origins at Loughborough University."

Abzena

Abzena (www.abzena.com) has raised £20 million, by way of a placing of 25 million new ordinary shares at 80 pence per share.

The company's entire issued share capital of 97.4 million ordinary

shares (as enlarged by the placing of new ordinary shares) was admitted to trading on AIM on 10 July 2014 under the ticker ABZA. At this price, the market capitalisation of Abzena on admission was approximately £80 million.

Abzena's technologies and services are provided through its wholly-owned subsidiaries, PolyTherics and Antitope.

Antibody-based products and therapeutic proteins are the two largest and fastest growing segments of the biopharmaceutical market. Abzena provides a suite of complementary services and technologies to R&D organisations to improve the chances of successful development of therapeutic proteins and antibodies. The company's know-how is supported by a broad patent estate, to enable it to create better biopharmaceuticals for its customers.

John Burt, CEO of Abzena said "We are delighted to have completed our IPO. We are confident that the business we have created for enabling our customers and partners to develop better biopharmaceuticals will thrive as pharmaceutical companies increasingly seek external expertise to advance their programmes. We believe that Abzena is well positioned to capitalise on this demand and we're excited about the opportunity to grow and develop the business, and to deliver value to all our stakeholders."

Among investors, Beringea, the growth capital investor that manages the ProVen Venture Capital Trusts, saw its shares in Abzena reach a multiple of 2.4x the cost of the investment. Beringea first invested in Polytherics through ProVen Growth and Income (PGI) and ProVen Health (now merged with PGI) in September 2011.

Medaphor

On 27 August Medaphor Group plc (www.medaphor.com) announced its admission to trading on AIM under the ticker symbol MED.

Medaphor, a spin-out company from the University of Cardiff, is a global provider of advanced ultrasound education and training simulators for medical professionals. Its lead product is the Scan-Trainer ultrasound simulator training platform which assists students, doctors and sonographers to acquire ultrasound scanning skills with minimal expert supervision and without the need of a patient to practise on.

100 ScanTrainer simulators are currently installed in over 80 hospitals around the world, and Medaphor is in the process of expanding its platform simulator technology, from a mainly obstetrics and gynaecology UK base, into the global obstetrics and gynaecology, general medical and emergency medicine markets. The company is based in Cardiff in the UK and San Diego in the USA.

The placing raised approximately £4.7 million, and at the placing price the company had a market capitalisation of £10.1 million. The net proceeds received from the placing will be principally used to fund the expansion of the company's sales network globally, and to fund the development of new applications for the ScanTrainer technology platform within complementary medical markets.

New spinouts

Although the formation of new spinouts seems to be at a low level, several universities are now doing more to help staff and recent graduates to form start-up companies. We expect to have round-ups from some of these in our next issue.

Oxford BioChronometrics

Oxford BioChronometrics (www.oxford-biochron.com), spun out from the Isis Software Incubator, has developed software which allows businesses to distinguish between real human users and spam bot page views.

Isis Innovation, the University of Oxford's commercialisation company, announced that the company has raised sufficient funds from private investors to launch its first product, NoMoreCaptchas.

Adrian Neal, founder and CEO at Oxford BioChronometrics, said "Using markers that distinguish the behaviour of humans from spam bots, our software reveals who or what is knocking on the door of any site or app. We found that at least 96.5% of these attempts to login are by bots, not human users.

"We can also determine whether ads are being clicked on by bots or humans, providing assurance to online advertisers that their budgets are not being wasted on bots and are actually being seen by humans. We can detect human bots and bot farms, which is a hugely important step for firms wanting to manage their online advertising cleverly and effectively."

Oxford BioChronometrics' software captures user inputs and creates a signature that is more individual than a fingerprint. This cannot be replicated by human beings or by bots and creates what the company calls a user's electronically Defined Natural Attributes, or e-DNA.

"Traditional authentication tools such as passwords, PINs, and one-time-codes are cumbersome and can still be hijacked by viruses and hackers," said Neal. "As banks and merchants move away from desktop PC online banking and into mobile banking apps, our ability to authenticate users from one device to another becomes very important in ensuring safe online transactions and avoiding scams."

The NoMoreCaptchas software is already being used by hundreds of websites around the world. The company now plans to focus on providing a seamless user experience while working to eliminate the need for passwords all together.

The algorithms used were developed by Neal, a software engineering masters graduate and cryptographics expert at the University of Oxford and his co-founders, also post-graduate researchers at the University.

Intellego Technologies

The idea for Intellego Technologies (www.intellego-technologies.com) was conceived in 2011 by a group who disliked getting sunburnt each spring and summer. Together, they started to sketch an indicator that would show how much UV radiation a person actually gets when out in the sun.

The idea met with considerable interest, and the team set out to develop the simplest, yet most effective UV indicator for personal use, which besides working on the beach would also work for activities like swimming, skiing, sailing and mountain climbing.

Intellego's first product, the Smartsun, is a one-day wristband which changes colour when it has been exposed to a certain amount of UV radiation and warns when it may be time to get out of the sun.

Smartsun is being marketed by Swedish-based company Intellego Technologies, established by entrepreneur Claes Lindahl. Professor Andrew Mills and Dr Michael McFarlane, who developed the original invention while they were previously with Strathclyde's Department of Pure and Applied Chemistry, are engaged as consultants to Intellego.

Quantilyte

Quantilyte is a spinout from the University of Strathclyde which is developing a compact, quantitative, highly sensitive diagnostic platform for point-of-care testing in the veterinary market.

Point-of-care testing is carried out at or near the site of patient care. Quantilyte's core product will be a portable (desktop) diagnostic device and a disposable cassette that will allow diagnostic tests to be performed in a sealed environment with minimal user interaction. The company will develop a range of low-cost tests that provide fast, lab-quality results at the point-of-care thus addressing the main limitations of current solutions which are considered to produce expensive results that are not as sensitive as those produced in a laboratory. Target customers will be companion animal veterinary practices, small animal hospitals and small labs supporting local markets.

Quantilyte will offer the market the first commercially available high sensitivity, multiplexed immunoassay at point-of-care.

Tandem Nano

The University of Liverpool has launched a new company Tandem Nano (www.tandemnano.com) to make insoluble chemicals and materials disperse in water.

The company's technology has significant implications for cost reduction and the improvement of the effectiveness of drugs and chemicals across a broad range of products from HIV medication, steroids and antibiotics to detergents and cleaning agents.

Soluble drugs are generally much easier to process and more easily absorbed into the body. An increasing number of drugs in development, however, are poorly water-soluble, requiring the administration of high doses to get therapeutic blood concentrations, which can sometimes result in toxicity. It is thought lower doses may accelerate development of drugs with low solubility, resulting in safer and more cost effective medicines.

Tandem's offering is the result of collaboration between the Department of Molecular and Clinical Pharmacology and the Department of Chemistry, spearheaded by the research groups of Professors Andrew Owen and Steven Rannard.

Tandem's technology provides partners with tailored nanoparticles of insoluble materials allowing for beneficial results to be achieved faster and more cheaply than traditional approaches. For pharmaceuticals, the approach may minimise some of the risk of drug failure during development.

Once the market opportunity was identified, the services of Liverpool IP were engaged to merge a suite of existing patents with University

technology to enable the team to realise their vision and turn their science into commercial opportunities.

3Dynamic Systems

3Dynamic Systems is a manufacturer of 3D additive manufacturing systems.

3DS, which is based at Swansea University, was founded by Dr Daniel J Thomas, Senior Research Officer in the College of Engineering's Welsh Centre for Printing and Coating (WCPC).

Dr Thomas has conducted extensive research in the field of manufacturing and 3D printing and is now ready to commercialise his 3D bioprinting systems, with the aim of opening up bioprinting research by providing quality machines to researchers who want to harness the power of 3D bioprinting technology.

These machines are capable of depositing a new range of materials to make useful industry components. During the development of these

systems, Dr Thomas and his team worked at the leading edge of research into tissue engineering and aerospace structure manufacture. 3DS is now commercialising the additive manufacturing of 3D integrated electronics, biosensors, construction materials, foods and complex multicellular tissues.

The company recently announced the availability of its two 3D bioprinting machines – the Alpha and Omega bioprinters. These are capable of depositing a range of biologically active and biologically compatible materials, with applications for life sciences research, regenerative medicine, bone tissue engineering, and pharmaceutical development.

The systems use a layer-by-layer additive fabrication method for building three-dimensional functional living macro tissues systems, using biologically active materials. The stem cellular-based materials have measurable biological properties which later mature into a living tissue structure.

Recent investments

The following reports omit the large fundraisings totalling £57m by quoted companies (details are shown in the table on p7) for which considerable information is available elsewhere. Even without these deals, there has been a high level of investment activity this quarter, with regular investors Parkwalk Advisors and Mercia Fund Management well to the fore.

Adaptimmune

Established in July 2008 with a research base in Oxford and a clinical base in Philadelphia, USA Adaptimmune (www.adaptimmune.com), focused on the use of T-cell therapy to treat cancer and infectious disease, recently completed a \$104 million Series A financing round

The oversubscribed round was led by New Enterprise Associates (NEA), and several new investors. Existing investors participating included the University of Oxford and others.

Adaptimmune plans to use the proceeds from the Series A financing to advance the company's internal programmes into the clinic in multiple cancer indications. Adaptimmune is currently running trials across the USA in multiple myeloma, melanoma, sarcoma and ovarian cancer.

ZoneFox

Security software firm ZoneFox (zonefox.com) has secured a further £450k funding from the Archangel and Tri Cap business angel syndicates and the Scottish Investment Bank, to take the total raised by the company to more than £1 million.

ZoneFox was launched in 2010 by Edinburgh Napier University graduate Dr Jamie Graves, who said the cash injection would be used to ramp up the company's sales and marketing activities.

The company's software monitors and records activity on its clients' systems in order to detect possible security breaches in real time. Graves said "We're looking to target the legal market in London, given the amount of intellectual property held by sectors such as the oil and gas industry. In the longer term, the US represents a huge market potential, and we're in talks with potential partners in the Far East."

Aston EyeTech

Aston University spinout Aston EyeTech Limited has received £230k of investment from Mercia Fund Management.

Aston EyeTech, a spinout from Aston's School of Optometry, has developed software that supports eye care professionals with diagnosis, selling optical products and conducting clinical trials. The new funding will be used to grow the company's team and other resources required in its first year as the company trials its initial product range.

The company is specifically targeting ophthalmic retailers in the UK and overseas, clinical trials organisations, domiciliary service providers and the NHS.

The deal is Mercia's first investment with a spinout from Aston University, though it is already working with other Midland universities on technology and biopharmaceutical technology businesses.

Irresistible Materials

Irresistible Materials (IM, www.irresistiblematerials.com) is a University of Birmingham spinout company created to commercialise the fullerene based photo-resist technology developed by Dr Alex Robinson, Professor Richard Palmer, Professor Jon Preece and colleagues. Photoresists are critical materials in the computer chip manufacturing process as they enable chip manufacturers to fabricate ever-smaller features for microelectronic devices.

The next generation of chips will require a new photoresist technology, as existing polymer based photoresists do not have sufficient performance to support extreme ultraviolet light (EUV) lithography.

The latest technology results from IM have demonstrated a significant jump forwards in achievable resolution. The team has recently

demonstrated 13 nm halfpitch resolution patterning, together with promising results at 11 nm halfpitch.

IM has secured £235k of further support from Innovate UK (TSB) and business angels from the US and UK.

InoCardia

Technology investor Mercia Fund Management (MFM) has announced a £229k investment in InoCardia, a Coventry University spinout providing drug screening services.

Dr Helen Maddock, from the University's Centre for Applied Biological and Exercise Sciences and the CEO of InoCardia, has spent ten years developing a new method using real human heart tissue to test the effect of drugs on the heart to assay for side effects without using human or animal trials.

Targeted at the biotech and pharmaceutical sectors, InoCardia's 'work-loop' assay assesses cardiac contractility in normal, diseased and ageing cardiac muscle in order to determine the cardiovascular safety of pharmaceutical compounds.

Dr Maddock commented "Both the pharmaceutical industry and regulators recognise that contractility assessment is currently fraught with problems, so we are delighted that our research is now at a stage where we can confidently say that the work-loop assay is the only relevant *in-vitro* human model of cardio-toxicity available worldwide. We are already working with a multinational biopharmaceutical company and results are promising."

Spectral Edge

Spectral Edge (www.spectraledge.co.uk) was founded in 2012 as a spin-out from the University of East Anglia to exploit novel image fusion technology developed by Professor Finlayson's 'Colour Lab'.

Image fusion is a large field and refers to the process of combining many different images, often using different modalities such as visible light, near infrared, x-rays and thermal imaging, into a single display image. Applications for image fusion can be found in photography (RGB + near infrared), remote sensing (merging the hundreds of bands from satellite images), and medical imagery (in diffusion tensor imaging).

Spectral Edge technology enhances images and video by using information outside the normal visible spectrum or applying transformations to that within it. The company's first target application is to treat colour deficiency as an image fusion problem: fusing all the colours that colour normals see to make a new image which induces a similar perception in those suffering from poorer colour vision.

A £300k financing round led by the Icen Seedcorn Fund and the Rainbow Seed Fund managed by Midven will provide working capital to enable Spectral Edge to expand its team, complete the development of its Eyeteq product line, and take it to market.

Oxford Genetics

Oxford Genetics (oxfordgenetics.com), a University of Oxford start-up, has developed SnapFast™, a system that simplifies the purchase of synthetic DNA molecules (plasmids).

Since its first round of SEIS funding in 2013 from Mercia Fund Management, Oxford Genetics has expanded its range from 200 to over 1,600 DNA plasmids, and has also launched a dedicated web tool,

Plasmid Builder, which allows customers to design and build complex DNA sequences online.

Oxford Genetics has signed agreements with both a global distributor and partners in 30 countries including the US, Canada, Japan and Germany.

Mercia Fund Management recently announced a further £330k in funding for the company, including a £100k Innovate UK (TSB) Smart Award.

ROADMap Systems

Parkwalk Advisors recently made an investment in ROADMap for the University of Cambridge Enterprise Fund II (UCEF II) in a first round of financing of £515k. It is envisioned that a further financing round will be required in 12 months.

ROADMap (www.roadmapsystems.co.uk) is founded on four patents licensed from the Cambridge Centre for Advanced Photonics and Electronics (CAPE) covering silicon wavelength switch technology.

Network operators are facing the triple challenge of increasing capacity, managing unrelenting downward pressure on costs, and supporting fast evolving service features and demand patterns that put a premium on network configuration flexibility. This leads to a requirement for very flexible optical switching that can operate at the wavelength level. Conventional switch architectures no longer meet this need as they cannot accommodate next generation 400 Gbps data rates.

The telecommunication industry is also migrating towards 'flexgrid' architectures where the capacity of each channel is moderated to satisfy fluctuating demands. Optical switches within the network known as a Reconfigurable Optical Add/Drop Multiplexers (ROADMs) must be competitive and have good manufacturability whilst being able to accommodate the flexibility and programmable functionality required. Within ROADM the Wavelength Selective Switches (WSS) is the key component.

ROADMap's aim is to build a demonstration WSS which will be constructed in alliance with network equipment providers to ensure network compatibility and interoperability.

Diurnal

On 5 August Diurnal (www.diurnal.co.uk) announced a fundraising of up to £6 million.

Diurnal is a spin-out company from the University of Sheffield developing products for the treatment of hormone deficiency. Its lead product Chronocort® was recently the subject of a positive Phase 2 trial and is due to enter pivotal Phase 3 studies in the first half of 2015.

Existing investor IP Group has committed up to £4.1m of the £6m round, which subject to certain regulatory milestones being met will enable Diurnal to complete the Phase 3 programme for Chronocort® as well as advance certain other pipeline programmes.

Chronocort® is a patented, modified-release, oral formulation of hydrocortisone that allows for release of the hormone in a manner that mimics the natural circadian rhythm.

Oxford Nanopore

Oxford Nanopore Technologies (nanoporetech.com) has raised £35 million through a private placement of ordinary shares. This transaction, which was significantly oversubscribed, brings the total funds raised by Oxford Nanopore since its foundation in 2005 to £180 million.

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The following table includes some older events which were previously absent from the Spinouts UK online database. The reports elsewhere in this issue focus upon the more recent transactions.

New spinouts

company	university	sector	incorporated	web
AVA Technologies	Staffordshire	software B2B & e-business	25-Nov-10	www.spectral360.com
Bellrock Technology	Strathclyde	software B2B & e-business	25-Jun-12	www.bellrocktechnology.com
Oxford BioChronometrics	Oxford	software B2B & e-business	21-Mar-13	www.oxford-biochron.com
Intellego Technologies AB	Strathclyde	manufacturing & materials	01-May-13	www.intellego-technologies.com
Quantilyte	Strathclyde	drug discovery & diagnostics	16-Oct-13	
Tandem Nano	Liverpool	nanotechnology	20-Mar-14	www.tandemnano.com
3Dynamic Systems	Swansea	manufacturing & materials	23-May-14	

Recent exits

exit date	company	type	incorp	university	value	acquirer/market
9-Jul-14	Intelligent Energy	IPO	28-Mar-00	Loughborough	£639m	LSE:IEH
10-Jul-14	Abzena	IPO	28-Sep-01	ICL, UCL, Warwick	£80m	AIM:ABZA
5-Aug-14	Reinnervate	trade sale	25-Jun-02	Durham	n/d	Retrocell, Japan
27-Aug-14	Medaphor	IPO	12-Jul-04	Cardiff	£10.1m	AIM: MED

Winning Pitch expands

Spinouts UK project partner Winning Pitch, with its own origins in the University of Manchester, has secured funding to expand its team and develop a new Skills for Growth Division.



Winning Pitch®

Winning Pitch (www.winningpitch.co.uk), founded in 2005 by John Leach, is based in Salford and now has additional offices in Liverpool, Leeds, Gateshead and Cardiff. The company delivers coaching and business growth support through a team of direct employees and a nationwide network of over 200 experienced business coaches.

In May the company secured a £2.5m investment from two funds managed by Enterprise Ventures, comprising a £1.5m investment by the Enterprise Ventures Growth Fund, and a £1m investment from The North West Fund for Mezzanine.

In addition to its private clients, Winning Pitch has secured a number of public sector business support contracts in England and Wales. It is a lead partner in delivering GrowthAccelerator, the Government's flagship programme to encourage business growth. Winning Pitch also

manages the Government's new Growth Vouchers scheme in the North West.

Winning Pitch has recently created a new Skills for Growth division to address the UK skills gap in high performance selling, an area of increasing concern for the UK Government. The company has recently secured its first training contract from Greater Manchester Chamber of Commerce to establish the Winning Sales Academy.

In July Winning Pitch appointed Peter Smart as non-executive chairman. Peter is the former chairman of Leeds-based national law firm Walker Morris. He has been a director of a number of public and private companies, and is presently an independent consultant, chairman of Eureka! The National Children's Museum in Halifax and a non-executive director of Rensburg AIM VCT plc.

Recent investments

date	company	university	amount (million)	investors
07-Apr-14	Adaptimmune	Oxford	US\$104.00	New Enterprise Associates, OrbiMed Advisors, Wellington Management Company, Fidelity Biosciences, Foresite Capital Management, Ridgeback Capital Management, Novo A/S, QVT, Rock Springs Capital, venBio Select, Merlin Nexus, University of Oxford
8-May-14	ZoneFox	Edinburgh Napier	£0.45	Archangels, TRI Cap, Scottish Investment Bank
28-May-14	Cambridge Imaging Systems		£1.50	Cambridge Innovation Capital
01-Jul-14	Aston EyeTech	Aston	£0.23	Mercia Fund Management
17-Jul-14	Irresistible Materials	Birmingham	£0.24	angel investors, Innovate UK grant (Mercia?)
21-Jul-14	InoCardia	Coventry	£0.23	Mercia Fund Management
21-Jul-14	Spectral Edge	UEA	£0.30	Iceni Seedcorn Fund, Rainbow Seed Fund (Midven)
29-Jul-14	Ceres Power	ICL	£20.00	placing - new and existing institutional shareholders
30-Jul-14	Oxford Genetics	Oxford	£0.33	Mercia Fund Management, TSB Smart award
01-Aug-14	ROADMap Systems	Cambridge	£0.52	Parkwalk Advisors U of Cambridge Enterprise Fund)
05-Aug-14	Diurnal	Sheffield	£6.00	IP Group
11-Aug-14	Photonstar LED	Swansea	£2.20	placing with institutional and other investors
12-Aug-14	Oxford Nanopore Technologies	Oxford	£35.00	private placement - IP Group, existing investors
01-Sep-14	Retroscreen Virology Group	QMUL	£33.60	placing - new and existing institutional shareholders
08-Sep-14	Jukedeck	Cambridge	£0.50	Cambridge Enterprise, Parkwalk Advisors (Cambridge University EIS Fund), Cambridge Innovation Capital
12-Sep-14	MGB Biopharma	Strathclyde	£4.00	Archangels, Barwell, TRI Cap, Scottish Investment Bank, Innovate UK grant
15-Sep-14	Celoxica	Oxford	£1.50	Beringea Growth Finance
22-Sep-14	Expedeon	Cambridge	£0.24	Santander Corporate & Commercial
23-Sep-14	Inivata	Cambridge	£4.00	Imperial Innovations, Cambridge Innovation Capital, Johnson & Johnson Development Corporation
24-Sep-14	Aqdot	Cambridge	n/d	Parkwalk UK Tech Fund, University of Cambridge Enterprise Fund II
25-Sep-14	Videregen	NPIMR	£3.10	SPARK Impact (NW Fund for Biomedical), Innovate UK grant, London Business Angels
26-Sep-14	Tangentix	Bradford	n/d	EV, Finance Yorkshire, Parkwalk Opportunities Fund, Parkwalk Syndicate
30-Sep-14	Brainomix	Oxford	£1.20	University of Oxford Isis Fund, Chimera Partners investor group, Parkwalk Advisors
30-Sep-14	Oxtex	Oxford	£0.15	Parkwalk Advisors (U of Oxford Isis Fund)
02-Oct-14	Destina Genomics	Edinburgh	€1.20	Vitro Group of Spain, Old College Capital, SIB, private investors
08-Oct-14	Kesios Therapeutics	ICL	£1.85	Imperial Innovations

Venturing in the dark: tech transfer in regenerative medicine

University technology transfer is difficult. Each institution brings unique procedures, culture, and faculty incentives to the process.

While most major research universities promote entrepreneurial approaches, few provide the resources, training, or career support to sustain a productive start-up environment and drive regional economic development.

These challenges are especially evident in regenerative medicine. Stem cell technology development is primarily driven by university-led research, and a disproportionate number of regenmed start-ups are directly tied to university research. Like all entrepreneurs, academic entrepreneurs with stem cell innovations must acquire scarce resources and connect to critical partners. In the field of regenerative medicine, however, uncertainty about regulation, distribution, and IP rights make decision-making more difficult. This isn't about risk-taking, it's about how entrepreneurs cope with "unknown unknowns." A good example was the unexpected exit of industry pioneer Geron in 2012, which dramatically changed the landscape right down to the availability of start-up funding.

For the past two years, we've been studying Scotland's entrepreneurial ecosystem in this important, global healthcare field. We conducted and analysed in-depth interviews with entrepreneurs, academics, support entities, and government. Some of our findings aren't surprising. For example, regenmed entrepreneurs become consummate storytellers. They build narratives to sway investors and partners, and adjust those narratives as the industry evolves. But these stories do more than communicate information. Creating and telling stories shapes how entrepreneurs understand their own technologies.

But story-telling alone doesn't explain entrepreneurial behaviour. Participants in Scotland's regenmed ecosystem also engage in both problem-focused and emotion-focused coping strategies. Problem-focused coping seeks knowledge to reduce uncertainty; emotion-focused coping accepts and adapts to uncertainty. Each strategy has strengths and pitfalls. Problem-focused coping often leads regenmed actors to partner for market knowledge. But some regenmed outcomes are currently unknowable. New regenmed ventures are expensive; investigating multiple commercial outcomes can be expensive and lead to fatal delays in technology development.

Emotion-focused coping, including denial and distancing, can be effective strategies in the face of uncertainty. Rather than waste resources seeking unavailable information, these entrepreneurs and ecosystem actors put aside unanswered questions and focus on what they have. It may seem counterintuitive, but regenmed isn't like web commerce or retail where customer feedback is instantly available. Our prior research on world-leading Cellular Dynamics (in Models of Opportunity: Cambridge) emphasized that regenmed ventures can make effective strategic decisions based primarily on what works within the organisation.

The real challenge for both these strategies arises from collaboration. Partnering in regenmed creates tensions, because ventures must share critical knowledge in a rapidly changing IP environment that differs dramatically across national borders. Problem-focused actors face high

transaction costs associated with revealing critical information due to technology sophistication and contracting complexity. Emotion-focused coping strategies, however, may be especially vulnerable during collaboration processes. Managers may not be willing to risk sharing core knowledge, protected or not. In these cases, ventures with mistaken beliefs about technology potential or market development are likely to partner with other firms with the same mistaken beliefs. Here, story-telling leads entrepreneurs and firms to believe information based not on facts, but on what other industry participants want to hear.

This leads to three questions. First, what drives regenmed managers to be problem-focused or emotion-focused? Second, how do entrepreneurs avoid coping strategy pitfalls? Third, what can be done to facilitate Scotland's entrepreneurial activity in this important sector?

The primary driver for regenmed coping strategies appears to be the entrepreneurial culture of the research universities generating foundational technologies. When universities and technology transfer offices create administrative spin-out hurdles and burdensome licensing terms, academic and professional entrepreneurs become defensive. The apparent lack of control may drive entrepreneurs towards emotion-focused coping strategies. This kind of organisational imprinting is a common phenomena. In regenmed venturing, which lacks a community of large mature firms, the role of the parent institution may be disproportionately powerful. Rather than making such ventures stronger, an adversarial environment may hinder the firm's ability to function cooperatively, limiting how much collaborative knowledge it creates and absorbs.

The best way for entrepreneurs to avoid coping strategy pitfalls is to find established, experienced mentors to identify new venture flaws. There are relatively few of these in the stem cell sector in Scotland; regenmed entrepreneurs may need to seek such resources in larger ecosystems until the Scottish ecosystem matures.

Finally, there are no easy solutions to creating entrepreneurial culture at large institutions. The idiosyncrasies of university commercialisation context emerge from decades or centuries of embedded culture. Some general lessons may be gleaned from successful ecosystems such as Stanford and MIT: transparency, consistency, even-handed processes, top-down leadership and department-level champions. But the most challenging drivers are highlighted in Ruth Graham's MIT/Skoltech report on entrepreneurial ecosystems: trust-based relationships with the broader E&I community and creating a market for university entrepreneurial activity (tinyurl.com/MITentrepEco). These hallmarks of a vibrant and supportive entrepreneurial culture remain foreign to most large-scale research universities.

Our own studies continue—we recently launched a cross-national comparison between the regenmed venturing ecosystem in Scotland and a comparable stem cell commercialisation ecosystem outside the UK. We expect to share our findings in early 2015. The study may shed light on global challenges to regenmed venturing, while pointing

to specific opportunities to improve entrepreneurial activity around Scotland's world-class research universities.

Dr. Adam J. Bock is Senior Lecturer of Entrepreneurship at The University of Edinburgh Business School. He is the co-founder of three university spin-outs, including a regenmed venture. He is the co-author of *Models Of Opportunity*:

How entrepreneurs design firms to achieve the unexpected (2012 Cambridge).

David Johnson is a doctoral student at the University of Edinburgh Business School. His research focuses on regenmed venturing, knowledge exchange, and entrepreneurial coping strategies.

Recent investments - continued from p8

Oxford Nanopore Technologies is developing a new generation of nanopore-based electronic systems for analysis of single molecules including DNA, RNA and proteins. The GridION™ system and miniaturised MinION™ devices may be used in scientific research, personalised medicine, crop science, security & defence and environmental applications.

Both new and existing investors in the UK, US and mainland Europe subscribed to the fundraising.

Cambridge Innovation Capital announces first investments

Cambridge Innovation Capital (www.cambridgeinnovationcapital.com, CIC), an investor in high-growth technology companies in the Cambridge cluster, has completed its first investments from its £50 million fund.

Some but not all of these are spinouts or start-ups from the University of Cambridge.

Cambridge Imaging Systems

CIC has provided £1.5 million in growth funding for Cambridge Imaging Systems (www.cambridgeimaging.com), which is developing cloud-based and on-premise software that enables owners of video to archive, deliver and bill for content.

Cambridge Imaging Systems, formed in 1991, has developed technology used by corporate and government clients including the Ministry of Defence, IMG Sports, the BBC, the Imperial War Museum, the British Library and more than 60 universities.

Origami Energy

Origami Energy (www.origamienergy.com) has secured a £3.5 million round, including £1.25 million from CIC alongside Octopus Investments and two angel investors. Origami's technology allows renewable energy generators, storage providers, and energy users to trade with each other at a micro-grid level and maximise the value of their assets, creating a real-time marketplace for the distributed energy world.

Jukedeck

CIC has also invested £100k in University of Cambridge spinout Jukedeck (www.jukedeck.com), which is developing software that allows users to generate their own original music for videos, online games and many other applications where real-time, responsive music is desired without copyright limitations. The investment was made alongside £400k in seed funding from Cambridge Enterprise, the commercialisation arm of the University of Cambridge, and the University EIS Fund managed by Parkwalk Advisors.

Inivata

Inivata (www.inivata.com) a clinical cancer genomics company focused on harnessing the potential of circulating tumour DNA (ctDNA) analysis to improve cancer testing and treatment, has raised £4m in a

funding round led by Imperial Innovations with Cambridge Innovation Capital and Johnson & Johnson Development Corporation.

Inivata's founders developed pioneering ctDNA and novel treatment approaches in Cancer Research UK-funded laboratories at the University of Cambridge. Cambridge Enterprise has been involved in the commercialisation and development of Inivata in collaboration with Cancer Research Technology.

Novel applications of ctDNA are enabled by Inivata's technology platform which includes its TAM-Seq™ technology. TAM-Seq, which is licensed to Inivata from Cancer Research Technology and the University of Cambridge, allows the detection and analysis of genomic material from a cancer patient's cell-free ctDNA collected through routinely accessible blood samples.

MGB Biopharma

MGB Biopharma (www.mgb-biopharma.com), which is developing a novel class of anti-infectives, has secured £4 million to advance the development of its lead antibacterial, MGB-BP-3.

MGB-BP-3 is based on minor groove binder (MGB) technology developed by scientists from the University of Strathclyde. It represents a new class of drugs with a new mechanism of action that could transform the treatment of common, and potentially fatal, infectious diseases.

Funding of £2.7 million has been provided by a syndicate of business angel groups, led by Archangel Informal Investment together with existing investors Barwell PLC, TRI Cap and the Scottish Investment Bank, the investment arm of Scottish Enterprise. This brings the total funding secured by MGB Biopharma since the beginning of this year to £4 million, including a £1.3m funding award announced in June by Innovate UK, formerly the Technology Strategy Board (TSB), under its Biomedical Catalyst programme.

MGB Biopharma will use the funding to conduct a Phase I trial to start in the first half of 2015 that will investigate the oral formulation of MGB-BP-3 for use in the treatment of *C. difficile* infections.

Expedeon

Expedeon (www.expedeon.com), a specialist in protein discovery and analysis spun out of Cambridge University in 2003, is to invest in new infrastructure and machinery following £240k in funding from Santander Corporate & Commercial.

Founded in 2003 by Dr Heikki Lanckriet and Dr Daniel Jones, Expedeon's vision has been to develop and commercialise tools and reagents for protein research. The company began selling end products in 2007 and, under CEO Dr Lanckriet, has also expanded via targeted acquisitions - US-based PageGel Inc in 2009; Protein Discovery Inc in 2012; and Astranet System Ltd in 2013. In the process, the company has established offices in Singapore and San Diego to complement its UK base in Harston, Cambridgeshire.

The funding from Santander Corporate & Commercial will help the business not only to expand its operations by investing in a state-of-the-art new production line and refurbishing the Harston facility, but it will also support Expedeon's international expansion via an Enterprise Finance Guaranteed facility.

Aqdot

Parkwalk Advisors recently made a follow-on investment, in a development financing round into Aqdot for the Parkwalk UK Tech Fund V and University of Cambridge Enterprise Fund II.

Aqdot (www.aqdot.com) is a spin-out from the Department of Chemistry at the University of Cambridge and was founded in late 2012.

Aqdot has developed a proprietary chemical encapsulation technology that enables droplets in the millimetre and nanometre range to be produced to carry 'active materials': for example cleaning enzymes used in domestic detergents, and agrochemicals for crop treatment.

Videregen

Videregen (www.videregen.com), formed in 2011 as a spin-out from Northwick Park Institute of Medical Research (NPIMR) in London, produces biological scaffolds to which a patient's own stem cells are added, creating a bespoke organ replacement.

Founded in 1994, NPIMR (www.npimr.org) is a charity-based independent institute working to translate pre-clinical medical research rapidly into patient care.

Videregen, based at Liverpool Science Park, has secured funding totalling £3.1 million, comprising £900k in equity funding from The North West Fund for Biomedical managed by SPARK Impact, grant funding of £1.9m from Innovate UK (TSB), and £300k from London Business Angels and other private investors.

This investment will enable extensive manufacture development and clinical research with the aim of being the world's first commercially available tissue engineered stem cell organ replacement product.

Dr Steve Bloor, chief executive officer at Videregen, said "We developed our technology platform to help address the chronic shortage of organs for transplantation. Trachea replacement is the first product from our platform technology, from which our research partner Northwick Park Institute for Medical Research is also developing bowel and liver replacement organs."

Tangentix

Enterprise Ventures (EV), Finance Yorkshire, and Parkwalk Advisors have closed an investment into Tangentix (www.tangentix.com) as a follow-on from a £1.4m fund-raise in March 2013. Parkwalk invested from the Parkwalk Opportunities Fund and a Parkwalk Syndicate Tangentix was formed to commercialise new mathematics from the University of Bradford for representing 3D objects using partial differential equations. The company holds key patents on these techniques and others developed for other compression challenges.

Tangentix recently launched GameSessions™ a web based service that allows users to try PC games through free trials, with the option to rent or buy the game once the trial has ended.

Players download a full copy of the game 2-3 times faster than from anywhere else, and, until purchase, that copy is protected by proprietary access control. At the optimum time, the user can choose to rent further sessions, or instantly purchase full access to the game.

University of Oxford Isis Fund makes first investments

The £1.25 million University of Oxford Isis Fund, set up by Parkwalk Advisors and Isis Innovation in February, has made its first investments, in medical device spinout Oxtex and in Brainomix, a start up from the Isis Software Incubator which is developing software to improve stroke diagnosis.

Spun out by Isis in 2011, **Oxtex** (www.oxtex.com) has developed a self-inflating tissue expander for use in reconstructive and dental/oral surgery, with applications in burns, scar revision, breast reconstruction and cleft palate surgery. Developed by surgeons at the John Radcliffe Hospital and scientists from the Department of Materials, the device enables the creation of additional skin through controlled stretching in a wide variety of anatomical locations.

Oxtex has raised a total of £1.4m from business angels through three rounds of investment since its incorporation in 2011. The University of Oxford Isis Fund has invested a further £150k which will be used to strengthen the company's senior management, scale up the device manufacturing and launch its first commercial product for the veterinary market.

Brainomix (www.brainomix.com) is aiming to improve stroke treatment dramatically by developing software that gives all hospitals and clinics access to reliable diagnoses for their patients.

Brainomix co-founder Professor Alastair Buchan, the Dean of Medicine and Professor of Stroke Medicine at the University of Oxford, is the inventor of the ASPECTS system which is the most reliable method to diagnose stroke for treatment that improves patient outcomes. However, in practice the ASPECTS accuracy is often impaired by human subjectivity and its utility is severely limited by a lack of expert clinicians. Brainomix e-ASPECTS software is the first system to provide automated and standardised analysis of CT brain scans for stroke damage, assessing patients' suitability for life saving treatment.

The University of Oxford Isis Fund joined an investor group led by Mark Jaffray of Chimera Partners, and including Parkwalk Advisors, in a £1.2 million funding round that Brainomix will use to further develop and launch the software for clinical use.

Kesios Therapeutics

Kesios Therapeutics is developing therapeutics for the treatment of multiple myeloma and other blood-related cancers. The company has been created to commercialise research led by Professor Guido Franzoso, from the Department of Medicine at Imperial College London.

Professor Franzoso and his team have identified a drug target within a pathway that appears to be critical in promoting cancer cell survival in certain white blood cells of patients with multiple myeloma and other malignancies. Kesios is developing drug candidates that disrupt this target and demonstrate the potential to specifically and selectively kill cancer cells, without causing toxicity to normal cells.

Imperial Innovations recently completed a seed investment of £1.85 million in Kesios Therapeutics. The team at Imperial College London has separately received a Biomedical Catalyst grant from the Medical Research Council (MRC) up to the value of £3.9m, in order to validate the modality and efficacy of this novel drug target.

Insurance – the times they are a-changin’



Science & Technology

INSURANCE BROKERS

The origins of the insurance industry can be traced back to Edward Lloyd’s coffee house in the 17th century.

It was a very different world then and insurers have had to adapt to changes in business models and also to try and keep pace with rapid changes in science and technology.

The lines used to be clear. Businesses generally manufactured something physical or provided advice or a service.

As a consequence, insurers produced very distinct insurance covers; Product Liability for the manufacturer and Professional Indemnity Insurance for those providing advice or a service for a fee. The former primarily concerned with third party bodily injury or property damage from the supply of a product - the latter financial losses as a result of negligent advice.

However, business models have changed and when it comes to medical device companies, the digital sector or indeed the bioscience industries it is clear that some of the traditional models of insurance may not always be suitable for these types of businesses.

For example, is software a product or a service? Under English Law it is potentially either, dependent upon what is delivered and by what means. As a consequence specialist insurers have their Professional Indemnity Insurance policies to cover financial loss claims, even though such claims may emanate from the supply of a product.

Similarly, licensing models mean that Product Liability Insurance may not provide sufficient insurance protection for the product supplier. Take a business that licenses technology to a third party which then exploits that and manufactures a physical product, which it supplies under its own brand to a third party.

If a customer suffers an injury caused by that product, they are likely in the first instance to bring a claim against the licensee, who in conjunction with their insurers may seek to deal with such a claim in the first instance. However, it is likely that they would subsequently seek recovery from the licensor. This secondary claim against the licensor from the licensee is no longer a claim for bodily injury but a financial loss and may fall outside the scope of a standard Product Liability cover.

The same principle can be applied to businesses supplying a product to an OEM for incorporation into their product.

Times are definitely a-changin’ – it is vital that any early stage technology business takes the right advice in ensuring that they are appropriately protected: not only today, but through the lifecycle of their business.

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Isis Innovation is the technology transfer company of the University of Oxford; it promotes commercialisation

of IP through licensing, consultancy, and formation of spinout companies. Isis was ranked 1st in the UK for spinouts over three and ten year periods in the 2013 Annual Report for the PraxisUnico Spinouts UK survey. www.isis-innovation.com



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