

Issue 31
Autumn 2011

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nexusnews

Connecting, communicating & informing life sciences in Scotland



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expanding service capacity
to meet increasing demands

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Nexxus Events

SME TOOLBOX: CLINICAL EVALUATION REPORTS FOR MEDICAL DEVICES
15 September 2011, Edinburgh

HORIZONS IN BIOINFORMATICS
September 2011 (date TBC),
Edinburgh

SECOND MEETING OF GLORI (GLASGOW ORTHOPAEDIC RESEARCH INITIATIVE)
6 October 2011, Glasgow

NEXXUS AWARDS (EAST AND WEST)
Annual Nexxus Life Science Awards and showcase of images for the Nexxus 2012 Life-Sci Visions Calendar
3/16 November 2011,
Edinburgh/Glasgow

Other Scottish Events

12TH ANNUAL SCOTTISH WOUNDCARE CONFERENCE
15 September 2011, Glasgow

RESEARCH IN CANCER AT STRATHCLYDE UNIVERSITY
(supported by Nexxus)
29 September 2011, Glasgow

SECOND SISCA WORKSHOP ON BIOLOGICAL NETWORKS: THEORY AND APPLICATIONS
(supported by Nexxus)
21 October 2011, Edinburgh

UK STROKE FORUM CONFERENCE
29 November – 1 December
2011, Glasgow

For further info about the above events (NB Nexxus events are free) see www.nexxusscotland.com/events

I am part of all that I have met... (Alfred Tennyson)



IT GIVES ME great pleasure to introduce the latest edition of the Nexxus newsletter. Thanks to all of you who have contributed and to Jan for exercising her usual keen editorial eye.

Whilst considering a theme to draw together the elements of the newsletter, I read that the Kremlin has given its blessing to the construction of a 65 mile rail tunnel across the Bering Strait. So, come 2030 it will be possible to travel by train from King's Cross in London to Grand Central Station in New York. Thus the technology that shaped the 19th Century will be reborn for the 21st, so proving that no matter how much we connect the world virtually, physical connections still count. Social networks such as Facebook and LinkedIn have built communities and connections that are growing businesses but they have not supplanted the 'old tech' of face-to-face meetings, far from it. Indeed much of this edition of the newsletter reflects this long standing paradigm and there are some related developments I would like to highlight.

Firstly, it is fantastic to see that in the short time since the launch of the Nexxus membership scheme

we now have almost 100 companies signed up with another 250 members representing our universities, research organisations and the NHS. We greatly appreciate your commitment to Nexxus and we work to ensure you derive the maximum benefit from membership. If you have yet to join, why not do so now at the Membership section of our website?

Secondly, July also saw the formal launch of the European Diagnostics Cluster Alliance (EDCA) in Montpellier. The EDCA has been established in response to a European-wide demand for collaboration in the medical diagnostics sector. Nexxus are proud to have been invited to join as one of only two UK clusters (the other being OBN in Oxford). The EDCA is another route for our members to build working links with other European businesses - something that our impact assessment found was invaluable to membership. Information on other organisations we are pleased to be part of (CEBR and EBN) can also be found on page 17 of this issue.

Colin, Osian, Jan and Judy have been working hard over the summer months to put together our autumn/winter events programme and more details will be available on our website soon. We have already booked the venues for our Annual Nexxus Life Science Awards in November and are delighted that Sir Kenneth Calman and Professor Sir Ian Wilmut will join us as guest speakers. Earlier this month we were delighted to partner with Ernst & Young in bringing the prestigious Beyond Borders biotechnology report presentation

to Scotland and are sure that the findings of the report will help us all inform our future paths.

I would like to take this opportunity to congratulate once again the many members of the Scottish life sciences community who were given well deserved awards in the Queen's Birthday Honours list - particularly Kevin Moore and Dr John Brown. I would also like to bid au revoir to Kate Fink, until recently our Marketing Communications Assistant in Edinburgh, and to Chris Hillier, a well kent figure in the local life science community, and wish them both well for the future - one as a Veterinary Medicine student and the other in their new role in Barbados - I'll let you guess which is which but if you're stuck see page 6!

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Get snappy

ENTRIES for the 2012 Nexxus Life-Sci Visions calendar competition close on 14 October 2011. Send us your life science related images to showcase your expertise at the Nexxus Annual Life Science Awards in November. Winners could be hanging on around 3,000 walls next year! See www.nexxusscotland.com/news/life-sci_visions_competition.

Poised to exploit emerging opportunities

DESPITE ALL the advances in biomedical research and high-throughput screening technologies for chemistry and genomics, the pharmaceutical industry has failed to translate this into new drugs. Arguably, the complete opposite has happened with the number of approvals decreasing while R&D spending has been increasing to an unsustainable level; pharma is moving from an R&D to a 'Search & Development' strategy and is outsourcing this to service providers (CROs, biotech) and companies such as Edinburgh based Fios Genomics.

The FDA Critical Path Initiative identified biomarker development and bioinformatics as some of the key drivers that 'will increase efficiency and productivity in the development of new medical products'. A better understanding of genetic mutations and protein expression has led to better models to understand factors influencing responses to drugs, including sensitivity of drug targets, drug metabolism, adverse side effects and so on, leading to development of personalised medicines over a one-size fits all strategy. Patient stratification is

also seen as a highly desirable goal where advance screening of a patient's genomic make-up should determine whether that individual is likely to respond favourably to a particular drug or whether a different medicine would be more effective (non-responder); this approach can also pre-determine whether the patient is likely to suffer adverse side-effects.

Effective data analysis and interpretation is the bottleneck and pain point for the pharmaceutical industry and Fios Genomics, founded by Peter Ghazal, Tom Freeman and Thorsten Forster and spun-out in 2008 from the University of Edinburgh, is ideally positioned to exploit these emerging opportunities.

Dr Bill Buckie, CEO says, 'Fios Genomics provides an extensive range of genomic and bioinformatic data analysis services to pharma, CROs and academia for drug discovery and development and applied research. Our services provide expert statistical and pathway-based approaches for the analysis and interpretation of a variety



Bill Buckie

of data types generated from R&D, pre-clinical development and clinical validation

for applications ranging from patient stratification, biomarker discovery and validation, pathway analysis, predictive toxicology, pharmacogenomics and pharmacogenetics (SNP genotyping/next generation sequencing).

'In our experience, few service providers can offer the comprehensive range of data analysis services or possess the required expertise and computing infrastructure that we have to analyse data rapidly and provide meaningful, functional interpretation of the data, that is 'Proof of Relevance'. Outsourcing to Fios can save clients considerable internal investment in bioinformatics staff and computing resources, and rapid turnaround of data can reduce product development times and costs which are estimated at US \$1M per day.'

Since its foundation, the company has been generating revenue steadily and counts among its customers major pharma, biotech companies, CROs, clinical centres and academic groups throughout the UK, the US, Europe and Asia. Its growth strategy is focused upon building long term relationships with these customers and new contracts are anticipated following very positive demonstration of the company's capabilities. Fios now plans to expand its service

capacity to meet increasing demand from customers and to deliver industrial scale projects. It will strengthen the existing team with additional hires and intends to build new capabilities such as in biomarker development, companion diagnostics and stratified medicines, to stay at the forefront of the industry.

To achieve these goals, Fios recently raised £500K from a syndicate led by Archangel Informal Investments that included TRI Capital, Scottish Enterprise's Co-Investment Fund and company directors. Recent appointees include Dr Bill Buckie (ex Pharmagene, Photonic Materials, Cascade Technologies, ATEEDA) as CEO and Dr Sandy Primrose (Arrayjet, Lab901, Amersham International and GD Searle) as non-Executive Chairman.

'We're quite a young company,' said Director of Operations Dr Gary Rubin, 'but feel we've already achieved a lot in a relatively short period of time. Recent investment will allow us to increase our expertise and add to our already excellent team and we are looking forward to expanding our current services and breaking into new, emerging markets.'

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The Fios team and founders

Long term health conditions

ALREADY TWO million people live with long term conditions in Scotland and this figure is rising, in large part due to the ageing population.

According to Audit Scotland¹ the number of people aged 75 and over will rise by 75% between 2004 and 2031. The number of people with Chronic Obstructive Pulmonary Disease (COPD) is projected to increase by 33% between 2007 and 2027 and the number with dementia by 75% over roughly the same period.

Economy

As the number of people with long term conditions rises beyond two million, the cost to the economy is significant. A recent report estimated the cost to the Scottish NHS alone would reach £2.15B by 2025². This is in addition to costs to other services, particularly social care, and the impact of people not being active in the labour market.

Services

Current services are not sustainable in the face of rising demand and falling public funds. NHS services were designed to treat illness, not support people to manage conditions over many years, and the bulk of resources remain tied up in acute provision. Services do not effectively or efficiently meet people's *full range* of needs and separate policy, budgets, targets and accountability mechanisms help to sustain this.

People

People who live with long term conditions, and their unpaid carers, are already more likely to experience social isolation,



Delegates at February's Multiple Conditions Conference, organised by LTCAS in partnership with NHS Health Improvement Scotland

unemployment, poverty, debt, mental health problems and poorer access to transport and services³. These issues are compounded by the economic climate and many people with long term conditions, and their unpaid carers, are among the worst affected by a tightening labour market and reductions to support and services.

'Meeting the growing challenge of long term conditions is essential to Scotland's people, communities and economy,' says Ian Welsh, Chief Executive of Long Term Conditions Alliance Scotland (LTCAS). 'As need rises and resources fall, policy and services must make the shift to community-based provision that supports people earlier and more effectively. Key to this is unlocking the enormous capacity that exists within individuals, families and communities (both of interest and place), thus enabling people to be active partners in their own health and wellbeing, in supporting others

and in contributing to policy and service redesign.'

The self management agenda offers a practical example of how this type of approach can be put into practice. Self management - and related 'asset-based approaches' such as recovery, independent living and co-production - have begun to gather traction in Scotland over recent years. The £4M Self Management Fund (managed by LTCAS on behalf of Scottish Government) has so far supported 81 diverse third-sector led projects, many of which have been delivered in partnership with statutory agencies. The Fund has helped demonstrate that even a relatively modest investment in this type of approach can produce significant positive outcomes in quality of life for individuals, capacity building for people and communities, and reductions in pressure on public services.

'We now need to step up the pace of change in Scotland;

a sentiment reinforced in the Healthcare Quality Strategy and Christie Commission Report,' continues Ian. 'As growing consensus emerges on the direction of travel required, it will be crucial that this penetrates the local structures that impact so greatly on people's lives. Real change needs to happen at the level of health boards, local authorities and Community Health Partnerships (CHPs), with the third sector as an equal partner and contributor.

'Health boards, local authorities and the third sector all face significant budgetary constraints and already some have responded by retreating into bunkers. In many areas statutory funding has begun to shrink back towards core, acute provision and away from supporting self management and prevention. We need to quickly understand the context in which services are operating and find smarter, more efficient ways of working across sectors - health

and social care, and statutory and third sector. There is a need for improved partnership - and funding - arrangements between health boards, local authorities and the third sector so that organisations can continue to provide high value, low cost, preventative support and ensure a voice for people living with long term conditions.'

Scotland has already made notable progress in its approach to long term conditions. The past few years have seen significant innovation and service redesign as a result of the work of LTCAS, the Scottish Government,

the Long Term Conditions Collaborative and individual NHS Boards and CHPs. As this is built on, the most important principle must be that the voice of people living with long term conditions, and their unpaid carers, continues to be at the heart of the agenda.

Ian concludes, 'It is people living with long term conditions themselves who tell us that the move towards self management, person-centred approaches and co-production needs to happen regardless of the financial and demographic pressures we face. People do not want to be treated

simply as 'patients' but as active citizens who enjoy the right to live high quality, independent lives in which *they* are in control.

'Above all else we need to recognise that people and communities in Scotland represent the solution, not the problem.'

The Long Term Conditions Alliance Scotland (LTCAS) is an independent Scottish Charity funded by a grant from the Scottish Government.
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¹ *Managing Long-Term Conditions (2007) Audit Scotland*

² *Radical Scotland, Confronting the challenges facing Scotland's public services (October 2010) NESTA*

³ *Characteristics of adults in Scotland with long term health conditions: An analysis of Scottish Household and Scottish Health Surveys (2007) Scottish Executive Social Research 2007*

New approach to growing stem cells

A TEAM of scientists from the University of Glasgow has developed a unique method of growing vast numbers of high quality stem cells using nanopatterned material substrates usually found in the mass production of CDs/DVDs.

Adult stem cells are potentially an extremely valuable source of stem cells that could be used for many regenerative applications. In particular, mesenchymal stem cells (MSCs) derived from bone marrow hold great potential to regenerate bone and cartilage.

Current approaches to deliver high quality, patient derived MSCs to the clinic remains a critical problem due to a lack of availability of large quantities of high quality stem cells grown in the laboratory. In the case of MSCs, prolonged laboratory

growth results in spontaneous differentiation of the stem cell population, ultimately limiting their regenerative capacity and usefulness.

The team, led by Drs Matthew Dalby and Nikolaj Gadegaard, with Kelvin Smith Scholar Rebecca McMurray, has identified a unique strategy which can be used to overcome this problem. Using nanopatterned material substrates they found they were able to maintain and continue growing the viable de-differentiated MSCs stem cells for up to eight weeks without the assistance of any chemical additives. The team also discovered that stem cells could respond in different ways when the nanopatterns were varied - some patterns encouraged the cells to remain in their current de-differentiated state, while others encouraged the cells to differentiate into bone cells.

Within the James Watt Nanofabrication Centre at the University of Glasgow, established techniques normally used within the electronics industry to produce CDs/DVDs are being used to develop a nanopatterned master substrate. This can then be used to imprint into various polymers - a technique which allows for relatively inexpensive, rapid fabrication of large volumes of topographically patterned substrates suitable for cell culture. The relative ease with which this technology can be scaled up, makes it particularly attractive for the future development of novel tissue culture plastics for cell culture.

The use of topographical substrates as a non-invasive tool for the maintenance and manipulation of MSCs provides a powerful yet simple solution to the current challenges regarding the provision of MSCs for use

in regenerative medicine. However it also provides a previously unavailable platform for studying the underlying regulations of self-renewal, and opens up the possibility for the investigation into other types of stem cells, such as neuronal or endothelial stem cells in response to nanotopography.

Further investigation into other types of adult stem cells could have many implications for the treatment of diseases such as Alzheimer's or Parkinson's disease.

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Pupils get hands-on



MOST PEOPLE can tell you that DNA contains the blueprint for a living thing - but how does it actually work?

For the past six years staff at Glasgow Science Centre, working in partnership with scientists from the Medical Research Council (MRC) - University of Glasgow Centre for Virus Research (CVR), have been delivering a series of practical workshops on DNA technology to Advanced Higher Biology pupils. Hundreds of pupils continue to attend from across Scotland and enjoy the opportunity to learn modern molecular biology techniques as part of a hands-on workshop at Glasgow Science Centre.

The workshop, entitled 'The Polymerase Chain Reaction', is a whole day of interactive science. The aim of the workshop is to recap knowledge of DNA structure and replication using state of the art 3D DNA animations created by the CVR, introduce the technique of Polymerase Chain Reaction (PCR), listen to talks from CVR practising scientists and consider the ethical implications of the human genome project through a mini debate. It

centres on pupils undertaking the role of medical scientists in a diagnostic laboratory to determine the cause of severe facial blisters on two patients with compromised immune systems. Working with CVR scientists the pupils are provided with mock DNA samples from the two patients to determine by the polymerase chain reaction (PCR) what the virus each patient was infected with is.

The workshop allows pupils to get hands-on with science outside the context of learning in the classroom and serves to inspire budding scientists to think about future career options in the field. The workshop is an exemplar model of how scientists and science centres can pool their skill sets to provide a much sought after experience, matching curricular outcomes. Feedback from both teachers and pupils is very positive. One Advanced Higher pupil said, 'It was a great opportunity to gain inside information on careers and hands-on practical work. I have decided to pursue a career in medical research. I'm really looking forward to getting stuck into it all.'

An HMIe review of the contribution of the Scottish Science Centres' network to formal and informal science education stated, 'The Centre has been very successful in developing provision which both complimented the school curriculum and challenged senior pupils at an appropriate level.'

Dr David Bhella, a Programme Leader in the CVR said, 'Working in collaboration with

Glasgow Science Centre over a sustained period has allowed us to engage with hundreds of advanced higher biology students from across Scotland, giving them access to technologies not readily available in the classroom, and providing us with the opportunity to communicate our enthusiasm for scientific research and promote the work of the Medical Research Council and the University of Glasgow.'

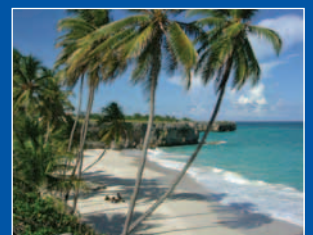
Woah, he's going to Barbados

PROFESSOR Chris Hillier, co-founder of Biopta and Sistemic, will be leaving his position at Glasgow Caledonian University in November to take up a Professorial position within the University of the West Indies. His main responsibilities will be to develop new technology transfer systems and to introduce entrepreneurial and innovative models for commercialisation.

Chris will be based within the Medical Faculty at the Cave Hill campus on Barbados and will be also be responsible for monitoring the commercial effectiveness of the IP portfolio at the three other campuses of the University in Jamaica, Trinidad & Tobago, and the Bahamas. The government of Barbados have indicated their intention to grow their bioscience base by attracting world-class clinical and academic scientists to join their growing cohort of home-grown, ambitious, entrepreneurs.

Chris said, 'The position I will be taking up is part of an overall plan that includes the development of a world-class biotech park and the implementation of a series of commercial strategies designed to leverage Barbados' educated workforce, rich and untapped natural resources and biodiversity, and unique geographical location as a natural distribution hub between South America, North America, and Europe.'

'I will, of course, be working to develop strong links with Scotland where our interests cross such as environmental monitoring, medicine and medical devices (particularly in relation to diabetes), optics, and biofuels.'



My Job



*Andy MacLeod,
Modern Apprentice, XstalBio*

Q: So what do you do?

XstalBio is an advanced drug delivery company specialising in the formulation and stabilisation of therapeutic proteins, peptides, DNA and vaccines based in Glasgow and I've been a trainee technician there on the modern apprenticeship programme since September 2010.

I'm one of a team of 12 people, and the only technician, and my role involves preparing kits for analysis, preparing solutions, ensuring equipment is functioning well, testing and organising servicing where needed and ensuring adequate stock levels are maintained and organising re-order of items

when required. I also carry out some R&D work under supervision and contribute to aspects of the lab where I can.

I also contribute to research and development work at XstalBio. Under direction and guidance from my boss, Dr Davidson, I prepare formulations, assist in writing some aspects of reports for clients and also sit in on meetings and telecoms. My job is really varied, more so than I thought it would be.

The things I really like about my job here though is that every day there is a chance to try something different and every day I learn something new, for instance I might try a new experiment or gain a better understanding of why things work out the way they

do. The college side of the apprenticeship is going well too - it's challenging but helps me better understand what's going on at work, and answers a lot of questions about why some experiments worked out the way they did.

Q: Tell us about a typical day (or is there no such thing?).

At XstalBio there is no such thing as a typical day, there's always something different going on whether it be experimental work for a project for one of the clients or for our own research. For instance yesterday was pretty busy. I started with the stock check list and ordering, then was involved in the Monday morning meeting to plan the work ahead for the week. I did some trouble-shooting on some equipment and some training with a new graduate who's just started. Later on, I was in the lab, carrying out protein dialysis and concentration. I finished up by helping design a new lab SOP.

Q: So what's taken up most of your time recently?

At the moment, most of my time has been taken up carrying out research and development experiments, and carrying out some research for an upcoming project related to an in-house project looking at regenerative approaches to bone healing.

Q: What's on the cards for the next few months?

I'm working on a number of projects that are quite varied in their demands, one is a vaccine

and the other is a monoclonal antibody. The vaccine is a paediatric vaccine and the monoclonal antibody is a client-owned one, in the animal health sector. I will be contributing a lot of effort to sterile manufacture of the products.

My Life Sciences Level 3 course at Stowe College will start again soon and this takes up one day per week plus some study time. Over the next two years of my apprenticeship I hope to get more involved with/take on more responsibility for formulation development at XstalBio, taking on more of a research scientist role. Although I do enjoy my duties as a technician I want to move beyond this with time, as I gain more experience. The good thing about my job and working here, is I get to be involved in a whole range of different aspects of the company and genuinely feel that I am making a contribution.

Q: What would you want to do if you weren't doing this job?

Well, when I was at school I had originally planned to make a career in the engineering industry as I liked engineering and craft and design more than science subjects. It wasn't until I realised that chemistry was interesting that I thought about a career in the life sciences industry, and decided to pursue this path instead. I'm quite happy doing what I'm doing now.

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European Virtual Institute of Malaria Research (EVIMalaR)

MALARIA IS an infectious disease caused by a parasite, *Plasmodium*, which is transmitted via the bites of infected mosquitoes and continues to be an enormous public health problem in the tropical regions of the world. In the human body, the parasites initially multiply in the liver and then in red blood cells where they cause the various symptoms and pathologies associated with the disease. Humans lack an effective vaccine and parasite resistance to existing anti-malarials and vector resistance to the commonly employed insecticides all contribute to the worsening disease landscape. These shortcomings are due in no small measure to our continuing lack of fundamental understanding of the biology of the parasite and its interactions with its host and vector, the female Anopheles mosquito. The region most affected by malaria is sub-Saharan Africa where more than one million deaths occur each year due to infection with *Plasmodium falciparum*.

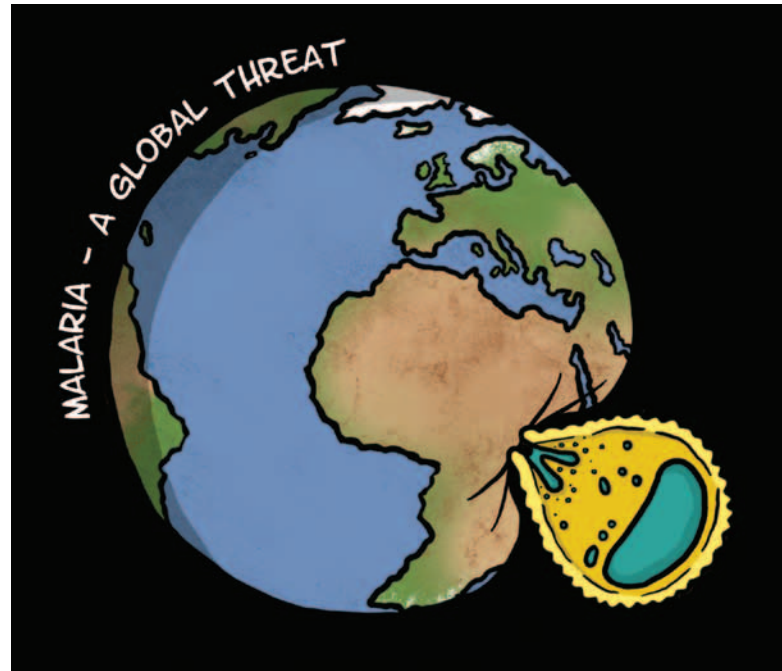
The project

EVIMalaR is a Framework Seven (FP7) Network of Excellence (NoE) funded by

the European Commission. Formerly known as BioMalPar, the EVIMalaR incarnation began in October 2009 and is now in the second year of a five year cycle. The €12M award is led by Professor Andy Waters, FRSE, Professor of Molecular and Developmental Parasitology & Wellcome Trust Principal Research Fellow at the Wellcome Trust Centre for Molecular Parasitology in the Institute of Infection, Immunity & Inflammation within the College of Medical, Veterinary and Life Sciences at the University of Glasgow. As Scientific Director and through the EVIMalaR office based in Glasgow he co-ordinates this large network which consists of 54 partner groups from 37 institutes across Europe, Africa, India & Australia. There are also 18 affiliated member groups who benefit from interactions within one of the largest projects of its kind in the world and the wider global malaria community.

Aims

EVIMalaR seeks to integrate European malaria research that is directed towards a better understanding of the basic biology of the parasite and of the biology of the interactions between the parasite and both its mammalian host and vectors. The structure of the network significantly evolves prior concepts of network structure, introducing new modes of research that have recently



emerged. Comprising four research clusters, the core activities include molecular cell biology of the parasite, host immunity, vector biology and systems biology. The overall goal of the network is to enhance European (and global) collaboration through integration, in turn improving the speed of discovery in order to be able to feed the pipeline of development of therapeutic agents and strategies. Therefore, one arm of the network's activities is concerned with the timely and effective translation of research whilst respecting the IP rights of partner institutes.

One very successful mechanism for achieving integration has been the network's significant contribution to the production of the next generation of malaria researchers through the instigation and subsequent

expansion of a European PhD School for malaria research based at EMBL in Heidelberg. Early stage researchers in this School benefit from two supervisors based in different member states encouraging mobility and they (and other network personnel) maximise individual potential through bespoke training courses and workshops some of which have already taken place in Uganda, Germany and the UK. EVIMalaR has already recruited 23 young malaria researchers from all over the world to this prestigious programme who it is hoped gain an appreciation of the benefits of collaborative research rather than working within the four smaller walls of a single laboratory. EVIMalaR has also created six post-doctoral fellowships within the network aiming to create a longer term benefit from network activities.



Furthermore, individual career mentoring facilities will continue to guide and engage network graduates.

Membership of EVIMalaR continues to expand - new members have been integrated on a competitive basis with an emphasis on young, emerging Principle Investigators. In an attempt to extend the impact of the network activities, the network has developed an exchange programme OzMalNet, with OzEMalaR the Australian equivalent, managed by the Australian Society for Parasitology and funded by the Australian MRC, that will foster bilateral research projects. Attempts are ongoing to expand this initiative to other suitable

malaria research networks and these attempts are married to individual outreach activities such as presenting the network and its research at international meetings for example, the International Congress of Parasitological Societies (ICOPA) held in Melbourne in August 2010.

The future

Outreach is the key to the aims of the project and new initiatives are constantly being explored. Besides the website which is being redesigned, a 'comic' publication targeted at a 21st century visually centred society for both the lay and scientific community is currently being created for dissemination in schools and universities,

to encourage young people to foster greatly improved understanding of the biology of the malaria parasite integrated with a deeper knowledge of its evolving interactions with both host and vector.

Also, through the establishment of an umbrella foundation and active lobbying of government and non-government funding agencies as well as the establishment of a charitable and commercial profile, the network will strive to become self-determining through the establishment of a legal entity that will seek to continue the network initiated activities beyond this funding cycle. With such initiatives and activities it is hoped that EVIMalaR will

continue to be a significant influence on the shape, directions and manner in which malaria research is conducted. The ultimate goal would be that EVIMalaR is eventually able to establish a real bricks and mortar European Institute for Malaria Research (EIMR) - thereby losing the 'V' - that would interact with the global malaria research community whilst housing cutting edge basic malaria research.

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BIO 2011

SEVERAL SCOTTISH

companies attended this year's BIO International Convention in Washington in June and found it to be a very positive experience. Here is how just a few of them got on.

Verna McErlane, Director of Commercial Operations, Sismic said, 'We (Jim Reid, CEO and I) did a lot of work before we got to BIO to ensure that we had a full partnering schedule. Our meetings were fairly divided up between the drug discovery and development side of the business and the cell therapy/stem cell product areas. Since our return we have been busy with all the follow ups which precipitated another trip back to the States and we hope to have some very exciting news to share in the coming months regarding a significant deal with a key player in our target market.'

'The atmosphere was very exciting and BIO did a

wonderful job with the diversity of innovative companies that they had presenting as well as the informative educational sessions held on Business Development and Deal Making for example. Scottish Development International had a great stand and were a fantastic help in providing facilities to meet customers, and in showcasing the breadth and depth of Scottish innovation.

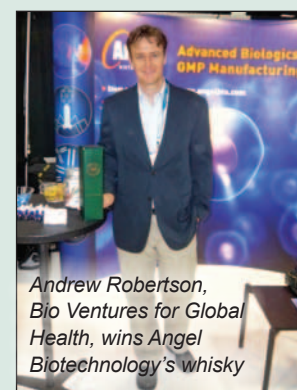
'Two press releases which we issued, focusing on our expansion plans which are driven by the success in the market of our miRNA-based profiling in context technology and our Companion Biomarker Program were well received and we believe helped to build our presence at such a large show. BIO is already part of our schedule for next year!'

Angel Biotechnology, an established cGMP contract manufacturer specialising in the provision of advanced biologics, found BIO 2011 a very useful event too. Representatives participated in the partnering meetings, gave a talk at the BioProcess pavilion and had a separate booth away from the SDI/UKTI pavilion. Andrew

Carver, Business Development Manager said, 'There were a significant number of visitors at the stand on the first day (as measured by business cards), helped in part by a draw for a bottle of whisky!'

'Overall we felt that booth traffic over the three days was good and that the SDI organised whisky tasting/reception was particularly useful for us as we could 'invite' guests (visitors to the stand) to come to the reception thus helping build on the initial meeting at the stand. Of around 140 business cards collected at the event, 30 were good quality leads and 2 have already progressed to confidential discussions.'

Arrayjet, the leading microarray company in the production and application of high quality microarrays with inkjet technology, were first time participants at BIO this year and were delighted with the size of the opportunity the event provided. Iain McWilliam, CEO, used the BIO-partnering system to arrange meetings in advance. The one-on-one meetings allowed Arrayjet to present its technology and services to a highly focused audience which resulted in some



high quality leads from a range of global companies.

Iain said, 'We are excited about the number of leads generated and I'm looking forward to seeing these discussions progress to new relationships and new business for us. The success of BIO 2011 means Arrayjet will undoubtedly attend BIO in future years.'

Next year BIO will take place in Boston from 18 - 21 June. Registration opens in November 2011. For more information see <http://convention.bio.org>.

Products of good training

WE ARE all guilty of taking for granted the many products we encounter in our lives. We assume they are generally fit for purpose and that they will be safe and easy to use. But where did they originate from? Chances are some of them may have been the brainchild of a student from the Product Design Engineering (PDE) Programme.

The Programme, a joint initiative between Glasgow School of Art and the Department of Mechanical Engineering at the University of Glasgow, began just over 20 years ago and this year more than two dozen students will progress to their fifth year of study to secure a valued MEng degree.

Craig Whittet, Head of Department, said, 'The Programme aims to give students a solid grounding in a number of areas including engineering, design and manufacturing, thus allowing them to better appreciate all of the factors which must be taken into consideration to devise a well designed product. And despite the long time it can take to bring a successful medical device to market, many of our students are particularly interested in this area.'

'Sometimes the original ideas come from the students themselves and sometimes we're approached by companies who have a project they'd like assistance with. The latter may have some preconceived ideas as to how a device or technology might function or look but we encourage them not to pass on too many of those to the students! With a relatively blank

page the students often come up with alternatives which had never been considered.'

Support from industry, whether financial to help a student develop a prototype or providing valuable time to chat with the students and explore ideas, is greatly appreciated. 'We're fortunate in having many companies keen to be involved with the Programme,' said Craig. 'In today's competitive world companies recognise the need for well designed and innovative products and technology. While commercialisation is obviously a consideration, what we really instil into our students is the responsibility invested in them to improve the quality of people's lives by their designs – it's something we take very seriously. Thankfully, more companies and individuals are coming round to the approach of design it better and it will enable you to live your life better.'

Some of the items showcased at this year's PDE Degree Show include a number of innovative medical devices that ably demonstrate the ingenuity of this year's graduates. 'I liken our students to method actors,' continued Craig, 'In order to correctly determine the requirements of a product, they must first immerse themselves fully in the role of the product's end users. The success of PDE students, whether in securing employment or winning competitions, is proof that their approach is highly regarded.'

Retraction for Open Surgery – Gavin Spence

When performing open surgery, skin and tissue retraction is a



vital task which needs to be carried out correctly to allow the surgeons to operate well. Currently, the only effective way to self retain these tissues is by using an assistant who holds the tools in place. This, together with poor lighting techniques can limit the surgeon's ability to carry out quality surgery.

The Retraction for Open Surgery base holds the patient in the correct anatomical position for surgery and highly adjustable and re-usable gooseneck arms can be inserted. The arms have interchangeable tools which enable the surgeon to have the full functionality of a highly trained assistant without one being present and two lighting tools aid further. The number of people involved with surgery is reduced and the surgery is made easier which in turn ensures improved quality.

Mi Top – Katie McKinnon

Each year in the UK more children are born with a Brachial Plexus Injury (BPI) than Down's Syndrome, yet their recovery is a neglected area. BPI is a birth injury that results in impaired movement of the child's arm. The majority of children recover through physiotherapy alone but there is little support, guidance or research available.

Mi Top has been designed as an independent, interactive

physiotherapy top for children. A wearable instrument, it produces sounds as the child moves in an effective manner. The garment is a subtle and non-invasive way of encouraging children to perform their exercises and also assess their progress and retain data for much needed research.



The product's aim is to instill a positive response to effective exercise, introducing it into the child's daily routine and beyond.

Leading Edge Electrosurgery Instruments – Douglas Deans

Electrosurgery provides an efficient and effective means of cutting and coagulating body tissue. Used in 80% of open surgery procedures worldwide, its use however has an appalling history of safety issues. In the UK there are over 100 reports per year of injury to staff and patients, with many more injuries going undetected until the injury has worsened and may result in life threatening infections.



Leading Edge offers a unique and innovative solution to this problem. By the removal of the primary cause of injury - the patient return electrode - and by passing the current over a localised area of tissue, Leading Edge removes the risk of potentially life threatening burns to patients and staff.

Leading Edge Electrosurgery Instruments not only dramatically increase safety but also offer increased usability and efficient surgical smoke evacuation, a need identified through close collaboration with surgeons and theatre staff. The designer hopes to develop the product in order to license it to a leading electrosurgery device manufacture and is currently involved with Scottish Institute for Enterprise and Wellness & Health Innovation to establish a development strategy and seek funding to do so.

Rehabilitation Knee Brace – Alex Anderton

Almost 90,000 total knee replacements (TKRs) are carried out in the UK every year. In the vital six week period between their discharge and first check-up however it's difficult for hospitals to monitor a patient's recovery. Additionally, lack of motivation in this period accounts for patient's poor adherence to the vital home exercise necessary for their recovery.

The Rehabilitation Knee Brace uses an angle sensor to measure and record the range of motion of the patient's leg extensions. A good range of motion is desirable and the sending of data to the hospital allows the patient's recovery to be remotely monitored, highlighting cases requiring urgent review or where



targeted early intervention of complications is needed. The brace also has a secondary function - adjustable resistance to leg extension is used to progressively strengthen the user's quadricep muscles to restore the dynamic stability of the knee. Creating structured goals for recovery provides patients with the motivation to exercise twice daily.

HelpfulHaler – Martin Anderson

The HelpfulHaler is a new, more efficient and easier to use inhaler for asthma sufferers. It can also be attached to a side product that motivates and reminds the patient to use their medication. The products are intended to increase patient's asthma control and prevent unnecessary hospital visits costing the NHS millions of pounds each year.



The inhaler has an ergonomic design and an internal spacer that acts as a holding chamber for the medication, allowing the patient to inhale a full dose easily. The spacer also only allows the user to inhale the

beneficial medication, preventing the side effects of medication caused by current inhalers.

The additional product would be prescribed to patients with a history of poor asthma control. An alarm would sound when the patient needs to take a dose and it would track the patient's use for the doctor's reference.

Rehabed – Marco Biagini

Every year over 2,000 people suffer traumatic spinal chord injury in the UK. Currently, patients can spend weeks in bed before they are fit enough to receive physiotherapy. In addition to this, many patients suffering from strokes and neurological injuries have skin disorders and resultantly cannot leave their beds to receive recuperative physiotherapy.

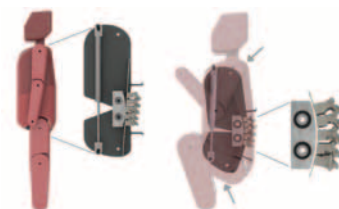


The Rehabed is an interface designed to facilitate the use of a rehabilitation device named the GOER (Gait Orthosis for Early Rehabilitation) in conjunction with conventional hospital beds. The GOER, developed by Juan Fang at the University of Glasgow, enables fully mechanised physiotherapy to be carried out on bed-rest spinal injury, stroke and neurologically injured patients who must remain in a supine position.

Paediatric Spinal Simulator – Garry Corr

Over a million lumbar punctures were performed last year but

success rates for the procedure are dropping. An investigation undertaken to determine the underlying cause found that medical students had difficulty in positioning the child correctly, a crucial step in the procedure.



The Paediatric Spinal Simulator is designed to mimic the movement of the spine as a lumbar puncture is performed. The product contains two pairs of plates - one representing the torso and one the pelvis - which are connected by a gas spring along with a double-pinned shaft. As pressure is applied to the 'upper back' and below the 'thigh', the plates hinge forward and a set of vertebrae attached to a strip of electric steel connected to the shaft transfers the force applied to the plates to open the vertebral spacing up. This allows a needle to be inserted and a lumbar puncture to be undertaken in the correct place.

For further information on the PDE Programme or to discuss working with a student on a potential project, contact Craig Whittet
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Stem cell banking

IN A true world first for Scotland, Glasgow based Pharmacells Ltd has launched the most advanced adult stem cell banking product yet designed - Oristem® - which now sits alongside their ThalloCell™ naïve stem cell supply products.

The new Oristem® product utilises a unique, patented technology that allows for isolation, extraction and storage of newly discovered, *ultra-naïve* pluripotent stem cell lines, technically referred to as BLSCs or Blastomere-Like Stem Cells.

Until now it has only been possible to store cells using invasive, costly techniques - mainly designed to access cell types that have already

'chosen' pathways within the body. The BLSCs stored by Pharmacells Ltd are significantly less mature, which in scientific terms means that they have much more potential for use within personalised treatments or therapies.

Oristem® offers a customised stem cell collection system that enables adults to be visited at home where 80ml of intravenous blood is collected by a trained phlebotomist, following a one-on-one medical consultation by one of the company's medical doctors.

To deliver Oristem®, Pharmacells has partnered with two leading companies in their field, Altrika Ltd (part of Ilika PLC)

to process the blood samples and extract the cells, and Vindon Healthcare PLC to provide long term storage. All parties have been inspected and licensed by the UK Human Tissue Authority, effectively guaranteeing that they operate to the highest standards possible. Together, they have designed a bespoke, temperature controlled Nanocool™ collection kit that allow samples to be safely collected almost anywhere in the

world and dispatched to Altrika Ltd for processing.

Athol Haas, Pharmacells' CEO says, 'We are extremely proud and excited to be the first UK bank to gain approval for storage of blood-derived stem cells by the Human Tissue Authority (HTA). The launch of the Oristem® product has stirred global interest and we are currently in the process of expanding our services to China, Japan and the UAE. We are also in advanced negotiations with potential partners in Portugal, Spain, Australia and the USA. Our product was designed to have no geographic boundaries and is receiving interest from both the UK and countries we never dreamed possible. We are proud to be able to use our patented technology to help improve the future health outlook of our clients. Stem cells are at the forefront of a new wave of medical technologies and our Oristem® product offers, for the first time, a cost effective opportunity for anyone to improve their future health, and that of their families.'

Like most small life sciences companies, Pharmacells has been pushed to revenue generation by a group of very enthusiastic investors, each of whom understands the value of the technology. They have been supported by private investors, Scottish Enterprise, Scottish Development International and well known Scottish angel group, Grampian Bio Partners. Each of these groups has added to the experience available to the team and been instrumental in helping produce a revenue generating business with true global potential.

Medical Director, Dr Neil Fell is at pains to point out however that Pharmacells has been structured not only to generate cell banking revenues but also to push forward towards new cell therapies, using their ThalloCell™ products within specific research products.

At the time of writing, Pharmacells is working with various academics in the UK, USA and Japan and is making strong progress, particularly with osteo applications. In fact, it is expecting to publish a paper by the end of the year that demonstrates the potential of BLSCs in a UK researched, broad spectrum application.

Neil said, 'Our idea is to create a self-sufficient business that can inward invest profits to help develop new cell therapies. We didn't want to continually be struggling with funding, nor to be held to boundaries, and this set-up gives us the best of both worlds. We expect that within a short number of years, we will be able to not only store naïve stem cells in large numbers but also apply them to a number of high profile uses.'

He added, "We are always willing to talk to academics, scientists and institutions about the specific properties that make ThalloCell™ special. If you think that we could work together, please get in touch.'

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Athol Haas

State-of-the-art scanner

THANKS TO a £1.5M British Heart Foundation Strategic Grant awarded in 2009 to Professors Berry, Dominiczak and Walters, based in the Institute of Cardiovascular and Medical Sciences, University of Glasgow, and additional funding in excess of £800K provided by the University, the BHF Glasgow Cardiovascular Research Centre hosts a new state-of-the-art 3.0 Tesla MRI Facility.

‘Given the opportunities for pre-clinical and clinical research imaging in our Centre,’ said Professor Colin Berry, ‘we decided, for several reasons, to go for a 3.0 Tesla clinical-grade scanner. Firstly, compared to a standard 1.5 Tesla scanner, the higher field 3.0 Tesla scanner provides about double the signal-to-noise, resulting in images with much sharper definition and contrast. Secondly, thinking of the study participant and volunteer experience during a scan, a wider-bore magnet (70 cm) rather than the conventional (50 cm) was felt to be a better option as the wider bore not only reduces the sense of claustrophobia which can be experienced by participants, but the increased bore width may also facilitate research imaging in metabolic disease and obesity. Thirdly, higher field strength scanners are more useful for pre-clinical small animal MRI and, finally, 3.0 Tesla scanners are particularly useful for myocardial stress perfusion imaging looking for regional reductions in blood flow in the heart related to coronary artery disease.’

A Siemens MAGNETOM Verio with workstations specified with

cardiac and vascular software packages was chosen to compliment the scanner and also a 31P surface coil for MR spectroscopy which allows the study of energy metabolism in organs including the heart, liver and muscles. Subsequent to research agreements with Siemens Healthcare being entered into, novel work-in-progress pulse sequences keeps the MRI Group at the BHF Cardiovascular Research Centre at the cutting edge of cardiovascular imaging.

The Group is multidisciplinary, including staff from the University of Glasgow and NHS Greater Glasgow and Clyde. It works within the envelope of Glasgow Biomedicine and has close links with the Golden Jubilee National Hospital (National Waiting Times Board). Recent developments with Glasgow Biomedicine mean activity on the 3.0T scanner will co-ordinate with other research imaging scanners being run by NHS Diagnostics Imaging and NHS R&D in the Western Infirmary.

Currently, the MRI Group has two radiographers trained in cardiovascular MRI with more planned, academic imaging cardiologists and physicians. The Group partners with academic neuroradiology led by Dr Kirsten Forbes, Consultant Neuroradiologist at the Institute of Neurological Sciences, Southern General Hospital and Dr Dan Kusuma, a Lecturer in Radiology, is also working in the lab. MR Physics is led by Dr John Foster, Consultant MR Physicist in GG&C and his team includes members who have

expertise in MRI and ultrasound. ‘The Group’s research mission,’ explained Colin, ‘is to initiate and develop cutting-edge clinically-relevant MR research in cardiovascular, metabolic, and renal

disease. We have current projects in computer modelling of the human heart with the Mathematical Biology Group of the University of Glasgow and the Signal and Image Processing Group of the University of Strathclyde. This work is supported by current grants from the Chief Scientist Office, Medical Research Scotland, Scottish Funding Council and EPSRC. In the past year, research in renal perfusion imaging, carotid artery imaging, micro-MRI of bone structure and even anatomical imaging cadaveric human hearts has been developed. And upcoming clinical projects include cardiomyopathy, cardiotoxicity studies of chemo-radiotherapy in lung cancer, ankylosing spondylitis, stable angina, heart failure and also in patients with recent myocardial infarction.

‘Our clinical research team is geared for clinical trial work including with a core laboratory for clinical trials in which MRI is used to provide functional and/or surrogate outcome information on drug effects. The MR physicians have extensive experience of clinical trials in which MRI has been used. We also have close links with



Professor John McMurray’s Heart Failure and Clinical Trials Research Group.’

The group are excited about emerging results with cardiac MRI in rabbits and renal imaging in rats. Given the well-established research programmes of Professor Godfrey Smith’s group (cardiac imaging and electrophysiology) and Professor Dominiczak and Dr Delyth Graham (rat genomics), it is looking forward to new opportunities linking *in vivo* phenotyping by MRI.

MRI collaborators currently include the Scottish Cardiovascular Research Imaging Group, SINAPSE, the Beatson Oncology Centre and academic partners at the Universities of Leeds, Leicester and Glasgow Caledonian. The group is keen to build links with researchers from all backgrounds and welcomes enquiries for collaborative or contract work.

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Is there a quantitative biology?



Professor Timothy Newman joined the University of Dundee as Professor of Biophysics and SULSA Chair of Systems Biology in 2011. Prior to this he was Professor of Physics and Director of the Center for Biological Physics at Arizona State University. Timothy's early training was in theoretical physics of non-equilibrium systems and he has been active in biological research since 2000. He is currently Editor-in-Chief of the interdisciplinary journal Physical Biology, published by the Institute of Physics.

Here he raises the question of whether biological systems are amenable to a quantitative understanding, and shares with us his views as to the best course of action to exploit quantitative approaches, specifically in terms of 'models' in the event that they will be of substantial use.

What is a model?

In science, a model - when not a mouse or a fly - is an abstract conceptual framework within which to define and test hypotheses relating to some real entity. In physics, such frameworks are almost invariably expressed through mathematics or computer algorithms. There is an increasing desire to mirror this approach within biology. It is important to stress that even within physics the mathematical expression of the model is often no more than a language through which to process deductions and determine consequences. The essence of the model exists independently of the mathematics, and is a set of assumptions laid upon a foundation of existing knowledge. Thus, when formulating a model, one should start, ideally, with verbalising or writing down these assumptions. In the life sciences, each assumption should have a meaningful interpretation in terms of known biology. Interpretations may appear crude or poorly justified, but they should exist nonetheless. If the assumptions and their interpretations cannot be presented on demand, one has not a model, but an academic exercise with, most likely, little power to inform one's understanding of reality.

Biology versus physics

There is a gulf between these two disciplines upon which I have recently dwelled in an essay entitled 'Life and death in biophysics'¹, so I will refrain here from details. In a nutshell, and as appreciated by many,

the fundamental difference between physics and biology, and the true potential stumbling block of quantitative biological investigation, is the process of evolution that underlies the present state of living systems. Evolution draws not a veil over the origin and 'becoming' of living forms, but rather a thick velvet curtain, through which little light is shed. The ancient fitness landscapes, upon which living systems competed and won or lost, are gone, never to be retrieved. We know not the course of the game, and are presented only with the contemporary winners. Do they represent an optimal solution - a realisation of some putative fundamental laws of biology - or are they just lucky and complicated?

Regulation versus emergence

Continuing with this line of thought, and contemplating the seemingly endless intricacy of living systems, one can ask the question: is the simplest predictive model of a cell a cell? The word 'predictive' is essential, of course, as many simple models of cells exist. The ultimate value of a model, though, rests with its predictive power. How far beyond the trivial inferences of the model assumptions itself will the model lead the investigator? In physics we have been 'spoiled rotten'. Simple physical models are outrageously powerful. Classically, one need only look at Newton and Maxwell to appreciate this. Twentieth century physics treated us to examples of a different ilk: the quantitative understanding

of *emergent macroscopic states from simple underlying interactions*, as evidenced, say, by water, with its simple 'genotype' of H₂O, and its abrupt transformation from liquid to solid 'phenotypes' at zero Celsius; or else the, perhaps less familiar, phenomena of semi- and super-conductivity, which emerge from simple quantum interactions. Dare we hope for such power, or even a trace of such, in biology? To what degree are living systems emergent states, as opposed to being defined and controlled by layer upon layer of regulation? Presently, most biological research is entranced by the details, the uncovering and contextualisation of each microscopic regulatory link. Will 'bottom-up' provide us with predictive power in our life-times, or will a healthy dose of 'top-down' pay shorter-term dividends? These are not rhetorical questions, and reflect the uncertainty, and hence excitement, of modern biology.

Description versus prediction

Regarding quantitative biology, what is it, ultimately, that we want or expect? 'We' here should, perhaps, be separated into experimentalists and theorists. The former are generating more data than ever, and it is reasonable for this community to look for new theoretical frameworks within which to rationalise and utilise this data. The latter originate from various quantitative disciplines, and come with different motivations, no doubt. To my mind, theorists need to nail their colours to the mast and place biological understanding as their foremost

goal. Mathematics and computer algorithms are tools. They can be used, almost trivially, to describe biology. This should not be the modus operandi. Rather, theorists, in close collaboration with experimentalists, need to define models which have the potential to uncover new insights and understanding from the data itself, thereby generating predictions which are compelling enough to persuade biologists to design new experiments.

This feedback loop between experiment and theory is fundamental, and has brought clarity to most problems in the physical sciences. It remains to be seen whether biologists and theoreticians can create a culture of working together in this fashion, and whether biological systems will succumb to this quantitative approach.

For further information on Timothy's research see www.lifesci.dundee.ac.uk/people/timothy-newman

¹ T. J. Newman 2011, *Life and death in biophysics*, *Physical Biology* 8 010201

Innovator of the Year competition

THIS BBSRC competition recognises and rewards individuals and small teams who have harnessed the potential of their excellent research. There are three categories – Commercial, Social and Most Promising.

See www.bbsrc.ac.uk/business/impact-incentive/innovator.aspx for more information and deadlines.

Diabetes research



THE SCOTTISH DIABETES RESEARCH NETWORK

(SDRN) was commissioned in 2006 by the Chief Scientist Office of the Scottish Government as part of the UK Clinical Research collaboration (UKCRC) with the aim of improving both the quality and the quantity of diabetes research activity across Scotland. SDRN has three main workstreams - epidemiology, the SDRN research register and clinical trials.

The epidemiology group specialises in linking anonymised patient data from the national clinical database, Scottish Care Information - Diabetes Collaboration (SCI-DC), with other national registers, usually held within the Information and Statistics division of NHS Scotland eg the hospital admissions register or fracture register. With around 230,000 people with diabetes on the national clinical database, this data linkage gives the researchers a large dataset for their

epidemiological research. This group has published several papers in leading diabetes journals and has several more currently in process. One example looked at a possible link between a commonly used insulin and cancer rates.

The SDRN research register is a proactive way of approaching people with diabetes to ask if they are interested in being contacted about research. Most diabetes patients (around 70% on personal contact and 50% on written contact) agree to be approached about any research study for which they are eligible and there are currently around 10,000 patients on the research register across Scotland. Electronically, the research register sits within SCI-DC so when a study comes to SDRN, a search can be made for eligible patients, using their latest clinical data, within minutes. This has led to Scotland achieving top recruiter status, both within the UK and internationally, for several studies over the last two years.

Numbers of clinical trials have increased significantly for the five years that SDRN has been in existence, particularly commercial trials. In 2009 there was an increase of 19% in numbers of commercial trials, while in 2010 this increase doubled to more than 38% and repeat business has been

obtained for all pharmaceutical companies that SDRN has worked with. The numbers of academic trials has also increased and Glasgow is about to become the lead centre for a global trial funded by the Juvenile Diabetes Research Fund (JDRF) - the REMOVAL study led by Professor John Petrie.

SDRN trains all its research nurses to work to Diabetes Specialist nurse level, thus providing holistic care for all patients participating in research and it has Standard Operating Procedures for all clinical and epidemiological processes.

SDRN also has a public and patient involvement strategy and positively encourages researchers to have patient input into studies, either commenting on patient information sheets or participating in study steering committees. SDRN welcomes approaches from researchers with new studies and will facilitate whenever possible.

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Bio network Beijing

BEIJING - a city with a splendid past and an infinite future, ancient, yet young. Beijing is the political, financial and research capital of China with more than 80% of the country's banks, insurance, securities and investment companies having their headquarters there. The biopharmaceutical industry, a sunrise industry full of great investment potential and development space, has emerged as one of the four key fields for Beijing's modern manufacturing industries. In 2010 the industry sales income was 179.3 billion USD (increased by 26.4% compared to 2009) and the gross profit reached 19.8 billion USD (increased by 26% compared to 2009).

As the research centre of China, Beijing has the advantage of being home to some 74 universities and around 240 institutes and colleges offering masters degrees and PhDs. There are 629 academics in the Chinese Academy of Sciences and Chinese Academy of Engineering in the Beijing area, accounting for 46.7% of the country's entire body of academics nationwide. Nearly 4,500 students graduate in biomedical related studies in Beijing every year and there are around 13,000 people undertaking life science research in Beijing of which 65% are scientists and engineers. According to the latest figures, about 80% of Chinese students abroad would like to come back to China to establish their own businesses, with 60% of them citing Beijing as their preferred location.

As the administration centre of China, there are a number of government agencies located in Beijing that directly or indirectly impact on research and research-based industry. The impact of the government's role in innovation, science, technology development and the development of research-based industry is immense. The Beijing Municipal Government has established a series of policies to promote industry development and to create an excellent development environment. The implementation of the 'Science and Technology Beijing' Action Plan became the guidance for the current development of science and technology as well as high-tech industry in Beijing. Of all the policies regarding industry development promulgated by Beijing, the biopharmaceutical industry comes first, making it one of the most important supporting industries, gaining great support from the government.

Beijing Pharma and Biotech Center (BPBC), founded in 1996, is a governmental agency under the Beijing Municipal Science and Technology Commission. It is dedicated to stimulating innovation, promoting industrial development, and providing consultation services for the Beijing biopharmaceutical industry. BPBC achieves this by providing up-to-date information about the industry, consulting on industry development for government and on company development, partnership seeking, technology transfer and policy analysis for both Chinese and international biotech and



pharmaceutical companies and institutes, and holding conferences and workshops. Currently it has 46 full time employees, working in six divisions - Strategy Research, Project Management, Business Development, R&D Promotion, International Affairs, and Events & Expo.

BPBC has close working relationships with government, universities, research institutes, academic organisations, biopharmaceutical companies and a wide international network composed of embassies in China and multinational enterprises. It liaises between government, institutes, and biopharmaceutical enterprises, helping domestic institutes and enterprises get policy, financial and information support from the government; and also helping international enterprises that are interested in forming partnerships or setting up R&D centres in China.

Over the last 15 years BPBC has earned a reputation for provision of high quality

services and value to both the government and industry. It has built bridges for international companies and organisations to gain easy access to the biopharmaceutical industry in Beijing, and arranged activities with key governmental, industrial, research, and clinical personnel, including visits to many institutes and companies based in Beijing. In addition, BPBC provides domestic biopharmaceutical organisations and companies with opportunities to track the latest development trends and to explore international markets, through organising overseas visits and attending international trade shows.

BPBC has set up several subsidiary organisations to further unite domestic enterprise, of which, ABO (Alliance of Biotechnological Outsourcing) is the most influential and successful. Founded in 2005, ABO currently has 39 member firms comprised of leading Chinese R&D service providers. It provides a wide range of R&D services in areas such

as genomics, chemicals, formulation, diagnostics, vaccines, antibodies and so on. In 2010, ABO's technology service revenue exceeded 160 million USD, of which half was accounted for by international orders.

In addition, BPBC provides various platforms for networking and knowledge exchange in both business and scientific fields, by organising international and domestic forums, seminars, workshops, and exhibitions, such as the Annual Healthcare Industry Forum (HIF), Life Science Annual Conference (LSAC), Life Sciences Frontier Seminar (LSFS) and so on. BPBC has successfully organised 14, 10 and 104 of these events respectively.

The annual HIF which began in 1997 is a global pharmaceutical and biotechnology industry conference which, over 14 years, has attracted over 7,000 attendees. In accordance with HIF's motto - 'analyse the industry situation, solve developing problems and construct a healthy future' - the HIF has dedicated itself to bringing together VPs, CEOs and executives from the Global 50 companies and the Top 300 Chinese companies to exchange ideas and identify opportunities for collaborations. The forum is

now recognised as the platform that brings global participants together to bridge western and Chinese biopharmaceutical industries.

This year the forum runs from 1 - 3 November in Beijing. The theme of HIF 2011 is 'Extensive Communication, Resource Gathering, Win-win Co-operation, and Leap-Forward Development'. The HIF will include a plenary session, theme summits, one-on-one partnering meeting and exhibition. Hot topics to be discussed include biopharmaceutical industry Leap-Forward Development, new Chinese biopharmaceutical industry trends, the CMO & CRO industry, overseas talents' opportunities, development in science parks and clusters, technology transfer, investment and financing. It will provide an excellent opportunity to learn more about new policies, key incentive measures and major achievements in the Beijing pharmaceutical and biotechnology industry.



For more information on BPBC contact Mr Lei Ting, Director-General, Beijing Pharma and Biotech Center
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Delegates at the annual Healthcare Industry Forum

Network benefits

THE COUNCIL of European BioRegions (CEBR) - of which Nexus is a member - is a small and lively self-funding network of healthcare life sciences clusters or biocommunities across Europe. Founded eight years ago by a core group of clusters in Europe, including Cambridge, Paris, Berlin, Heidelberg, Munich, Barcelona, Uppsala and Piemonte, the network aims to defragment the support and operation of biotechnology in Europe. Members are the primary point of contact for small biotechs in their biocommunity and include science parks, business networks, cluster managers - whoever is the core support for cluster development.

Members work together to share biotech support services across Europe and develop new services that can be used across all biocommunities. Examples of the network in action are the €3.5M Advanced Biotech Cluster platforms for Europe (ABCEurope) project to develop and launch new support services for SMEs, plus Special Interest Groups around key topics for cluster development, such as harnessing talent, cluster assessment and shared facilities. Members are very active, defining and delivering all network activities and CEBR offers a neutral, independent platform for cluster and biocommunity managers to work together across Europe.

The European Biotechnology Network is a two year old

charity which has been launched to facilitate co-operation across all biotechnology sectors. Launched in response to Europe's continuing fragmentation of biotechnology by sector, country and organisation type, the Network brings together all actors involved in delivering and supporting biotechnology, from universities, SMEs, large companies and support providers.

Core to the network are the online Company Directory, with over 2,400 entries (all listed using OECD criteria) and the Biotechnology Funding Hub, a platform that tracks research funding open to companies, that can be used to build collaborative partnerships in Europe. Members are from all walks of biotechnology - red, green, white..... just name your colour - work together to build collaborations beyond the main partnering efforts already in action in Europe.

For further information on how Nexus members can benefit from access to these networks, contact Claire Skentelbery on either network address or Graeme Boyle, as Scottish Member of the Council of European BioRegions.

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Clinical research centre gets people talking

IN MAY 2011, Queen Margaret University (QMU), Edinburgh launched its new Clinical Audiology, Speech and Language Research Centre (CASL). The Centre's aim is to apply cutting edge techniques which will assist in the diagnosis and treatment of a wide variety of communication disorders.

In the UK alone, 2.5 million people have a communication disorder, and a recent UK Government report has highlighted the need for research to improve treatment for children and young people with communication impairments. Communication disorders are highlighted as a key government priority, with 2011 designated The National Year of Communication¹.

QMU already has an international reputation for its outstanding research within speech sciences. The new CASL Centre will draw together existing research

and clinical practice expertise from within its long standing Speech and Language Sciences specialism and its more recent audiology specialism. CASL researchers are therefore extending their activities beyond speech science, with the aim of developing both technological and non-technological interventions for all kinds of language, communication and hearing disorders.

Speech, hearing and language are intimately connected. They have a profound impact on a person's ability to engage with society. For example, around 60% of young men in prison have below average language skills. Evidence also suggests that problems in understanding and expressing language can lead to communication breakdown and an increase in behaviours such as aggression. Scoping and enhancing provision of Speech and Language Therapy Services within Scotland's criminal justice pathway will be an important new research focus for the Centre.

CASL's audiology team is currently focused on the development of tools to facilitate hearing assessment and intervention for the elderly. With Scotland's growing elderly population at significant risk of hearing loss, coupled with increasing evidence of links between hearing difficulties and dementia, there is a very real need for new approaches to the management of hearing impairment in the elderly population. CASL researchers are working with care homes to



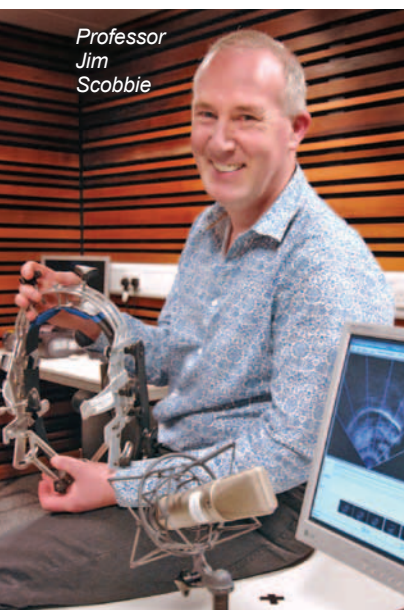
Dr Joanne Cleland using electropalatography with 10 year old Gallina to allow her to see her tongue position, in real time, while she talks

develop tools for the screening and diagnosis of hearing impairment in elderly residents. They are also developing new approaches to rehabilitation, moving away from more traditional use of hearing aids, and working on other listening technologies and communication strategies.

Much of CASL's research has focused on developing technologies which provide visual images of the tongue and its movement inside the mouth during speech. Professor Jim Scobbie, CASL's Director, explained, 'One of the main barriers to understanding and treating speech problems has been that we cannot see what the tongue is doing inside the mouth during speech. New imaging techniques are helping to change that.' One technique that Queen Margaret University has pioneered is electropalatography (EPG). This uses an artificial palate, like a dental plate, which contains 62 electrodes that detect where and when the

tongue makes contact with the roof of the mouth during speech and displays this on a computer screen. EPG can be a particularly useful means of helping people with speech problems because it provides the therapist with detailed information about speech patterns, and allows the client to view their own speech movements, and compare these to correct patterns produced by the therapist. Children with hearing impairment, cleft palate and Down's Syndrome have responded well to this technique.

A recent clinical research participant was 15 year old Lily Davidson. Profoundly deaf since birth, Lily was fitted with a cochlear implant before her 3rd birthday, which gave her access to sounds across the speech frequencies. Dr Jo White, Audiology Research Lead at CASL, has worked with Lily since she was two years old. She explained, 'Lily has always been an intelligent child and having spent her first three years unable to hear, she made



Professor Jim Scobbie

astonishing progress with her cochlear implant. By the age of 10 she had acquired age-appropriate spoken language but continued to struggle to produce clear speech.'

Lily's family was delighted to have the chance to work with EPG at QMU. Over a short period using EPG, Lily's speech clarity significantly improved. She believes that she has been extremely lucky to have benefited from the full range of different speech and hearing technologies. She said, 'I'm the only one of all my deaf friends who has had EPG and that's not fair. Everyone should have an equal chance to improve their speech.'

Ultrasound Tongue Imaging (UTI) is at an earlier stage of development. Over the last decade, QMU has developed world-leading ultrasound technologies, combining them with EPG and other instrumental measurement techniques. This has been made possible by collaboration with Dr Alan Wrench of spin-out company Articulate Instruments Ltd. This research equipment is sold to universities and clinical research centres internationally.



This year, a project between CASL and the Centre for Speech Technology Research at the University of Edinburgh was awarded £560,000 by the EPSRC to undertake pre-clinical research to further develop UTI and evaluate its use as a clinical tool

for treatment of developmental speech disorders.

A common theme across much of CASL's research is the use of modern information technology to support people with communication difficulties. CASL's Fitvoice® technology is designed to monitor and prevent occupational voice disorders in groups of workers such as teachers and call centre workers. The TUC estimates that five million workers in the UK suffer from voice impairments, at an annual cost of £200M to the UK economy. However, with early identification and simple voice care advice, most of these problems are preventable. The Fitvoice® approach uses an iPhone app to record and analyse teachers' voices at regular intervals and provide individualised advice for maintaining vocal health. The CASL team believes that the advent of portable devices like smartphones and tablet computers opens up possibilities for effective, low-cost support for a wide range of people with communication and hearing problems.

Professor Jim Scobbie concluded, 'We want CASL to build on its world-wide reputation for research in speech and hearing sciences and to make sure that as many people as possible, both in the UK and abroad, can benefit from the techniques we have developed.'

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¹ For more information on *The National Year of Communication* see www.hello.org.uk/introducing-hello/whos-behind-it.aspx

Gene patents in the US

UK LIFE SCIENCE

companies with an eye on the US market will have been anxiously watching the progress of the 'Myriad' case. For those not aware of the history, a US District Court judge ruled in March 2010 that patents held by Myriad, which are directed to the BRCA genes and their use in diagnostics, were not patentable. The judge ruled that the subject matter covered by the patents was not allowable as a fundamental and general principle of US patent law, not just in this one specific case.

This ruling went against 30 years of USPTO practice in issuing 'gene' patents, and rocked the very foundations of the biotech industry. Hence there has been intense interest and wide speculation about where this case will lead. The latest chapter of this story has just been written - in the form of a 105 page judgement of the Court of Appeals for the Federal Circuit (CAFC).

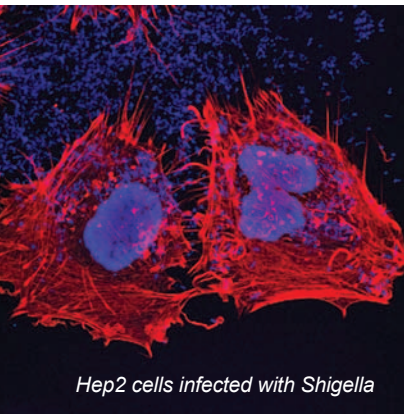
'In a nutshell,' says Douglas Drysdale, Patent Director, Harrison Goddard Foote, 'the sky has not fallen on biotech patents. It looks like we're back almost where we thought we were before, with one notable change.

In short - 'isolated' DNA (in this case DRCA cDNA, genes and partial gene sequences) is patentable; methods of screening compounds against cells with altered BRCA genes are patentable; methods of simply comparing BRCA sequences in subjects with known mutated sequences (ie genetic screening) are NOT patentable subject matter.

'This is a significant development, but it's not the end of the race. The three judges in the CAFC were not in unanimous agreement on all issues, and it is quite finely balanced. It's unlikely that this ruling won't be further appealed by both Myriad and the myriad parties (apologies!) challenging the patents. The next stages would either be the entire CAFC court of 10 judges coming together to hear the case 'en banc' and/or it moving up the Supreme Court. I'll be watching closely and am happy to discuss with interested parties.'

The judgement can be accessed at www.cafc.uscourts.gov/images/stories/opinions-orders/10-1406.pdf
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September workshops



Hep2 cells infected with Shigella

AS AN international technological University, the University of Strathclyde has a transformational agenda. The launch earlier this year of its £89m Technology & Innovation Centre (TIC) is bringing together multidisciplinary teams and leading industrialists to address major research challenges of significance in the 21st Century. In line with its aim of assisting Scotland's industries compete on the world stage, the new Centre will host a trio of horizon-scanning workshops on 27, 28 and 29 September 2011 and support can be provided for companies wishing to attend.

The workshops will focus respectively on Bionano - the

control of biomolecular interactions as relevant to nanotechnology and biomedical applications; Health Technologies - the development and translation of health technologies based on Strathclyde's unique strengths in drugs, diagnostics, medical devices and interventions; and Advanced Science and Technologies - proof of concept for technology developers and end-users in application of laser-driven particle accelerators, cold beams etc.

In parallel, the Centre for Neuroscience at the University of Strathclyde (CeNsUS) will be holding a Showcase and Partnering Event on 27 September 2011 and Research In Cancer At Strathclyde (RICAS) will be exploring all aspects of cancer from target identification to drug formulation on 29 September 2011.

To receive an alert when the programmes and registration details are available, send an email to rkes@strath.ac.uk indicating which events are of interest.

MEMBERS OF THE STEERING GROUPS

Nexxus promotes and supports research excellence, innovation and knowledge transfer within the life science community in Scotland. Since its launch in 2003, it has been guided by representatives from all aspects of the life science community in Scotland including: universities, further education colleges, NHS Trusts, professional service suppliers and life science industry representatives.

Current members of the West Steering Group are:

Chris Packard (Chair), NHS Greater Glasgow and Clyde; Fiona Godsman (Vice Chair), Kelados; Alison Bennett, Scottish Enterprise; John Bremner, Link Technologies; Alastair Muir, Vistage; John Waller, OracleBio; Graeme Milligan, University of Glasgow; Janet Halliday, Controlled Therapeutics; Kevan Gartland, Glasgow Caledonian University; Catherine Breslin, University of Strathclyde; Louise Rice (HR Consultant); Jim Hay, Scottish Colleges Biotechnology Consortium (acting representative).

Current members of the East Steering Group are:

Till Bachmann (Chair), University of Edinburgh; Jennifer Shipston (Vice Chair), Charles River Laboratories; Fiona Godsman, Kelados; Lee Innes, Moredun Research Institute; Patrick McCarthy, Genecom; Ruth Murray, ImmunoSolv; Alison Bennett, Scottish Enterprise; Aidan Courtney, Roslin Cells; Jane Kennedy, Roslin BioCentre; Christine Phillips, NHS Lothian; Bob Millar, MRC Human Reproductive Sciences Unit; Malcolm Bateman, Edinburgh Science Triangle.

For further information about Scotland's life science industry or to tell Nexxus about a news story or event which would be of interest to the community, contact Nexxus at:-

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