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Physiology News

Issue 89 / Winter 2012

Education special issue

Can physiology teaching help to improve patient safety?

Leading figures in physiology recall their school days

Teaching with technology

The Physiological Society

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Physiology News

We welcome feedback on our membership magazine, or letters and suggestions for articles for publication from Physiological Society Members. Please email **magazine@physoc.org**

In 2013 *Physiology News* will be running the following special issues:
International physiology, Summer 2013 (deadline for proposals: 4 March 2013)
Physiology in industry, Autumn 2013 (deadline for proposals: 17 June 2013)

Physiology News is one of the benefits of membership of The Physiological Society, along with reduced registration rates for our high-profile events, free online access to The Physiological Society's leading journals, *The Journal of Physiology* and *Experimental Physiology*, and travel grants to attend scientific meetings. Membership of The Physiological Society offers you access to the largest network of physiologists in Europe.

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Designed, produced and printed by Lavenham Press Ltd.

Message from the Chief Executive

Philip Wright

When I joined The Society just over two years ago, we faced several key challenges. First, there was real concern that, with the increasing profile of Open Access (OA), our journals would suffer and our income decline – especially when our existing publishing contract comes to an end on 31 December 2013.

Second, we had the impending office closures: Cambridge in mid-2013 and Peer House in London in early 2014.

Third, we had, and still have, the challenge of raising the profile and recognition of the importance of physiology. This is essential to ensure investment is sustained both in research and in the education and training of the next generation of physiologists.

The last 12 months has seen significant progress on all these fronts, especially driven by two task forces appointed by Council: one on publications (chaired by Jonathan Ashmore) and another on property (chaired by Mike Spyer).

We have signed a new publishing agreement with Wiley-Blackwell covering the period from 1 January 2014 to 31 December 2018. Over the last nine years, the relationship with Wiley-Blackwell has been a very positive one for The Society and the significant income we have received has allowed us to increase our support for our Members and deliver more in support of our charitable objectives: meetings, travel grants, and education and outreach activities.

The new agreement brings an improved financial package, greater flexibility for us in launching new journals, and other financial support from Wiley-Blackwell in the form of a generous donation for the outfitting of the auditorium at our new premises and as the principal sponsor for the IUPS Congress in 2013.

The publishing agreement also crystallises a more strategic working relationship that will ensure the editors-in-chief, the boards, the publications team and Wiley-Blackwell will work together to sustain and enhance *The Journal of Physiology* and develop a new strategy for *Experimental Physiology*. This sees the latter journal moving to online-only publication from January 2013. This work has also sought to ensure that we both differentiate our journals and remain compliant with UK and international trends in OA, such as the '12 month delayed green access' or ability to use a 'gold access' route.

As I write this we are well on track with launching an OA journal – *Physiological Reports* – as a collaborative venture with the American Physiological Society. An agreement has been signed creating joint ownership and, following a very rigorous selection process, Susan Wray has been appointed as the Editor-in-Chief of the new journal. The intention is to launch early in the New Year (see page 8).

The purchase of Hodgkin Huxley House (HHH) was made after 12 to 18 months planning with the help of our agents, Third Sector Property (now "TSP"), who will provide facilities management services for HHH.

The decision to purchase the property was not taken lightly, but the financial arguments and opportunities from the creation of a home for physiology were clear. The ability to host all our own committee and editorial board meetings, the opportunity to host other focused scientific meetings and the revenue from leasing the top two floors and hiring out the meeting rooms will ensure we get good value for money from our investment.

At the same time, under the guidance of the Finance Committee and external expert advisers, we have sold four properties we directly owned outside London, the income from which we have reinvested into HHH. While these properties had provided a good return in the past, the recent downturn has meant that it was advisable to sell and focus on London and our other investments.

The fit-out of HHH was 83% complete in early November, on track for a move-in date in mid-December. The focus of the Property Task Force has been on ensuring we have flexible meetings rooms and office space, maximising the opportunity to rent out the top two floors to like-minded, science driven organisations, and ensuring value for money.

2013 will therefore be a year of continuity, development and completion: continuity and development in terms of our journals; and completion in terms of settling in to HHH and getting everything up and running. Not to forget, of course, the challenge of hosting the IUPS Congress and sustaining our meetings programme beyond that.

The third challenge I mentioned is raising the profile of physiology. There has been progress on this with increased activity in education (as highlighted in this issue of *Physiology News*), as well as outreach and policy, but much more needs to be done.

Many Members have illustrated the pressure that the discipline of physiology is under within university departments and institutions. With the Research Excellence Framework (REF) looming on the horizon, it is essential that physiology is recognised as the core discipline of the life sciences. The financial stability provided by our new publishing contract and the base that HHH will provide, creates a sound platform for us to work towards this goal.

Editorial

"Education is the most powerful weapon which you can use to change the world."
Nelson Mandela

Sarah Hall

Guest Editor

This issue of *Physiology News* focuses on education, which is integral to our discipline. As physiologists, everything we do can be considered to have educational value. We educate ourselves, and others, through our research activities; this enhances and broadens our understanding of physiological function, as well as informing the direction of future research activities. We educate the general public through outreach and engagement, with the aim of improving health awareness, as well as explaining the development and treatment of disease and generating public support for research. Finally, through our teaching and mentoring activities, we build a foundation for the future.

The term 'physiology' seems to have fallen from favour in recent times. The general media tend to ignore the 'physiology' bit when reporting on the Nobel Prize in Physiology or Medicine, and 'systems biology' is a growing area of funded research, while funding for 'physiology' stalls. Educating the general public, and fellow scientists, about physiology is essential to improving recognition of our discipline. Explaining what we do and why we do it is integral to preserving the profile of physiology, and maintaining its key role in the health of the population, as well as the economic and scientific health of the country. Eleven per cent of The Society's annual budget is allocated to education and outreach activities, which include awarding grants for summer vacation studentships and teaching innovation, as well as producing careers information and supporting public engagement events. The Society has recently established the Otto Hutter Physiology Teaching Prize to reward teaching excellence and innovation, we are also encouraging development of teaching through teaching grants and focused meetings, including a teaching workshop during the IUPS meeting next year. In this issue, reports on a number of these activities recognise the educational impact of The Society and the diverse nature of the events we support.

Educating the next generation of physiologists presents significant challenges and several features focus on aspects of undergraduate teaching. Raising the profile of physiology as a degree and as a cornerstone of medicine is a priority for The Society. Eugene Lloyd cites examples from his own experience as a clinician and teacher to argue the case for physiology as an essential component of the medical curriculum. Harry Witchell outlines the rationale for setting standards in assessments; this is a hot topic in medical training, but it is reasonable to anticipate that similar standard-setting criteria could be applied to non-vocational degree schemes in the future. Despite such real challenges, technological advances have opened opportunities for expanding the teaching of physiology into the virtual environment. Neil Morris explains how undergraduate practical classes have been enhanced through the use of interactive tablet devices and social media to support and expand the learning experience. Such developments will ensure that physiology teaching remains vibrant and relevant to students.

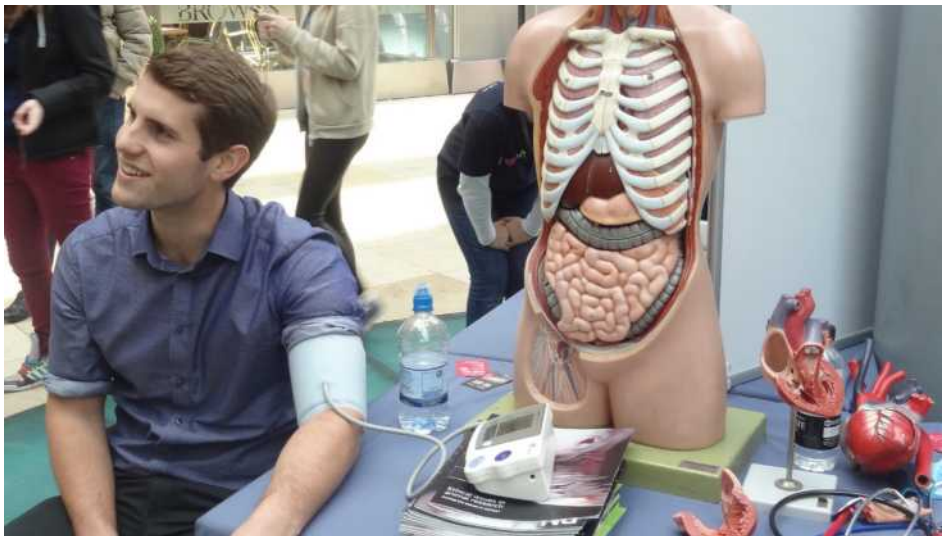
So, it is through educating the scientific community, the general public and the next generations of scientists that we will secure the future of our discipline and maintain its contribution to the physical, economic and cultural health of society.

I hope you find this issue thought-provoking and that, maybe, you might even learn something!

Biology Week and Physiology Friday

The Society's Outreach Officer, Lewis Dean, and Education Officer, Angela Breslin, report on the inaugural Biology Week

This year saw the inaugural Biology Week from 13–19 October. Coordinated by the Society of Biology, the week saw a huge variety of events organised by academics, schools, learned societies, zoos and local groups. A particular highlight was the open evening at the Royal Veterinary College, featuring a live dissection of a (dead) horse, a debate on whether we should save the panda (pandas survived the debate) and a record attempt for the world's largest memory game (sorry, we can't remember the result). The Society supported the week, in particular 19 October – named 'Physiology Friday' – through our grant programmes and by organising a writing competition.



Physiology Friday events took place at several venues around the country. For example, in Leeds, physiologists, led by Charlotte Haigh, ran a stall in a shopping centre celebrating the physiology of the heart. As well as exploring anatomical models of the trunk and heart, the public could have their blood pressure taken and sit for an ECG. In Brighton, Emma Ross organised a public symposium entitled 'The Science of Elite Sporting Performance', featuring physiologists and Paralympian cyclist Darren Kenny, discussing the impact of science on the training and performance of athletes.

With the success of this year's week, we're all looking forward to Biology Week 2013.

The Holy Grail of human biology research: under-19s writing competition

As part of Biology Week, we ran a writing competition for under-19s. Entrants were asked to answer the following question in no more than 200 words: "What do you think is the holy grail of human biology research?"

The judges were really impressed by the number and quality of entries received. Judging took place throughout Biology Week and on Physiology Friday (19 October) we were pleased to announce 16-year-old Oliver Neely of Tiffin School as the winner. This is his entry:

What do you think is the holy grail of human biology research?

I think that the 'Holy Grail' of human biological research is to do with certain curious structures found within all organisms: telomeres. These structures are found at the ends of chromosomes and telomeres are there essentially to protect the useful DNA from the 'end replication problem', so to stop genetic information being lost during replication.

As a person gets older, the telomeres on their chromosomes get shorter and shorter which accounts for the ageing process and eventually natural death.

An enzyme named 'telomerase' exists and is present within very young cells, such as those found in foetuses, and this enzyme repairs the telomeres at the ends of DNA. If we could somehow use this enzyme on our body's cells, then in theory we could make our cells immortal.

Cancer cells undergo rapid cell division and consequently their telomeres shorten very quickly, so, to get around this, they use telomerase in order to keep them from ageing. For this reason, research into telomeres might also help us to find a cure for cancer.

Finally, if we were able to get human cells to continuously divide, we could more easily produce cells for transplantation to help people with various genetic disorders.

We would like to thank everyone who entered this competition and congratulate Oliver on his achievement.

Editor-in-Chief and Deputy appointed for *Physiological Reports*

Together with our partners at the American Physiological Society, we have appointed the lead editors for our new, jointly owned open-access journal, *Physiological Reports*.

The Journal will be led by Susan Wray, University of Liverpool, as the Editor-in-Chief and Thomas Kleyman, University of Pittsburgh, as Deputy Editor-in-Chief. Both have expressed their excitement about working together with the Societies to set up the journal to a good start in the New Year.

Sue Wray said: "I am very pleased to be part of this exciting initiative. This is an excellent opportunity for our Societies to develop a flagship open access journal for the benefit of all our Members and to increase the impact of physiology in the broader bioscience community."

Thomas Kleyman added: "I look forward to working with Sue, The Physiological Society and the American Physiological Society in launching P*hysiological Reports*. This journal will provide Members of our Societies with an open access venue for publishing new and exciting findings."

UK teams win gold in European synthetic biology jamboree

Affiliate Member, Richard Kelwick of the University of East Anglia, reports on iGEM 2012

During the summer, nine UK teams competed against over 190 teams from across the world as part of the iGEM 2012 competition.

The International Genetically Engineered Machines (iGEM) competition is an exciting opening into the world of synthetic biology and is organised by the Massachusetts Institute of Technology (MIT) in the USA.

The competition involves interdisciplinary teams of undergraduate students supported by academic advisors. Each team must develop a novel biological system using synthetic biology techniques. In addition to the work in the lab, iGEM teams also engage in 'Human Practices' in which the teams must explore the broader societal, ethical and economic implications of synthetic biology.

Although iGEM is a competitive environment, the UK teams have often seized the collaborative opportunities that iGEM competitions help to create. To support UK iGEM collaborations, my team, from the University of East Anglia (NRP-UEA-Norwich), organised a UK team meet-up, which was hosted at Google Campus, London, in August. All nine UK teams attended and gave presentations. Guest speakers were Tom Ellis, a synthetic biologist from Imperial College London, and Adam Rutherford, an editor at *Nature* and BBC journalist. The teams were joined by a remote audience of over 300 people who watched the event streamed live over Google+.

Historically, the UK iGEM teams have been incredibly successful and this year is no exception. Gold medals were awarded to NRP-UEA-Norwich, Cambridge, Dundee, Edinburgh, St Andrews, and the UCL iGEM teams at the European jamboree. Exeter and Westminster both received a bronze medal. Cambridge, Edinburgh and UCL have our full support as they head onto the world final at MIT in November.

Visit igem.org for more information.

Your Society needs you!

The Society is looking to recruit a new Honorary Treasurer.

Rod Dimaline, the current Honorary Treasurer, will be stepping down at the 2013 Annual General Meeting following the end of his four-year term. He told *Physiology News:* "It's been a real honour to hold such a key position in The Society, and I've enjoyed the role enormously. The Society is in a very strong position and playing a part in keeping it that way is, I believe, a real contribution to physiology. As my term of office ends, I'm keen to see an enthusiastic and committed Member step up to the plate and contribute to what will be an exciting time for The Society going forward."

Charity finance training will be offered to the successful candidate, though some knowledge or interest in financial matters would be desirable.

The role of Treasurer is in addition to the normal role and responsibilities of a Trustee. The Council of Trustees meets up to four times each year, usually in London. Membership on the Council is unpaid, but expenses for travel to meetings and, where necessary, overnight accommodation are reimbursed.

No previous experience of being a Trustee is required although an induction and training programme is in place for new Trustees.

Visit www.physoc.org/new-honorary-treasurer to submit your application by 31 December 2012.

We are also looking for a new recruit to our Finance Committee to fill a vacancy from January 2013. The Committee meets four times a year at our London offices. As above, expenses will be reimbursed and charity finance training will be available.

Submit your application through www.physoc.org/finance-committee-member-candidates-sought by 31 December 2012.

Society attends party conferences

The Physiological Society attended the three main UK political party conferences this autumn, attending fringe events, and meeting with a number of MPs. With an eye on the changing legislation relating to animal research, a stand was funded at the Labour and Conservative conferences in collaboration with Understanding Animal Research and the British Pharmacological Society. These attracted roughly 250 people at the Labour conference, including Shadow Home Secretary, Yvette Cooper, and, at the Conservative conference Lord Turnball, Home Office minister with responsibility for animal research, stopped by.

Issues relating to science were highlighted at all three party conferences. The Liberal Democrats passed a policy motion calling for an increase in the ring-fenced science budget at 3% above inflation over the next 15 years and at the Conservative party conference, Chancellor George Osborne announced £200 million new money for the Research Partnership Investment Fund.

Meanwhile, Chi Onwurah, shadow science Minister, talked about her initial thoughts for a new policy on science and research for the Labour party. This includes a proposal for a review of how impact is assessed and a long-term funding plan for science. She was, though, unwilling to talk about the specifics, and wouldn't commit to supporting the Liberal Democrat call.

Society signs up to 'Declaration of Openness'

The Physiological Society has welcomed and signed up to a declaration on openness in research using animals. The declaration was co-ordinated by Understanding Animal Research and co-signed by many organisations within the life sciences sector, including the Research Councils, medical research charities, and a number of universities. The declaration commits signatories to "work together to establish a Concordat that will develop principles of openness, practical steps and measurable objectives which will underpin a more transparent approach to animal research." More information can be found online at www.physoc.org/media-statement/2012

Changes to the animal research act

The proposed changes to the Animals (Scientific Procedures) Act 1986 will be debated in the House of Commons and House of Lords during the winter – these are likely to have taken place by the time of reading.

Little will change drastically when the new legislation comes into force on the 1 January – areas including revised training requirements are not due to be dealt with until later in 2013.

New guidance and codes of practice will also be created in 2013, and any concerns raised during debates in the Houses of Parliaments could be fed into these documents. As such, it's crucial for Members to engage with their MP's now and discuss their research.

The draft amendments to ASPA 86 may be found on the Home Office website, and The Society will provide an in-depth article on the new legislation in the next issue of *Physiology News*.

Calls for greater focus on postgraduate education

The Higher Education Commission has released a report calling for greater focus on policy relevant to postgraduate education, stating that the issue is "almost entirely absent from the current policy debate".

Calling for greater awareness of the impacts recent changes may have on postgraduate provision, the report highlights the lack of data gathered about postgraduate education including fees and employment outcomes, as well as a lack of knowledge about the requirement for specific skills.

The report also called for attention to be paid to the funding situation for research Masters degrees, calling for the Government to establish a taskforce to examine the feasibility of a postgraduate student loan scheme.

The Physiological Society shall watch this policy space with interest, and look forward to helping the Higher Education Commission take this work forward.

Policy Corner

By the time this has landed on your doorstep, the Policy Committee will have had our inaugural meeting with Mary Morrell, the incoming Chair. We will have identified the key policy areas with which The Society will be engaging, our objectives for the coming year, and any gaps in expertise on the Committee.

The preparation for this meeting has taken a significant part of the last few months. We've had Trustee meetings, staff meetings, and discussions with the Education and Outreach Committee about areas of overlap between the two committees (e.g. the area of 'higher education' is relevant to both). We've also been looking at the 2011 Member Survey, and picked out the key areas that Members have flagged as being of importance.

We've also been evaluating what policy work is carried out by other organisations, and we hope that the Policy Committee meeting will help us to work out how to best engage with other organisations to ensure that the voice of physiology is heard, and how best to achieve the key policy aims of The Society.

We will provide an update on the outcomes of this meeting in the next *Physiology News*. However, if you have any thoughts in the meantime, please do feed them into our Policy Manager at policy@physoc.org

Outside of this, autumn has been busy from a policy perspective. The Physiological Society have co-run and co-funded an event in association with the British Pharmacological Society and NC3Rs. Entitled 'Models of Pain', the event aligned with The Physiological Society's commitment to the 3Rs, enabling discussion about opportunities for developing new and better models of experimental pain.

Over the last few months, The Society has been rather busy in a number of policy areas. We've invited MPs into labs conducting animal research in a scheme alongside the Association of British Pharmaceutical Industry and Understanding Animal Research, and have signed up to a Declaration of Openness on animal research. We have also fed into an inquiry by the think tank IPPR on 'The Future of Higher Education in England', and representatives of The Physiological Society have attended the party conferences.

A year 'In the Zone': a physiology roadshow from commission to completion

Sarah Hall

Cardiff University, UK

How many physiologists does it take to make an interactive touring exhibition about the physiology of exercise? The answer is - not many! From recent experience, I've learned that the physiologists are just a small component of a much bigger team, which includes engineers, computer technicians, designers, marketing and publicity experts, educators, tent manufacturers and even theme-park organisers.

Over the past year, I have been involved in a Wellcome Trust-funded initiative to develop an interactive physiology exhibition called 'In the Zone'. The science centre At-Bristol was chosen to create an exhibition building on the excitement surrounding the London 2012 Olympic Games to explain aspects of exercise physiology to the general public. The aim was to produce an outdoor touring exhibition that would travel to all 12 regions of the UK during the summer of 2012, to reach people who might not usually engage with science. Despite the very short time scale of the project and the wettest summer. since records began, all evidence suggests that, in the end, the exhibition was a great success.

November 2011: I was invited to be part of a small panel advising on the content of the exhibition. Our early brainstorming activities were inspired by Olympic sports and focused on topics that were scientifically intriguing and had some practical activity that could be measured easily and robustly. Discussions took place in the workshops of At-Bristol where we had great fun playing with prototype exhibits and generating ideas on how to demonstrate aspects of exercise physiology in novel and exciting ways. We winced at our vertical jumps replayed in slow-motion as we considered aspects of muscle contraction and force development, we calculated the calorific value of a single peanut as we generated power using hand cranks and we laughed at the colour of our cold hands on thermal camera images as we discussed changes in peripheral blood flow. At this early stage, though, lots of our ideas fell by the wayside because of financial or technical constraints. Even feasible ideas had to be modified to account for restrictions on time and space.

December 2011: As the scientific content of the exhibition developed, other groups were advancing key practical and technical aspects of this unique exhibition. The size, shape and even the colour of the structure to house the exhibition was considered at length, before a brightly decorated dome-shaped tent was chosen. The fluid movement of people through the exhibition was calculated by drawing on expertise from theme parks. Novel software was developed to allow participants to access their own data and video from the exhibits via a unique barcode system. This personal information could then be shared with family and friends. As Christmas came and went, exhibition testing began and the exhibition began to take shape.

January 2012: By the New Year, designers were developing the overall look and theme of the exhibition. The final concept of a studio broadcasting sports-related programmes meant that participants would feel part of a live TV show and this theme would run through all the aspects of the exhibition. At the same time a range of potential sites around the UK were investigated, so that the exhibition could be taken to a broad geographical and socio-economic profile of the population. All of this took place even before anyone faced the practicalities of making sure the whole exhibition fitted into

'In the Zone' on the road

Sir Steve Redgrave in the Power Zone

an articulated lorry, so that it could be transported between venues and reassembled without losing any essential components or too much sleep.

February 2012: Insulated from such logistical concerns, the scientific advisory group continued to help develop the content of the exhibition, moving from the interactive components of the exhibits to generating and approving the information in the transition zones and the wall panels. 'Showbiz Sean', the designer, flew direct from New York fashion week to work with us on the script for the commentary. A high-energy stage show was developed, involving audience participation and demonstrations, to entice visitors and entertain waiting crowds. Actors were auditioned to take the part of TV presenters on stage and At-Bristol staff volunteered enthusiastically to travel round the UK keeping the show on the road – little did they realise they would be working 10 hour days and sleeping in the 'In the Zone' camper van every night.

March 2012: With the Big Bang Fair approaching, aspects of the exhibition and stage show were showcased at a press event at At-Bristol. Together with elite athletes from Cardiff University and Bristol schools, we 'road-tested' the exhibits and competed eagerly with 'In the Zone' project champion Sir Steve Redgrave and Paralympic bronze medallist Ben Rushgrove to run faster, jump higher and react quicker. While the athletes were already well tuned to their own physical abilities, of course, they were fascinated to discover more about the physiological factors influencing their performance. Sir Steve demonstrated he still has an impressive lung capacity of 7.5 litres, which put the rest of us to shame.

April 2012: Tight control of the movement of visitors through the zones of the exhibition was essential to meet the high audience targets set by the Wellcome Trust. This required clever choreography, as well as robust mechanical and electrical equipment and heavy editing of content. It was no mean feat to create an exhibit that allowed people to view the veins in their hands and record their ECG, while considering the role of the circulation – all in under 120 seconds. At this stage, the main job of the advisory panel was to make sure that scientific integrity remained intact as the exhibition was fine tuned. Fortunately, the exhibition website offered participants the opportunity to get extra information after their visit, as well as the chance to compare their data with that of athletes and others members of the public, and to re-live their experience via a personalised showreel.

May–August 2012: During the wettest summer on record, the exhibition literally pitched its tent all around the UK at music festivals, county fairs and air shows; it even formed part of the *Blue Peter* roadshow, before settling in London's Victoria Park for the duration of the Olympic Games. The team worked tirelessly to make sure that the exhibits kept working and the event continued to excite and educate visitors of all ages and from all parts of the UK. Over 91,000 people had an 'In the Zone' experience and learnt about the physiology of their body systems. Despite relentless rain, treacherous mud and only rare glimpses of sunshine, feedback from these visitors indicated that they had really enjoyed the whole experience and had learned something new. Some eager visitors waited in line to go through the exhibition twice and one little boy must have spent his entire summer holiday 'In the Zone', as he managed over 20 trips through the tent – a budding physiologist of the future, perhaps?

exhibition.getinthezone.org.uk

The five zones of the exhibition:

Power: Perform a standing jump and learn about muscles and joints

Blood: Monitor your heart, look at your veins and learn about O_2 delivery to and CO_2 removal from working tissues

Exercise: Power a hand crank and learn how much work your muscles perform

Reaction: Test your reaction time and learn about nerve conduction

Sprint: Race 10 m and learn how all the body systems work together to move your body

How to Win Gold competition: Winners' report

Team 3 Directions (four from the right): Lauren Frost, Kymberly Gormer, Mitzi Munuo and Eve Doran

The largest competition ever run by The Physiological Society challenged A-level students to direct their own sports physiology research project, which included 30 hours of research with progress reports. Students were provided with access to scientific mentors for support and those shortlisted were invited to present a poster of their work at The Society's scientific meeting, *The Biomedical Basis of Elite Performance*, in London in March 2012.

The judges were very impressed by the quality of the student's ideas. The gold prize was a *Train Like a Champion Day* at an English Institute of Sport High Performance Centre, which was awarded to a team from Northgate High School in Suffolk for their project, 'The effect of video imagery on sports performance.' The team also won a school prize of a visit from the *Science Junkies* with their London 2012-inspired In the Zone live show.

Teacher's report
Julie Davey

In October 2011 I was forwarded an email advertising the How to Win Gold competition. I was immediately grabbed by the task the students were asked to do as well as the amazing prizes. It seemed like a challenging but achievable project that would be great for the students' personal and academic development.

Initially it was difficult guiding the students towards realistic ideas for projects. They were full of inspiration but unfortunately we didn't have the equipment, budget or ethical clearance to carry out many of their proposed experiments! The support from the organisers and the mentoring by academics was extremely helpful. The mentor for one group even came to visit them twice to check on their progress and then gave invaluable feedback. From a personal point of view, it was nice to feel connected to real investigative science again in contrast to the classic, predictable experiments which typically take place in the classroom.

All four groups worked hard and were rewarded by attending the final in London. This meant further research for the students, leading to production of their conference posters. I was extremely impressed with the quality of the finished posters; they certainly didn't look out of place at the conference. The students began the day feeling very nervous at the prospect of discussing their studies with the academics in attendance. It was great to see many of the scientists taking the time to meet and talk with our students. It was incredible to see them growing in confidence and speaking really passionately about their research. I was very proud of them all. The day was topped off for the students when Sir Alan Sugar's car had to stop to let them across a zebra crossing outside the conference centre as we left!

Being part of the competition took a lot of effort but was very rewarding. It was great to see students of all abilities getting a true sense of what scientific investigation is really all about. They developed skills to work both collaboratively and independently enabling them to communicate their research to leading academics. I hope The Society will continue to give students these unique opportunities that open their eyes to the real world of science.

Students' report
Team 3 Directions

All of the members in our group enjoy studying Biology and Chemistry at A-level, so entering the competition was a great way to expand our skills. The first thing to do was generate a unique idea for our project. We knew that elite athletes like Andy Murray use positive music for inspiration and decided to see whether positive video imagery would also enhance performance.

For the experiment, we either showed a clip of positive sporting images combined with powerful, upbeat music or a video of Paula Radcliffe pulling out of the Athens Olympic marathon combined with depressing music. The students were then asked to run 800 m. Although we didn't find a significant effect on heart rate or running times, we did notice that vigour was affected. The students' perception was that they weren't working as hard when they had watched the positive images. This could have a positive effect on ordinary peoples' attitude to doing sport as well as elite performers.

Working with our mentor Sam Marcora, from the Centre for Sports Studies at the University of Kent at Medway, was really helpful as he shared theories and techniques used in sports physiology. Sam explained the importance of trial randomisation, introduced us to the Brunel Mood Scale and told us how to calculate reliability, which was a great way of furthering our knowledge on carrying out experiments. The competition enabled us to talk to top academics in the field of sports physiology and develop our understanding in the science behind the sport. We learnt how to create an academically high-quality poster on our chosen experiment which has been brilliant in giving us a taster of university work.

When it came down to the final in London we were grilled by top physiology academics, which was very challenging to say the least! But we were pleased that the people who came and asked us about our project seemed interested. It goes to show hard work pays off, especially with such a good outcome!

Entering the competition has confirmed our aspirations of a future in the field of science. We all want to go to university and study science-based courses: medicine, nursing, biology and natural sciences.

We would like to thank our teacher Julie Davey for introducing us to the competition as well as our mentor Sam Marcora for his contributions.

2012 – 13 *Forthcoming events*

8 – 20 Dec

BPS Winter Meeting.
QEII, London
www.bps.ac.uk/meetings/BPSWinter

19 Dec

BNA Christmas Symposium
The Royal Society, London
www.bna.org.uk/events

2 – 6 Feb 2013

Journal of Physiology at Biophysics
Philadelphia, USA
www.biophysics.org/2013meeting

26 – 27 March 2013

BASES Student Conference
Cardiff Metropolitan University
www.bases.org.uk/Student-Conference

The IUPS 2013 Satellite Teaching Workshop Tune up your teaching: trends, tips and tasters

18 – 21 July 2013, Bristol, UK

Judy Harris

Local Organising Committee for IUPS Teaching Workshop 2013

Penny Hansen

Co-Chair IUPS Education Committee

"Why do good teachers wear out their shoes?" Just one of the intriguing questions that will be discussed by Murray Jensen (Minnesota, USA), an invited speaker at the IUPS satellite teaching workshop to be held at the University of Bristol, immediately before the Congress in Birmingham. Similar teaching workshops have been held in association with IUPS Congresses since 1983, under the umbrella of the IUPS Education Committee. They typically attract up to 100 participants from countries around the world.

As well as thought-provoking talks from invited speakers on topics such as 'The ethically aware physiologist' (Dave Lewis, Leeds, UK) and 'Tips for leading curriculum change' (Beatriz Ramirez, Santiago, Chile), the Bristol workshop will include less formal sessions designed to promote debate and discussion. Interactive workshops (14 in total) will focus on areas such as podcasting, team-based and case-based learning, best practice in designing and standard-setting examination questions, using simulation in physiology teaching, blending technology and classical lab experiments, building communities of practice, publishing educational research, and ways of engaging members of the public.

Some workshops will include expert panel sessions and one will include input from a panel of University of Bristol undergraduates, for which a number of volunteers have (without coercion!) already stepped forward. There will be demonstrations of innovative approaches to laboratory teaching and a poster session will be held on each day of the workshop. More information on the programme, registration, abstract submission and travel grants is available at www.iups2013.org/node/184.

As at all IUPS teaching workshops, both resource-rich and resource-poor regions will contribute innovative and useful approaches to teaching and learning. Long-term associations can develop from the workshops and communication in between the IUPS Congress years continues through regional and national workshops and by use of the IUPS Education listserv at iups-teaching@yahoogroups.com.

It has been possible to keep costs to participants at the Bristol event low through generous sponsorship by ADInstruments. The historic Clifton area of the city, which houses the University – and halls of residence and hotels for participants' accommodation – is an attractive venue and the social programme also includes activities at the city's busy harbour side.

See the website for more, www.iups2013.org

More education at the IUPS congress, Birmingham, UK 21-26 July 2013

The IUPS and ADInstruments Education Lecture: Teaching and Research in Physiology in Sub-Saharan Africa, Achievements and Challenges
Olusoga Sofola *(University of Lagos, Nigeria)*
16.30 - 17.15, Monday 22 July

Educational Symposia

Using technology to improve millennial students' learning
Xian Wang *(Peking University, China)* and Jonathan Kibble *(University of Central Florida, USA)*
09.30 - 11.30, Monday 22 July

Competency-based education in physiology: A global perspective
William Galey *(Howard Hughes Medical Institute, USA)* and Dee U Silverthorn *(University of Texas, USA)*
14.15 - 16.15, Monday 22 July

Historical perspectives on early physiology, 1870-1960
Jonathan Reinarz *(University of Birmingham, UK)*
09.30 - 11.30, Tuesday 23 July

Using narratives and stories to enhance learning
Frank Mojiminiyi *(Usman Danfodio University, Nigeria)* and Penelope A Hansen *(Memorial University of Newfoundland, Canada)*
14.15 - 16.15, Tuesday 23 July

Public engagement – can you help?

We are looking for volunteers to man the University of Bristol's Mobile Teaching Unit (Lab-in-a-lorry) on the forecourt of Birmingham International Convention Centre from 10am to 3pm on 22–24 July. Members of the public and school students will be invited in to explore activity stations offering hands-on activities around cardiovascular, respiratory and nervous system function. Training will be provided. Alternatively you are welcome to bring your own equipment and deliver your own outreach material. Please email outreach@physoc.org.

Meeting Notes

IUPS Physiology Teaching Conference and Workshop

31 March – 1 April 2012, Kingdom of Bahrain

Mirza Mohammed Feisal Subhan

Arabian Gulf University, Kingdom of Bahrain

During the closing session of the IUPS teaching workshop at Kobe, Japan, in August 2009, the idea of a similar workshop in the Middle East was raised. As I was the only representative from that region, I half heartedly volunteered (with a bit of gentle coercion). Back in Bahrain, I got the ball rolling by writing a proposal and getting approval from my university hierarchy, all the way up to the President of the Arabian Gulf University.

There has been a 400% growth in the number of Departments of Physiology in the Middle Eastern region over the last two decades. Twenty years ago, only eight medical schools were present in the Gulf Cooperation Council, now there are 29. However, during this time several nearby countries have been devastated by wars or civil strife, including Iraq, Afghanistan, Somalia and Yemen. Such countries need rebuilding and retraining in many areas, including physiology, but to hold a workshop in these countries would be difficult for security and logistical reasons, so Bahrain was an appropriate location.

We conducted a need assessment using an online questionnaire in April 2010, to find out what topics people would be interested in; this also advertised our meeting. After identifying suitable speakers, we embarked on a plan to find our participants. We emailed over 150 colleagues who were teaching basic sciences (primarily physiology) and we received 72 positive replies, from 14 countries.

The main focus of the meeting was to improve teaching of physiology to medical students, with the ultimate goal of improving the competence of doctors and the quality of medical care in the region. The objectives of this workshop were:

- To create a sustainable regional collaboration between physiologists and other basic scientists for learning and educational research
- To train physiologists and basic scientists in new teaching and learning strategies
- To provide a platform to discuss problems unique to the Middle East.

To bring the meeting to fruition, we had to address several organizational issues, primarily the absence of a functioning physiological society in the region and the problems of forming a new society under the prevailing political situation. We had to start from scratch to contact participants, speakers and sponsors, as well as set up the meeting website and even print bags and programmes. At one point, just days before the meeting, I was receiving and replying to more than 50 emails per day!

The meeting was originally set for March 2011. However, civil unrest in Bahrain meant it was postponed until 2012. The meeting eventually brought together 87 participants and five invited speakers from 23 countries, including Bangladesh, Egypt, India, Maldives, Nigeria, Palestine, Somalia and South Africa. Attending the meeting was not easy for everyone, though. A delegate missed her flight from Libya because of skirmishes near Benghazi airport and sadly, although 20 Iraqi physiologists had registered, they were not granted visas.

Feedback at the end of the meeting was extremely positive. Most participants commented on the knowledge they obtained, the networking between speakers and participants, the interactive experience they had, the good hospitality and organization of the meeting.

One participant wrote: "This was the first international conference I have attended and, as a novice in academia, I found it a stimulating, fruitful and an inspiring experience. Despite the limited resources available, you have managed to deliver an educational event that has brought together experts from all corners of the globe. This is a positive reflection on the cohesiveness of the department and academic staff in physiology, an example one would hope to emulate. Your efforts are much appreciated."

Meeting Notes

A commemoration of the life of Sir Andrew Huxley

17 October 2012, London, UK

Mike Collis

Sir Andrew Huxley with former chairs of *The Journal of Physiology* editorial board. Left to right: (back row) Stewart Sage, Nick Standen, Barry Hirst, Mike Spyer, David Eisner, Richard Boyd; (front row) William Large, Tom Sears, Sir Andrew Huxley, Wilfred Widdas, Ian Glynn and Richard Dyball.

Sir Andrew Huxley was elected as a Fellow of The Royal Society at the remarkably young age of 37 and was subsequently President from 1980 to 1985. It was therefore appropriate that this event, to commemorate his life and work, was held at their headquarters in London.

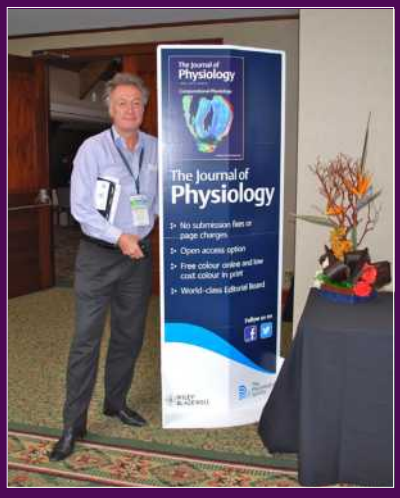
The lecture theatre was packed with Sir Andrew's friends, senior physiologists and peers who heard a number of eminent speakers discuss his life and accomplishments: Paul Nurse, 'Sir Andrew and The Royal Society'; John Bradfield, 'Sir Andrew and Trinity College'; Roger Woledge, 'Sir Andrew and UCL'; Jonathan Ashmore, 'Sir Andrew and The Physiological Society'; Dennis Noble and Malcolm Irving, 'Sir Andrew's research on nerve and muscle'; and his son, Stewart Huxley, 'Sir Andrew and Engineering.' These engaging talks were complemented by photographic and equipment exhibitions.

Sir Andrew originally planned to become an engineer and his ability to modify research tools was essential in his discoveries in nerve and muscle physiology. He had a close affection for Trinity College Cambridge where he was a Natural Sciences student, researcher until 1960 and Master of the College in 1984, at a time when he was also president of The Royal Society and a Nobel Laureate. As Master he dealt with important and controversial issues with characteristic dedication, devotion to duty and attention to detail. His analytical, even handed and wise approach shone through in all decisions, including buying a bright red car after a road accident to ensure other road users saw him!

As Head of Department at UCL in his middle years, Sir Andrew inspired many undergraduate and research students. However, his intellect was too much for first year medical students: one commented that his lectures would be easier to understand if he didn't rub out an equation on the blackboard with one hand whilst writing another with the other! Despite working in London for nearly 25 years, he retained his Cambridge home and stayed in B&Bs near UCL so that he was last to leave and first to arrive each day! His intellect was awe inspiring and he could appear to be asleep during seminars before delivering a devastating question. He had an 'extra gear' intellectually but could adjust and discuss research in a supportive and helpful way (even in Russian).

Sir Andrew had a 70 year association with The Physiological Society and published most of his key papers in *The Journal of Physiology*. He was on the editorial board of *The Journal*, covered as Press Editor and served two terms on the Society's committee.

Few scientists make one major discovery in their lifetime, but Sir Andrew made two. He also found time to provide leadership for prestigious organisations and encourage a generation of young researchers. He was a giant of technology and of physiology and this commemorative event was a positive endorsement of his achievements and a fitting tribute to a great physiologist.



Meeting Notes

The Journal of Physiology at Neuroscience 2012

12 October 2012, New Orleans, USA

A *Journal of Physiology*-sponsored symposium at Neuroscience 2012, the annual meeting of the Society of Neuroscience in New Orleans, USA, attracted 60 delegates. The symposium, 'Size Matters: Formation and Function of Giant Synapses', will result in a special symposium issue early next year. *The Journal's* stand in the exhibition area celebrated the first 10 dedicated neuroscience issues. Two Meet-the-Editors sessions, hosted by David Paterson, Ian Forsythe and Yoshihiro Kubo, proved very popular.

Our next conference appearance will be at the Annual Meeting of the Biophysical Society in Philadelphia, USA, from 2-6 February 2013. We hope to see you there!

Meeting Notes

15th International Biochemistry of Exercise Congress

17-21 June 2012, Stockholm, Sweden

Oliver Witard & Stuart Galloway

University of Stirling, UK

The Swedish School of Sport and Health Sciences, Stockholm, was a fantastic venue to host the 15th International Biochemistry of Exercise Congress (IBEC). Over 250 delegates from more than 20 countries were treated to a congress that revisited classic exercise biochemistry work, disseminated the latest cutting-edge biochemistry of exercise findings, and encouraged lively scientific debate and social interaction.

The congress opened with a poignant tribute to the late Eric Hultman. This session focused on his research in muscle metabolism and fatigue, particularly emphasising his contributions to work on glycogen metabolism, creatine and carnitine research. The tributes were delivered by esteemed colleagues who had worked closely with Eric, either as colleagues or post-docs. The conference also closed with an appearance and inspirational message from Per Olof Åstrand. During the conference experts in the field delivered presentations that addressed the capacity for exercise to regulate fatigue, adipose tissue metabolism, ageing, protein synthesis, skeletal muscle fat metabolism and gene expression. The computational biology debate concerning those fortunate individuals described as 'responders' and those less fortunate individuals described as 'non-responders' to exercise training provided one of many highlights that stimulated lively debate. To complement symposium presentations, a series of excellent oral presentations were presented by talented PhD candidates and post-docs such as Sophie Wardle (University of Stirling, Scotland), Sam Shepherd and Helen Bradley (University of Birmingham, UK), Ben Wall (Maastricht University, The Netherlands) and Vuokko Kavanen (Finland). A day prior to the conference, early-stage career researchers presented their work and received tips on personal development as a researcher. Adeel Safdar, from Harvard Medical School, USA, thoroughly deserved the Young Investigator Award and delivered an enthralling overview of his work on endurance exercise-mediated systemic mitochondrial rejuvenation in ageing

Social highlights included Swedish Baseball, forest running and a delicious conference dinner at the old brewery (München-Bryggeriet) overlooking the Riddarfjärden.

IBEC 2012 lived up to its billing as the 'premier exercise biochemistry congress'. We would like to thank The Physiological Society for awarding University of Stirling several travel grants to enable academic staff to attend and present their work at the meeting. The organising committee chaired by Carl Johan Sundberg and supported by Eva Jansson, Lars Larsson, Häkan Westerblad and Juleen Zierath of the Karolinska Institute, as well as colleagues from the Swedish School of Sport and Health Sciences (Eva Blomstrand and Kent Sahlin) are to be congratulated for coordinating a truly memorable congress. We are sure that Sao Paulo will organise an equally special event for the next congress in 2015.

University of Stirling contingent at IBEC 2012 in Stockholm. Left to right: Lee Hamilton, Naomi Brooks, Sophie Wardle, Kevin Tipton, Oliver Witard, Colin Moran, Stuart Galloway, Leire Gravina

Meeting Notes

British Society for Cardiovascular Research Meeting

Novel insights into the pathogenesis of cardiac remodelling

3-4 September 2012, Belfast, Northern Ireland

David Grieve, Barbara McDermott & Emma Robinson

Queen's University Belfast

Melanie Madhani

University of Birmingham

Meeting Notes

Cardiac & Respiratory Physiology Themed Meeting

New insights into the molecular basis of cardiac arrhythmias: from animal models to computations.

4-6 September 2012, Manchester, UK

Ming Lei & Henggui Zhang

University of Manchester

Christopher Huang

University of Cambridge

Cardiac arrhythmogenesis is a major clinical problem. On the one hand, it may simply result in minor, asymptomatic, episodic variations in cardiac rhythm. However, at the other extreme, there are the ventricular arrhythmias potentially lead to sudden cardiac death, atrial arrhythmias, predisposing to

We were pleased to host the first British Society for Cardiovascular Research conference to be held in Northern Ireland for 12 years, in the iconic Lanyon Building of Queen's University Belfast, which was founded by Queen Victoria in 1849.

Delegates were welcomed by glorious sunshine and lunch within the magnificently panelled walls of The Great Hall. The scientific programme comprised a mix of state-of-the-art presentations from invited international experts and selected talks by young investigators under the general theme of cardiac remodelling.

Specific sessions focused on emerging mechanisms underlying remodelling of three key components: the extracellular matrix (Paul Lijnen, Leuven; Karen Porter, Leeds; Stephane Heymans, Maastricht), cardiomyocyte (Ajay Shah, London; Susan Currie, Glasgow; Thomas Thum, Hannover; Sian Harding, London) and vasculature (Ralf Brandes, Frankfurt; Nicola Smart, Oxford; Tim O'Brien, Galway; Paolo Madeddu, Bristol).

The meeting also hosted the society's annual Bernard and Joan Marshall Research Prize Lectures, which are supported by a generous bequest specifically intended to encourage, recognise and support the work of young investigators, and to reward established research excellence. The Young Investigator Prize was awarded to Christine Cheung (Cambridge) and the Research Excellence Prize to Derek Hausenloy (London). The Distinguished Investigator Lecture was delivered by Johann Bauersachs (Hannover), who presented his world-leading research on left ventricular healing and remodelling.

Delegates enjoyed a wonderful conference dinner in the magnificent Belfast City Hall. The organisers would like to thank The Physiological Society for their generous support of this extremely successful meeting.

The iconic Lanyon Building of Queen's University Belfast

Keynote speech: Clive Orchard introducing Stanley Nattel

Photograph courtesy of Dr. Henggui Zhang

cerebrovascular pathology, and sinus node disorders depressing cardiac function. These more severe outcomes present a major medical challenge and significant public health burden. Their underlying mechanisms constitute a major focus for current physiological study. It was therefore particularly timely for the Physiological Society to support a themed meeting directed at the translational physiology bridging fundamental cellular physiology and biophysics, the properties of whole hearts and the clinical situation.

In the time available, the invited lecturers could provide but a glimpse of this broad but fascinating area of scientific inquiry. Nevertheless, it was possible to survey recent investigations beginning with recent developments in our electrophysiological understanding of the underlying cellular and biophysical cardiac mechanisms, particularly those relating to ion channel abnormalities in genetically modified arrhythmic cardiac models. Together with updates on related abnormalities in Ca^{2+} homeostasis, intracellular pH regulation and neural-cardiac signalling, these provided perspectives bearing on how alterations in the properties of surface and intracellular ion channels could ultimately disrupt patterns of electrical excitability within the heart as a whole. The concepts then extended to higher levels of organization represented by the pathogenesis of clinical arrhythmias in normal and diseased hearts, culminating in Stanley Nattel's memorable plenary lecture translating these ideas to the particular problem of atrial fibrillation. These ideas were then quantitatively integrated towards human arrhythmogenesis through the computer simulation approaches in the final session.

The exceptional quality of the poster and oral presentations particularly by the younger participants, exemplified by their award winners Fiona Hatch (Hull), Heiko Schneider (Manchester), Elisa Venturi (Bristol) and Kerrie Ford (Oxford), added freshness and vitality to the keynote lectures. The result was a lively and good-natured, scientifically intensive symposium. The one sombre note was the passing of Stephen O'Neill, on 9 August 2012, who would have been an active participant and to whose memory the organizers would like to dedicate this meeting, and name these awards. We will remember him for his strategic contributions, particularly in the area of cardiac Ca^{2+} homeostasis, his influences on the development of cardiac muscle as a special interest within The Physiological Society, and as a modest, dedicated and principled friend and colleague.

The themed meeting sought to produce a modern, cutting-edge and friendly environment for uninhibited scientific exchange on research on experimental and computer modelling of cardiac arrhythmias. It also attempted to provide a forum for physiologists to develop and establish scientific relationships and collaborations with each other. In these goals, the meeting succeeded, for which we thank The Physiological Society for its generous support as well as its continued encouragement of cardiac physiology, and Christine Carr's and Ruth King's friendly, efficient and energetic organization and meticulous attention to detail.

Dangerous medical assumptions and misconceptions

Can physiology teaching help to improve patient safety? Otto Hutter Prize winner, Eugene Lloyd, argues that the answer lies in encouraging clinical students to consider not only how the body works, but also why mechanisms have been disturbed, so that pathology and pathophysiology can be integrated.

Eugene Lloyd

School of Physiology and Pharmacology, University of Bristol, UK

I would like to use this opportunity to share with you my reflections upon the privileges and challenges of teaching medical students and junior doctors. I studied medicine in the early 1990s and was given the impression that anatomy was the most important preclinical subject. I intercalated in pharmacology and, after qualifying, worked in general medicine. I now work as Senior Teaching Fellow in Physiology at the University of Bristol, and as a Speciality Doctor in Emergency Medicine. I therefore teach medical students throughout their undergraduate years, help to train junior doctors and run a refresher course in applied clinical physiology for trainee surgeons.

One of the great challenges for emergency medicine (and society) is Britain's ageing population. In 2005 16% of the population was over 65 years old and the International Longevity Centre estimates that this will rise to 21% by 2025. I suspect that health and social reforms have extended the *quantity* of life but not necessarily the *quality*. Many of our elderly citizens are living a very vulnerable existence in their homes. Even a minor illness such as a urinary tract infection can make it impossible for them to cope at home and result in admission to hospital. It is not unusual for such a patient to arrive in the emergency department with a carrier bag of their ten or more regular medications.

The introduction of the European Working Directive has resulted in significant changes to the delivery of care for inpatients. The 'firm' structure, of a team of junior doctors led by a consultant caring for a patient from admission to discharge, has been partly replaced by a shift system. This requires handover of complex patient information between medical staff. There is no universal approach to handovers – sometimes it's just a few notes scribbled on a piece of paper and there is huge potential for errors to be made. The NHS Institute for Innovation and Improvement recommends the situation–background–assessment–recommendation (SBAR) tool. I'm pleased that this includes explicit mention of key physiological variables such as body temperature, pulse rate, blood pressure, respiratory rate and oxygen saturation. I discourage students and colleagues from using imprecise terms. I recall being told by a trainee over the phone that a patient had a blood pressure that was 'slightly low', and I was horrified to find the patient had an actual blood pressure of 62/40 mmHg due to septic shock!

Medical students are bright, enthusiastic high-achievers and they thrive in a world of social media. Their talents, both academic and extracurricular, never cease to impress me. However, my personal opinion is that some of them don't cope well with failure or uncertainty and lack resilience. There is a tendency in the early years to 'learn and forget' rather than taking a deeper approach to medicine. I'm concerned that the pressures

‘I would like to thank The Society for awarding me with the Otto Hutter prize and express my thanks to all those who have taught me’

Eugene delivering the Otto Hutter prize lecture at Physiology 2012 in Edinburgh

'I believe that the learning should be active with the student hearing the patient's story, examining them, formulating a list of potential diagnoses and interpreting results of special investigations'

upon them for ranking for the foundation year jobs encourages dysfunctional behaviour rather than the teamwork skills that are so important for the practice of medicine. They also struggle to adapt to learning in the clinical environment. In some cases I think curricular reforms have exacerbated the situation by replacing time spent with patients with more lectures and tutorials, whereas I believe medicine is best learned through contact with patients.

In the emergency department I'm often asked if a medical student can shadow me, which implies a passive type of learning with the student watching what is happening. In contrast, I believe that the learning should be active with the student hearing the patient's story, examining them, formulating a list of potential diagnoses and interpreting results of special investigations. This can be achieved through discussion between teacher and student with an ethos of shared care and is an excellent opportunity to illustrate key physiological principles. I'll illustrate this with a very memorable case.

An elderly gentleman was brought to the emergency department by paramedics. They said that the patient had dementia and had fallen. They suspected a diagnosis of a fractured hip. The student helped me to perform the primary survey, a structured approach to seek any potentially life- (or limb-) threatening physiological disturbances. None were found. The secondary survey (a detailed head-to-toe examination) revealed nicotine-stained fingers and that the patient's right leg was shorter than his left. The patient experienced pain on attempting to lift the leg up off the bed and when his hip was touched. He was too disorientated to tell the story of what had happened. The medical student suggested a diagnosis of a fractured neck of femur and that an X-ray would be the appropriate investigation.

The X-ray showed an unusual fracture of the acetabulum resulting in the head of the femur entering the pelvis. This was the type of fracture described in the Bolam court case of 1957. The jury returned a verdict of negligence as the patient had been given electroconvulsive therapy without being warned of the risks and without neuromuscular blocking drugs. The treatment had resulted in bilateral acetabular fractures. We began to wonder if the patient had fitted rather than fallen. I discussed with the student which investigations should be performed next, including a CT scan of the head and blood tests to include plasma concentrations of sodium, calcium, magnesium and glucose.

While the patient was having the CT scan, his wife and daughter arrived. Although distressed and upset, they were able to tell us that he didn't have epilepsy but had been standing in the kitchen when he suddenly went rigid, fell to the ground and began to convulse. It had lasted approximately five minutes. They mentioned that his confusion had started about three months ago, prior to which he had enjoyed hobbies such as gardening and golf.

The CT scan showed compressed ventricles and the loss of sulci typical of cerebral oedema without any evidence of a tumour or stroke. Subsequently the biochemistry laboratory telephoned to say the patient was profoundly hyponatraemic with a plasma sodium concentration of 111 mmol/L and a plasma osmolality of 250 mosmol kg^{-1}. I discussed with the student the control of plasma osmolarity and negative feedback. Under guidance, the student suggested a diagnosis of the syndrome of inappropriate antidiuretic hormone (ADH) secretion (SIADH) and suggested that a chest X-ray and measurement of urine osmolarity should be performed.

The urine osmolarity was elevated at 960 mosmol l^{-1} and the chest X-ray demonstrated a mass that was later confirmed to be a bronchogenic carcinoma. With the student present, I broke the news to the family that the patient had a lung cancer that was secreting abnormal amounts of a hormone that had disturbed his water balance causing his brain to swell and resulting in a fit that caused the fracture. The patient was admitted under the joint care of a respiratory physician and orthopaedic surgeon. The student reflected upon how much basic science across several systems of the body had been involved in this patient's illness.

One of my favourite sayings is, "To assume makes an 'ass' out of 'u' and 'me'". In the practice of medicine, making assumptions can be dangerous. In my lectures I emphasize to the students that the electrocardiogram records the electrical activity and not the mechanical activity of the heart. Initially they don't understand the importance of this, so I recount a story of when a junior doctor telephoned me for help because they couldn't work out what was wrong with one of their patients. Upon entering the room I found the doctor looking at the cardiac monitor that displayed sinus bradycardia with the patient in bed apnoeic and pulseless. This condition, known as pulseless electrical activity (PEA) or electromechanical dissociation (EMD), had puzzled the doctor who had assumed that if there was electrical activity as shown on the monitor, there must be mechanical activity.

When I'm teaching physiology I encourage the students to think about *how* the human body works. When I'm teaching clinical students I encourage them to think about *why* these mechanisms have been disturbed, in order to integrate pathology, pathophysiology and to provide safe clinical care.

I would like to thank The Society for awarding me with the Otto Hutter prize and express my thanks to all those who have taught me.

E-learning generation: Teaching with technology

Does blended learning – the combination of face-to-face classroom techniques and computer-mediated activities – have the potential to enhance student engagement and learning?

Neil Morris
University of Leeds, UK

Students entering Higher Education (HE) bring with them increasing expectations about how they will be taught and how, when and where they will interact with learning resources. They carry about their person a variety of powerful smartphones and tablet devices capable of accessing and interacting with content in a wide range of formats, and they are accustomed to using them to manage their learning and social lives. According to recent figures, almost 49% of UK adults own a smartphone and over 10% own a tablet device (Ofcom, 2012); anecdotal figures suggest that the figures are much higher on our university campuses. However, we are only just beginning to realise the potential of technology to enhance learning, and the concept of blended learning is relatively unfamiliar and far from universally accepted. For the uninitiated, blended learning is the term used to describe techniques and approaches to enhance face-to-face learning, as happens in lectures, tutorials, practical classes and such like. Blended learning techniques generally involve the use of technology, either within the classroom or for use in self-directed learning, and are used with students who are campus learners (as opposed to distance learners). Blended learning, digital, e-learning or technology-enhanced learning strategies are an increasingly common feature of HE institutions (HEIs) around the globe.

Blended learning has many potential advantages for learners, and although its use is commonly associated with high student satisfaction it also presents a number of challenges for learners, teachers and institutions. Primary amongst these is the seemingly huge chasm between learners' competence with technology and the perception of their ability to harness technology effectively. Whilst students are usually adept at posting and sharing content on Facebook, few have a clear understanding of online privacy or other essential digital literacy skills. Coupled with this, time-starved academic teachers, faced with a myriad of competing priorities, also lack the digital literacy skills and technical abilities to fully harness technology to enhance their teaching. For institutions, there are a number of challenges, including the need to equip students and staff with digital literacy and technical skills, respond to student expectations, respond to innovations in the sector and invest in the infrastructure required to support technology-enhanced learning.

The primary focus of this article is to describe potential uses of technology to enhance students' learning in a blended learning environment, providing evidence of effectiveness and impact on student learning and engagement, where available. Ways in which these technologies can be harnessed to enhance research impact are also noted, where appropriate.

Multimedia resources can enhance learning

There is growing pedagogical evidence that use of audio and video in learning and teaching can have a major impact on students' learning. Innovative use of audio and video in learning and teaching allows students to engage with learning in a variety of ways, to work collaboratively, to share learning materials and to showcase their creativity and research. For staff, publication of learning resources in a variety of formats encourages deeper student engagement and learning, and designing and delivering teaching and assessments using audio and

video is in keeping with expectations from students, employers and government strategy on use of technology in higher education. Furthermore, publication of research outputs (e.g. research seminars, research data, etc.) in multimedia formats has benefits for the impact and dissemination of research and for enhancing research-led teaching.

One of the simplest mechanisms for providing students with audio resources is to record teaching sessions with a digital audio recorder. Students greatly appreciate being able to 'listen again' to lectures, tutorials, feedback provided in supervision meetings and other staff–student interactions. Importantly, data suggest that such initiatives do not adversely affect students' attendance at teaching sessions. Results from a recent study with biomedical sciences undergraduates in the Faculty of Biological Sciences at the University of Leeds, where a large number of lectures are provided as podcasts, indicated that over 70% of students reported having listened to more than half of the recordings available to them, with most students usually listening to each recording once or twice. Interestingly, over 90% of students perceived podcasts to be 'important or very important' to their study, with 90% stating that their concentration in lectures was improved as a result of access to podcasts (Smith & Morris, unpublished data). Furthermore, there is evidence that providing students with podcasts of lectures can increase academic performance (McKinney *et al.* 2009; Morris, 2010). More sophisticated mechanisms to record lectures, using event (or lecture) capture technologies, can provide students with a synchronised resource, containing video, audio, presentation materials and animations, all available via a simple web-link. These resources are hugely popular with all kinds of learners (Owston *et al.* 2011), including high achieving students (who can skip to a challenging section), students struggling with the material (who can listen multiple times, pause and replay when necessary) and students for whom English is not their native language (Shaw & Molnar, 2011).

A natural step from recording live teaching events is to provide students with pre-recorded teaching materials, to access in advance of, or after, live teaching events. These might include multimedia pre-practical resources, assessment information or additional materials, which can be produced in a range of tools, depending on the sophistication required. A number of institutions have produced multimedia resources of this kind (e.g. University of Bristol's eBiolabs, www.bristol.ac.uk/ebiolabs/) to support students' understanding and preparation for practical sessions (e.g. health and safety training, equipment competence training) as well as improve student engagement, performance and use of laboratory time and demonstrators (Whittle & Bickerdike, 2012). Students can be mandated to access these resources in advance of practicals, via a virtual learning environment (VLE) or can access them within practicals, using tablet devices (Morris *et al.* 2012a). An increasingly common term within e-learning circles is 'flipped' teaching or classrooms, which describes the phenomenon of providing students with pre-class exercises using online materials (e.g. recorded lectures, multimedia resources, activities, etc.) and using face-to-face time to discuss problems and learn collaboratively.

'There is growing pedagogical evidence that use of audio and video in learning and teaching can have a major impact on students' learning'

Using existing resources to enhance student learning

Open educational resources (OERs) are learning and teaching materials that are freely available online for anyone to use. OERs can consist of full courses, course materials, modules, textbooks, videos, tests, software and any other tools, materials or techniques used to support access to knowledge. OERs come in many different formats, including text, images, multimedia, audio or video and can be found on a large number of websites. OERs are licensed to permit their free use or re-purposing (reuse, revision, remixing or redistribution) by others. Normally, small units of OER (e.g. animations, videos, podcasts) seem to be most attractive from both the re-use and production angles, as they are easier to embed into an existing lecture, module or programme. Many teachers embed OER material into teaching sessions (e.g. lectures, practical classes, workshops, seminars) and/or provide links to OERs via the VLE to enhance self-directed learning opportunities. There are many benefits for educators and learners that can arise from creating, sharing and utilising OERs in student education.

Most OERs are licenced using Creative Commons or similar licences (for more information see creativecommons.org). Applying for a Creative Commons licence to materials means that the creator of the resources retains copyright, but allows others to make use of, copy and distribute the resource and may allow changes to the resource. There are six Creative Commons licences that can be applied to OERs, which give the user differing levels of rights to use and alter the resource. One of the common features of all Creative Commons licences is 'By Attribution' which means users must credit the original creator, thereby ensuring that the creator is acknowledged in all subsequent use of their resource.

The production and use of OERs is growing rapidly worldwide at all levels of education, including within the HE sector. In the USA, a number of leading universities have been forerunners in this area, most obviously Massachusetts Institute of Technology (MIT), who have released virtually all of their course materials freely online (MIT open

'Academics who engage with technology-enhanced learning also support development of students' digital literacy skills, which are sought after by employers'

courseware). A number of UK HEIs have a leading position in OER production and use (e.g. Nottingham, Leicester and Oxford). Podcasts of lectures and interviews with academics released by the University of Oxford, via the iTunes U website, have been downloaded over 18 million times by listeners in over 185 countries.

OERs can be found by searching dedicated OER repositories (e.g. Jorum, Merlot, HumBox or Khan Academy), by using OER search engines (e.g. OER Commons, OER Dynamic Search Engine), photographic or other slide sharing websites (e.g. Flickr, Slideshare, ImageBank), Institutional and Learned Society pages (e.g. American Physiological Society, Society for Neuroscience) or other web-pages, particularly those that are based in the United States. Some of these repositories and search engines will allow filtering of search results by content type, level or ranking.

Mobile devices can enhance student learning and engagement

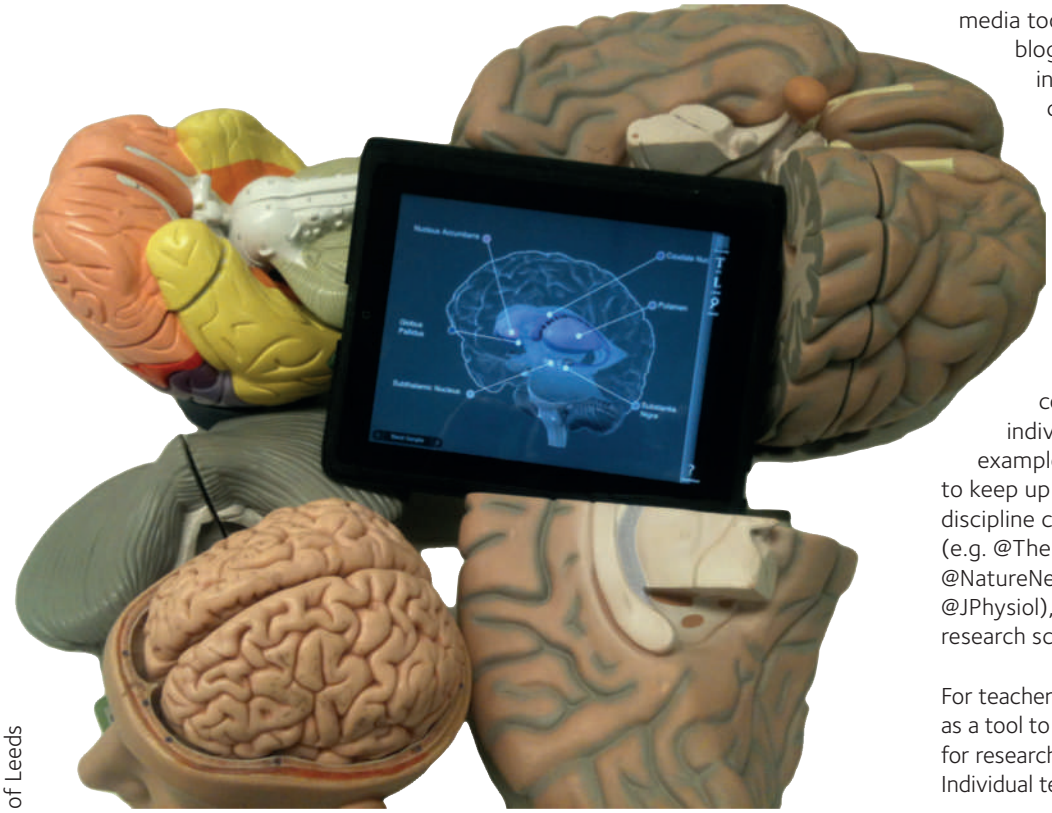
As more of our students enter campuses with smartphones and tablet devices, universities are looking at ways in which these tools can be harnessed to enhance the student learning experience. As the 'bring your own device' ethos looks set to expand, universities will be expected to ensure that their mobile resources and services are platform agnostic, providing all students, whatever the type of device they own, with a high-quality user experience. A recent study (Morris *et al.* 2012b) into the impact of a tablet device on students' studying behaviour illustrated that students make extensive use of such tools to study (over 3½ hours per day on learning activities) and use them in preference to existing devices (e.g. laptops). Tablet devices can also help encourage students to make use of audio/video (e.g. iTunes U) and interactive learning resources (e.g. quizzes), due to the ease of accessing such resources via apps. Tablet devices also offer opportunities for students to improve their learning within teaching classes (e.g. practicals/fieldwork). A recent trial using tablet devices in a neuroanatomy practical class illustrated that students greatly value the opportunity to access relevant apps (e.g. 3D brain, HD Brain, Sylvius brain scans) whilst learning (Morris *et al.* 2012a).

Social media in higher education

Social media such as Facebook, Twitter and LinkedIn have pervaded every aspect of our lives over the last 5 to 10 years, but their uptake by teaching staff within HE has been slow. Clearly, our students make extensive use of social media tools in their social lives, but they are now also beginning to recognise the benefits offered by these tools to enhance their learning, collaboration, access to information and professional development. Academics have been cautious about engaging with students in these predominately social spaces, but as the tools have grown in sophistication and functionality, usage by teachers has also expanded.

Twitter, a micro-blogging tool, allows individuals to 'follow' one another, thus receiving information from a controlled group. Tweets are text-based messages of up to 140 characters, often with links to websites or images. Tweets can be posted or read on a PC, laptop or mobile device and can be integrated with other social media tools (e.g. Facebook, LinkedIn, blogs). Twitter has become an incredibly successful instant communication tool for broadcasters (e.g. BBC Breaking News), companies, recruiters, advertisers, charities, journals, funders and, of course, individuals. For students, using Twitter as a learning tool can give them access to a constant stream of material relevant to their course, if they follow appropriate individuals and organisations. For example, a physiology student wishing to keep up to date with news in their discipline could follow learned societies (e.g. @ThePhySoc), journals (e.g. @NatureNews, @sciencemagazine, @JPhysiol), research groups, individual research scientists and potential employers.

For teachers, Twitter has many potential uses as a tool to enhance learning and teaching and for research purposes (Lowe & Lowe, 2012). Individual teachers can post information to



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support students' learning, re-tweet (i.e. re-post someone else's tweet) materials from other sources which may be relevant to their students, and encourage communication between students and staff. Many academics have Twitter accounts and post information about their research news (e.g. papers published, latest findings from the lab), which their students find incredibly useful to help with their understanding of the discipline. Some teachers also set up specific Twitter accounts to support modules or programmes, providing students with materials relevant to the specific activity. This type of approach is highly appreciated by students as it encourages them to read beyond the course materials and provides them with access to materials that their academic teachers have recommended.

Facebook is seen by many academics as a more difficult social networking tool to engage with than Twitter. Students have traditionally viewed Facebook as a purely social tool, and have resisted attempts by academics to use it as an extension of a VLE. However, many academics have successfully engaged with students through this medium, particularly in the areas of community building, transition to HE resources and staff–student social interaction. Facebook also offers students access to educational materials, by 'liking' pages from organisations, companies and individuals. Facebook is increasingly engaging with the education sector, and has recently launched 'Groups for Schools' which are private group areas (e.g. for a module, course, society, etc.) that only students at a particular HEI can join and use for collaborative learning. Therefore, it is likely that social learning in this space will increase significantly in the future.

LinkedIn is a particularly useful tool for students to learn about during their time at university. This tool, considered as a professional social networking tool, allows individuals to post professional profiles (in the form of a CV), link up with colleagues and external partners, join communities, post job opportunities and engage in professional discussions. For students, having a professional LinkedIn profile can assist them with career development and job hunting. LinkedIn is also a source of educational materials for students who subscribe to the pages of relevant organisations, companies, journals, etc.


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In conclusion, technology has the potential to enhance students' engagement and learning within their discipline, when used within a blended learning environment. Academics who engage with technology-enhanced learning also support development of students' digital literacy skills, which are sought after by employers. Blended learning offers students a variety of ways to interact with learning materials and makes productive use of the technology available to them.

'Students have traditionally viewed Facebook as a purely social tool, and have resisted attempts by academics to use it as an extension to the learning environment'

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Standard setting for physiology

In an era of increased student appeals and litigation, the science of setting standards for educational attainment has never been more important. Is it time to reassess our approach in physiology?

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Academics have always maintained standards of achievement for their examinations, such as marking on a curve, or having a pass mark of 50. The General Medical Council (GMC), in their 2009 document 'Tomorrow's Doctors' has outlined the need for "valid and reliable methods of standard setting" in UK medical schools. The passing grade of a test cannot be decided arbitrarily; it must be justified with empirical data. At this year's annual meeting of The Physiological Society in Edinburgh, an Education and Teaching (ET) theme symposium took place on 'Standard setting in physiology assessment: what is it and does it matter?' It considered the role of standard setting, the opportunities it provides, as well as its weaknesses.

Standard setting is a process that a group of test developers use to determine a cut score (e.g. the pass/fail borderline) for a given assessment. It is a systematic, externally justifiable process for reaching a consensus on professional standards. Standard setting 'operationalises' the 'minimally competent' standard of authorizing entities (such as the GMC) into a test score for a specific examination. Although standard setting incorporates methodologies, it is fundamentally a value judgement, and it often involves some kind of *a priori* estimation.

Standard setting is more justifiable than norm referencing. Norm referencing (or grading on a curve) determines grade boundaries based on a normal distribution of other students' performance (e.g. the top 10% of the class receives an A). Norm referencing compares students to each other rather than to an absolute criterion, so it may pass inferior students if they are among a weak cohort. Likewise, deciding upon a pass mark of 50 year after year assumes that the examination questions are the same difficulty from one year to the next, despite changes in staff and curriculum material. The downside of standard setting is that the process consumes time, money, and other resources.

Methods for standard setting are categorized as relative methods or absolute methods. Relative methods compare the students' performance to each other, while absolute methods refer to an external reference point. Absolute methods are preferable for high stakes competency tests, while relative processes are better for distributing a limited number of opportunities. Most absolute methods usually require much more time because the external standards are harder to reference and most aspects of the examination have to be considered piecemeal.

An example of absolute standard setting is the Angoff method. Test questions are sent in advance to a panel of subject matter experts,

comprising at least six to eight experts who are familiar with the material and with the expected performance of the student cohort (Norcini, 2003). Each member of the panel predicts for each question the expected score of a minimally competent student. The panel then meets to discuss their estimates on a question-by-question basis, and panel members may readjust their scores as they move toward consensus. The cut score (i.e. a score that is minimally competent for the entire test) is calculated from the predicted difficulty scores for the individual questions.

Rationale: What are the risks of not standard setting?

In an era of increased student appeals and litigation, standard setting makes the decision process of test outcomes legally defensible. Law courts can accept the validity of subjective judgements, so long as these are reached by an appropriately qualified group (and are not discriminatory). Standard setting is based on expert judgement informed by data about examinee performance. This makes it transparent, easy to institute, and easy to explain. The value of standard setting is supported by a body of evidence (Norcini & Shea, 1997).

Standard setting is particularly important for assuring consistency, particularly from year to year. Standard setting maintains standards when a particular assessment is too easy. Likewise, a new module leader may compile an assessment that is too difficult and standard setting can correct for that too. This means that standard setting is fairer over the long term. While marking on a curve (norm referencing) also corrects for tests that are too difficult, some student cohorts are genuinely better, and others are genuinely worse; standard setting pitches the cut score toward an *a priori* standard.

By being an explicit process, standard setting reinforces the fit of the assessment content to the learning outcomes. This is true for both the learning outcomes of the curriculum, and those of any validation body such as the GMC. From the test developers' perspective, standard setting can allow examiners to recognise confusing questions, problematic assessments or poor teaching; these are mooted when the students' performance on a question differs from predicted performance. Particularly because standard setting predicts the level of a minimally competent student, when the mean student score for an item (or for a test) is below the expected score for a minimally competent student, it highlights that item. This divergence of standard setting from student performance prioritises investigating this item (or assessment) for more serious problems, although the problem may be only that the standard setting panel made a poor prediction.

Challenges and pitfalls of standard setting

Students complain when too many of them fail an exam. Over-estimating student performance and thus failing too many students is an intermittent problem, and one standard setting method (Hofstee, see below) specifically prevents this by polling the expert panel on the maximum and minimum acceptable failure rates, which is incorporated into the determination of the cut score.

The literature on standard setting stresses the importance of selecting the right experts for the panel — both in quality and quantity. Subject matter experts should be experts in a field related to the examination, although there is a small research literature showing that sometimes the standard setting results from a panel of recent medical graduates is more 'credible' than from a panel of assessment writers (Verhoeven *et al.* 2002). That result may be explained because ideal panel members should be familiar with both examination methods and the level of candidates; finding faculty experts who understand, and agree on, what a first year medical student should know *versus* what a third year medical student should know may not be as accurate as polling fresh graduates, who remember the difference quite well. Similarly, subject matter experts from a single discipline may feel unqualified to predict many items in assessments from a multi-disciplinary systems-based course. Another approach is to use only multidisciplinarily trained experts, such as medical faculty — some medical schools include their GP facilitators in standard setting, although this is a costly option.

Even when the panel chosen has the requisite expertise there can be biases in judgement. In multidisciplinary panels, experts often see questions in their own discipline as easier and more essential than other disciplines. Finally, in most panels there are hawks and doves, whose standards for passing seem consistently quite high or low.

While most academics are prepared to put time into a process if it results in a better education or higher standards, panel members are less enthusiastic if the process or its results seem confusing, arbitrary or unmoored from actuality. The literature often mentions that panel members find estimating the performance of minimally competent (or "the borderline candidate") difficult. To combat this, some panels begin with a discussion of what is a borderline candidate. Furthermore, it is complex, time-consuming, and costly to assemble a large panel of high ranking experts to meet for hours, especially when a resit exam should (for reasons of parity) be standard set at the same time as the main exam — thus doubling the meeting length. Some departments are experimenting with

'Standard setting is particularly important for assuring consistency, particularly from year to year'

online methods to gather the expert's predictions, such as Survey Monkey.

The process of standard setting highlights the fact that most medical schools use a single examination to test both for competence and for excellence (e.g. class rank). Some standard setting methods are most suitable for multiple choice questions (e.g. the USMLE step 1), where there is a clear need for data to determine how well students should perform on a particular test item (because some of the difficult questions were 'confusing' – Case & Swanson, 2012). When searching for excellence, which incorporates innovation, multiple choice type questions are inappropriate; likewise, the assessments best suited for detecting excellence may in some cases be completely irrelevant for determining competence. Thus, with some methods of standard setting (e.g. the Cohen method), mixing core with non-core material on an assessment creates a theoretical difficulty — borderline students will have spent exam time attempting difficult questions that are above both their abilities and the requirements. Oxford and Cambridge routinely apply to their medical cohort two separate assessment systems: one for competence (MCQ based) and one for excellence (essays).

Strengths and weaknesses of the most common methods for standard-setting

There is no gold standard for standard-setting; different methods will produce different pass scores (Downing *et al.* 2006). We surveyed 31 UK medical schools as to which standards setting procedure they used for written exams (e.g. physiology in the first two years); there is currently no consensus among UK medical schools (see Fig. 1), although the Angoff method and its modifications remain the most prevalent.

A recurring problem for the Angoff method is "regression to the mean" (Buckendahl *et al.* 2002). The cut scores change only slightly as the difficulty of the assessment increases, and in many cases the cut score is often the same number year on year irrespective of the examination's true difficulty; yet, producing the cut score can require a 'tiresome' amount of staff work (Norcini, 2003). When the Angoff method makes errors (unexpectedly high or low failure rates, expert estimates that diverge from student performance), usually this is attributed to the composition of the expert panel (too few experts, or incomplete expertise). During The Physiological Society 2012 symposium, Prem Kumar organised a demonstration implying that for short answer questions the modified Angoff method (rather than the composition of the expert panel) may be at fault.

The Ebel method has the advantage that it does not require the experts to put a number to the difficulty of the question; instead, they rate questions as easy, medium or difficult. This makes rating easier for the experts, and it may help with the dove/hawk problem as well. The Ebel method also asks panel members for an estimation of whether the item is testing for essential information (i.e. is it relevant for core competence); items are rated as essential, important, or acceptable. The cut score is calculated from the difficulty and relevance ratings.

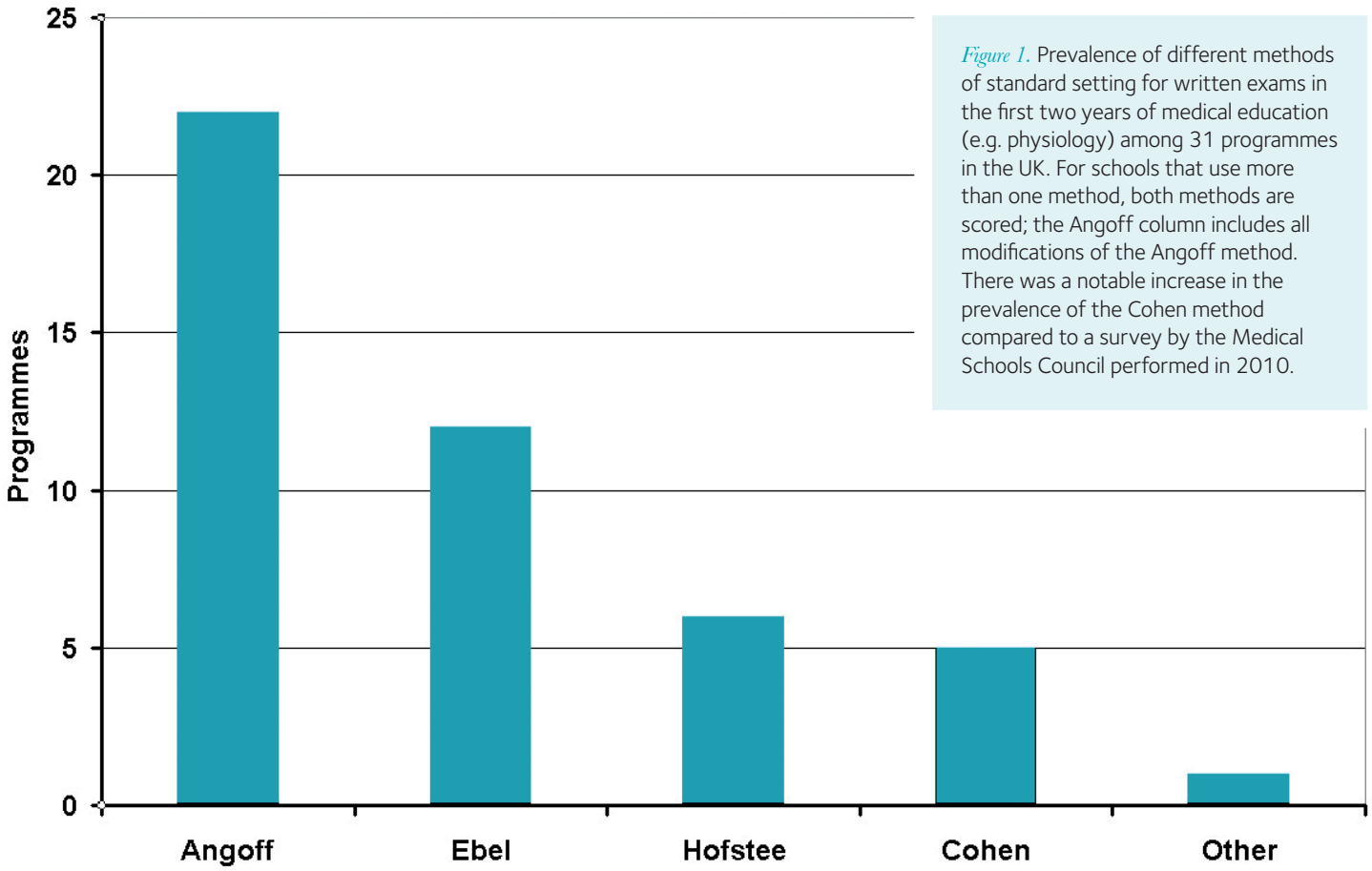

Figure 1. Prevalence of different methods of standard setting for written exams in the first two years of medical education (e.g. physiology) among 31 programmes in the UK. For schools that use more than one method, both methods are scored; the Angoff column includes all modifications of the Angoff method. There was a notable increase in the prevalence of the Cohen method compared to a survey by the Medical Schools Council performed in 2010.

The Hofstee method is a compromise method, between absolute and relative, in which the experts review the assessment in detail and then answer: what are the minimum and maximum acceptable cut scores? What are the minimum and maximum acceptable failure rates? Student performance is then compared to the experts' answers to determine a cut score. The advantages of the Hofstee method are that it is easy to implement, and that the experts (especially educators) are comfortable with the decisions. The main disadvantage is that the cut score arising from the Hofstee calculation may not be within the experts' range, so Hofstee is not typically the first choice in a high stakes assessment.

The Cohen method is a relative method that calculates the final pass/fail boundary on a percentage of the highest performers' scores, e.g. 0.65 x 90th centile. The highest performers in the class are seen as a reliable index of exam difficulty – their performance is considered consistent. Examiners feel comfortable when running the Cohen method because it does not involve estimating the performance of a 'borderline candidate'. It differs from other relative methods because the pass-fail boundary does not depend on the performance of the failing/weakest students. However, as with other relative methods, it tends to be eschewed in high stakes assessments. In our survey of UK medical schools, the prevalence of the Cohen method has increased compared to a survey done two years ago by the Medical Schools Council.

Conclusion

Despite the extra work and the intermittent challenges with its execution, physiologists assessing on medical programmes are instituting standard setting in good faith. Attempts are being made to understand the repercussions of each method of standard setting, and the resulting opportunities for improving our assessments and teaching are being pursued.

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Meeting Notes

Physiology 2012

Education and Teaching (ET) theme symposium
Standard setting in physiology assessment: what is it and does it matter?

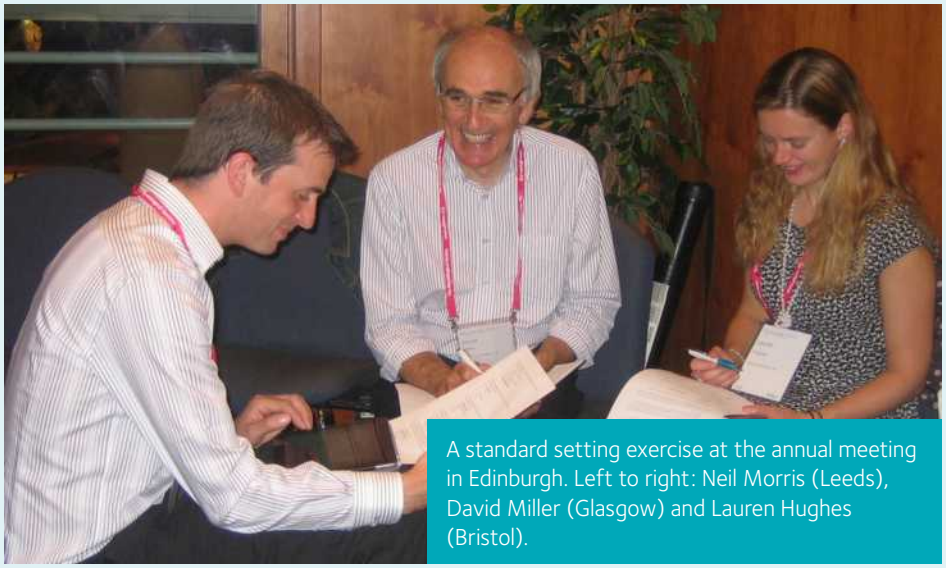
4 July 2012, Edinburgh, UK

For many attendees this was the first time they discussed how standard setting was performed outside of their own universities, making this ET theme session both useful and thought-provoking. First, Prem Kumar from University of Birmingham outlined the various types of standard setting, and explained their rationales, which varied from the defensible to the feasible. He later presented a talk and demonstration entitled, "Can we use the modified Angoff method for short answer questions." He proposed that the widespread modified Angoff methods may be particularly suitable for multiple choice formats and for those assessments that gauge a readily agreed upon competency; however, there might be a problem when applying these kinds of methods to short answer questions. Attendees formed the expert panel to judge two questions (one known to be more difficult based on past student results). The demonstration showed that in a room full of physiologists, all of whom are experienced teachers, there was still regression to the mean. As this outcome could not be attributed to the composition of the expert panel, the problem may be fundamental to the modified Angoff method.

Judy Harris from University of Bristol gave a presentation with an interactive demonstration. "Using the Ebel method for standard setting" allowed groups of the attendees to try out the Ebel method's two-way rating system based on importance and difficulty. In the symposium, attendees found the process of rating without numbers amenable, and the results were consistent with intuitive expectations about the items rated; the ratings varied by group, so "hawks and doves" were still present.

John Morris (co-authored with D Young and R Perera) at University of Oxford presented "Standard setting for core biomedical assessments: Oxford's experience with a new method." At Oxford, assessment of wider reading and understanding is done by essays in which students have a choice, but core information (relevant to minimal competence and the requirements of the GMC) is tested by an automated system with questions based on single best answer or extended matching format. One criterion they sought from standard setting was to separate the variance in exam scores due to the difficulty of the examination from that due to the performance of the students. Their results reaffirmed the fundamental premise of the Cohen method, which is that the standard of a top cohort of students is consistent from year to year and from examination to examination.

Stewart Petersen from the University of Leicester gave a presentation incorporating his experiences as part of inspection teams acting on behalf of the GMC, and David Lewis from the University of Leeds led the subsequent discussion session.



Credit: Judy Harris

A standard setting exercise at the annual meeting in Edinburgh. Left to right: Neil Morris (Leeds), David Miller (Glasgow) and Lauren Hughes (Bristol).

Stem cells for the treatment of Parkinson's disease

The potential of stem cells in regenerative medicine is huge. The challenge is to understand how they can be directed and controlled.

Rupert CM Wright
Paul Roach &
Rosemary A Fricker
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Many tissues in the human body such as nerve cells and cardiac muscle do not have a strong ability to regenerate when damaged. With ageing populations where degenerative disease is common, healthcare systems are under pressure, so regenerative medicine is being developed using cells to restore diseased or damaged tissue.

To date, cell therapies for neurodegenerative disorders such as Parkinson's have been attempted in small clinical trials, using grafts of dopamine-producing neurons directly dissected from fetal central nervous system (CNS) tissue (Lindvall & Björklund, 2004). These trials have shown the potential of cell replacement therapies; however, the cell source is scarce and is insufficient to cover the demands of the patient population. To circumvent the need for large numbers of cells, stem cells are proposed as a more suitable source for neural transplants. Here we outline the key innovations and challenges surrounding stem cell therapies for neurodegenerative disease, focusing specifically on advances in Parkinson's.

Which stem cells to use in cell therapies?

Stem cells are found throughout the body from development through to adulthood. They are defined by two main properties: self-renewal and the ability to become (differentiate into) mature cell types.

Stem cells range from being:

- Pluripotent – can differentiate into any cell type in the body.
- Multipotent – have a more restricted lineage, e.g. neural stem cells form neurons and glia of the (CNS).
- Unipotent/bipotent – make one or two cell types, respectively.

Stem cell therapies branch in two main forms:

Autologous: Same donor and recipient. This is a personalized medicine that avoids immune rejection. Stem cells can either be re-programmed *in situ* or removed from a patient, manipulated and returned in a transplant.

Allogeneic: Different donor and recipient. The advantage here is that these could be derived from more diverse sources, e.g. embryonic stem cells. Matching will be required for immune compatibility: it is estimated that a cell bank of 150 embryonic stem cell lines would be required to cover 85% of the British population (Taylor *et al.* 2010).

Identification is only the first step to achieving high yields of specific cell types from stem cells. A major challenge with developing optimal cells for therapies is recreating the complex spatial and temporal signalling processes that are required to create specific mature cells (e.g. neurons) within organised three-dimensional tissues and structures.

Embryonic stem cells

Embryonic stem cells (ESCs) are pluripotent, forming any cell type in the body, and show extensive self-renewal meaning large clonal populations can be produced. ESCs were first separated from mice (Evans & Kaufman, 1981), and more recently from human embryos (Thomson *et al.* 1998), derived from the inner cell mass of blastocysts

provided by residual IVF tissue. This makes their use contentious for some, whilst others argue that the potential merits (generating a limitless number of cells from a small starting source) outweigh the ethical concerns of blastocyst destruction. ESCs can be steered into many mature cell lineages with appropriate cues.

Dopaminergic neurons have been derived from embryonic stem cells using a variety of culture methods. Effective methods include transfection with genes known to enhance neuronal differentiation (intrinsic signals) and the use of co-cultures or the addition of signalling molecules (cytokines, mitogens, trophic factors or morphogens) in a complex culture medium, to mimic the cells' natural environment (extrinsic signals).

The task of finding relevant signal molecules has become more efficient as a result of high-throughput gene and protein screening methods such as genetic micro-array technology and proteomic mass spectrometry (Fig. 1). Our research group has utilised a mass spectrometry method to find new molecules to detect extrinsic signals (Orme *et al.* 2010). Proteins were harvested from developing midbrain tissue, targeting our search for specific protein signalling molecules by comparing their temporal and regional expression. Thus, we have identified novel and/or previously unidentified proteins that play key roles in the differentiation of dopamine neurons. Using genomic micro-arrays it is possible to look for gene products coding for intracellular signalling molecules to identify key transcription factors for defining neural lineages (Panman *et al.* 2011).

Some of the challenges of working with ESCs have already been overcome. Early problems such as karyotype abnormalities (incorrect numbers of chromosomes) have been avoided through stable culture protocols. Also, defined environments have been developed for human ESC culture, to remove the risk of animal/human pathogen transmission from media components or substrates.

Adult stem cells

Adult stem cells have fewer ethical hurdles because no embryos are destroyed during their production. Adult stem cells have been used extensively by clinical professionals, e.g. stromal bone marrow and adipose tissue to provide mesenchymal stem cells (MSCs) that are multipotent. When a patient is given a bone marrow transplant for leukaemia, the bone marrow stem cells replenish the recipient's supply of haematopoietic stem cells.

The adult CNS contains two distinct but small pools of neural stem cells, with the potential to treat Parkinson's. However, *in vitro* it is difficult to derive dopaminergic neurons from adult neural stem cells and the cells are difficult to harvest. Through a process called transdifferentiation where a cell's lineage changes, dopaminergic neurons have been derived from bone marrow stem cells. The problem is that the cells express a lot of relevant markers but do not function as mature neurons, rendering these cells unsuitable for therapies.

Adult stems cells are safest, but currently have a limited potential. One problem is generation of large numbers of relevant cell types as the fates of the adult stem cells are often restricted; another problem is that it is difficult to expand the cells into large populations for clinical use.

Induced pluripotent stem cells

In 2006, Nobel prize winning research led to a new breakthrough – generation of induced pluripotent stem cells (iPSCs), derived from mature tissues (mouse fibroblast cells) and reprogrammed to a stem cell state using key pluripotency genes (Takahashi & Yamanaka, 2006). iPSCs have similar properties to ESCs but not the ethical problems associated with destruction of embryos.

The promise of iPSCS for the treatment of neurodegenerative disease has been demonstrated by their conversion to neurons, shown to improve movement problems following transplantation to models of Parkinson's (Soldner *et al.* 2009).

A number of research groups have now derived iPSCs successfully from Parkinson's patients, thus generating autologous cell types for transplantation or for disease modelling (Soldner *et al.* 2009). In further technological developments, there is some evidence to suggest that it is possible to derive neurons directly from mature tissues, omitting the naïve stem cell stages (Caiazzo *et al.* 2011). Stem cell-derived disease models would be a fantastic tool for the pharmaceutical industry and biotech companies, to test promising molecular/gene therapies.

Safety concerns have been raised over the reprogramming factors used to generate iPSCs and their delivery using viruses. However, more recent work suggests that iPSCs can be induced without using genes associated with tumour formation, and that reprogramming can be accomplished more safely, using excisable viruses, or avoiding DNA or viruses altogether by using chemically modified proteins.

However, iPSCs have been found to be less efficient than ESCs in differentiating into neurons (Chin *et al.* 2009), probably due to genetic and epigenetic differences. Another concern is that iPSCs are not truly naïve but possess latent 'memories' of their original lineage e.g. an iPSC derived from blood cells is more likely to turn into a haematopoietic cell than a neuron.

'Embryonic stem cell use is contentious for some, whilst others argue that the potential merits outweigh the ethical concerns'

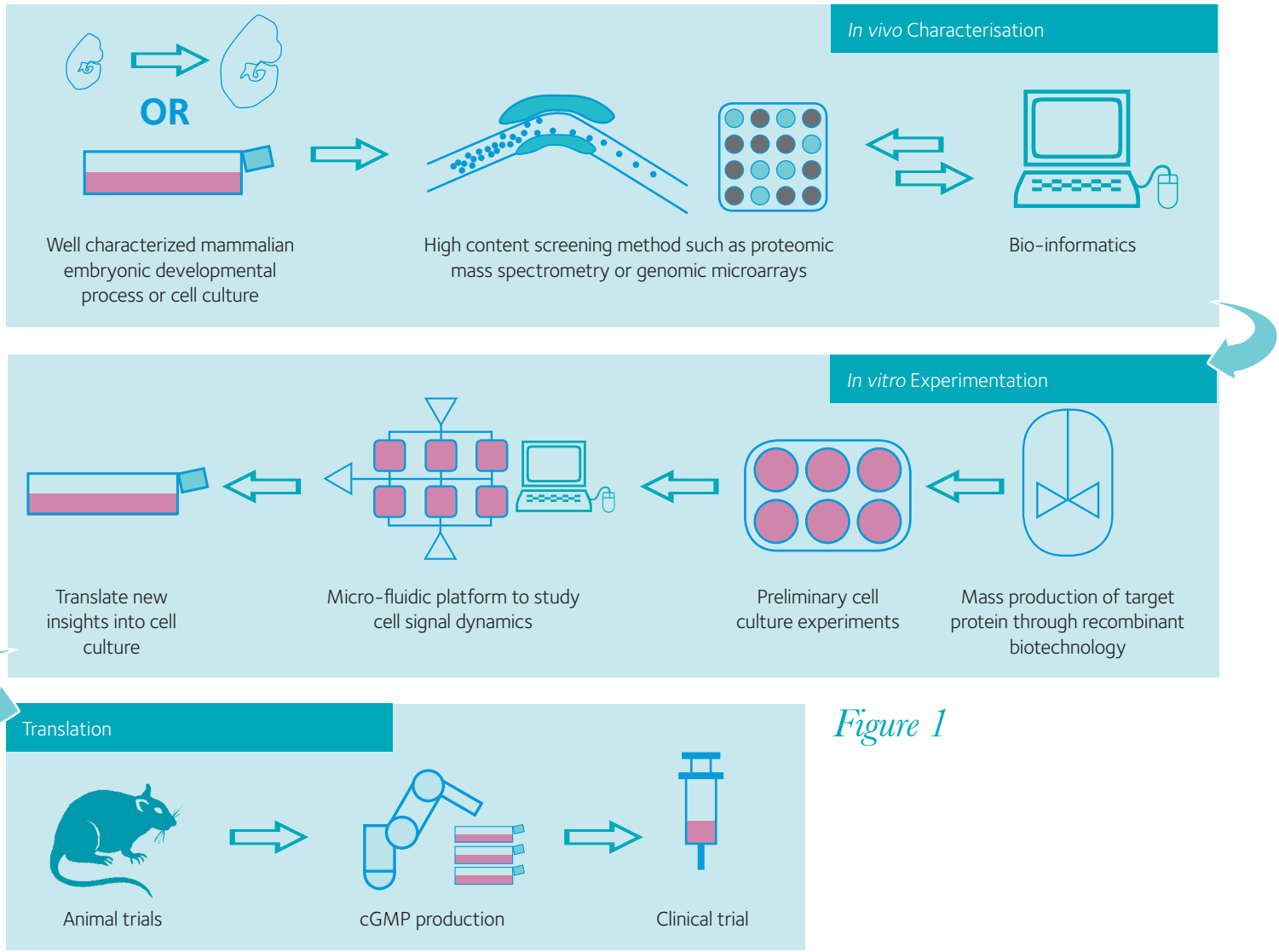

Figure 1

'In 2006, Nobel prize winning research led to a new breakthrough – generation of induced pluripotent stem cells derived from mature tissues'

The complexity of stem cell differentiation

Currently one of the biggest challenges with stem cells is to differentiate them with high efficiency and create complex structures (Fig. 1). Some recent achievements might indicate that technology is improving: highly functional dopamine neurons have recently been derived from ESCs *in vitro*, following developmental principles (Kriks *et al.* 2011; Jaeger *et al.* 2011). The key to success seems to be providing the cells with sequential and specific signal molecules that are up-regulated at different times in the development of dopamine neurons. With so many signal molecules, the challenge is to figure out the dynamics of how stem cells experience signal molecules during their differentiation. The simplest dynamic is that different concentrations of signal molecules will push naïve stem cells down different lineages. Good examples are sonic hedgehog and Wnt proteins that work in a concentration gradient during neural tube development. More complex spatial patterns can be described with Alan Turing's reaction/diffusion model (Turing, 1952; Fig. 2), where activator and inhibitor signals spontaneously organize into binary patterns. At the single cell level, some signal molecules can elicit greater responses when delivered as a pulse rather than a steady dose (Ashall *et al.* 2009). Also, heterogeneous cell responses can occur to the same stimuli through internal feedback loops within individual cells and interplay between neighbouring cells. These complex dynamics could be responsible for the lack of effectiveness in current differentiation protocols. There is a non-linearity to developmental systems and its modelling is likely to be important for future stem cell research. There are multiple opportunities to integrate computational methods into stem cell science, for instance incorporating microfluidic designs to differentiation protocols (Fig. 1, middle panel). These advances will provide better understanding of cellular systems and improve the efficiency of stem cell differentiation, a crucial step for their translation towards clinical therapies.

Figure 1. An ideal route map for creating a stem cell therapy. The top panel represents a discovery stage, where details of normal development are elucidated using tools such as proteomics, genomics and bioinformatics. The middle panel applies new knowledge to cell culture experimentation, based on the most effective process to achieve efficient and optimal stem cell differentiation and incorporating the complex dynamics of normal development. Novel signalling molecules/proteins may require mass production prior to use in differentiation processes. The bottom panel shows the necessary steps in the translational process of taking basic science into the clinic.

Figure 2. Two variants of signal dynamics. The first is a concentration gradient where the dose of a signal molecule will direct cell lineage. The highest doses are seen closest to the source; the gradient is established through diffusion. The second dynamic shown is an example of an Alan Turing reaction/diffusion model; the system self-organises on the principle that there is a slow moving activator and a fast moving inhibitor; also exposure to either will cause the release of the other.

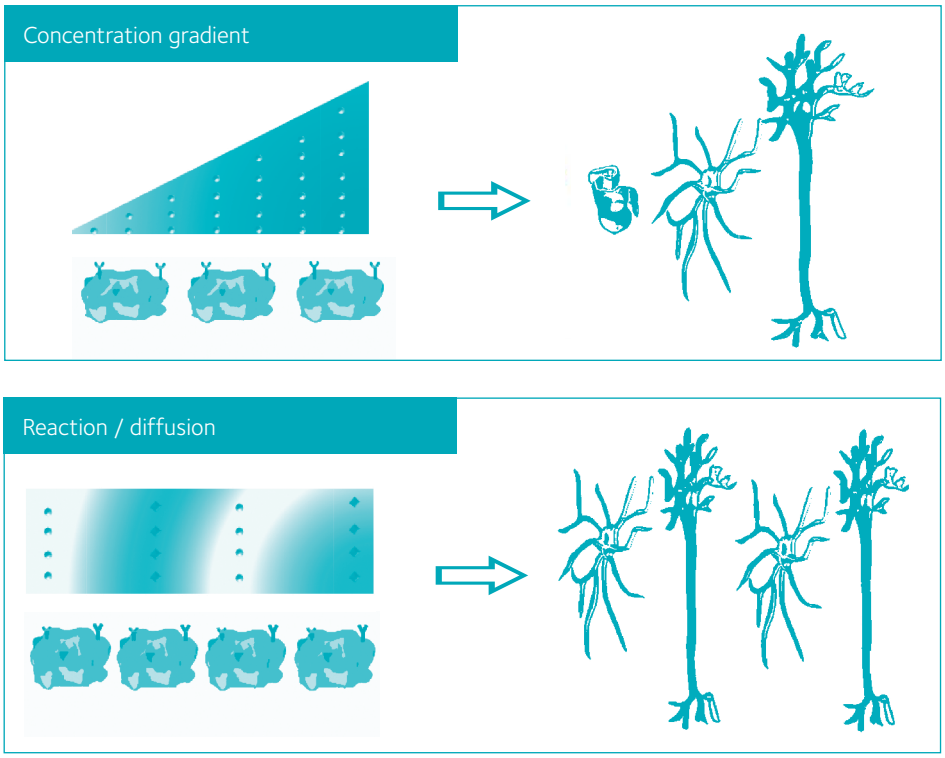

Figure 2

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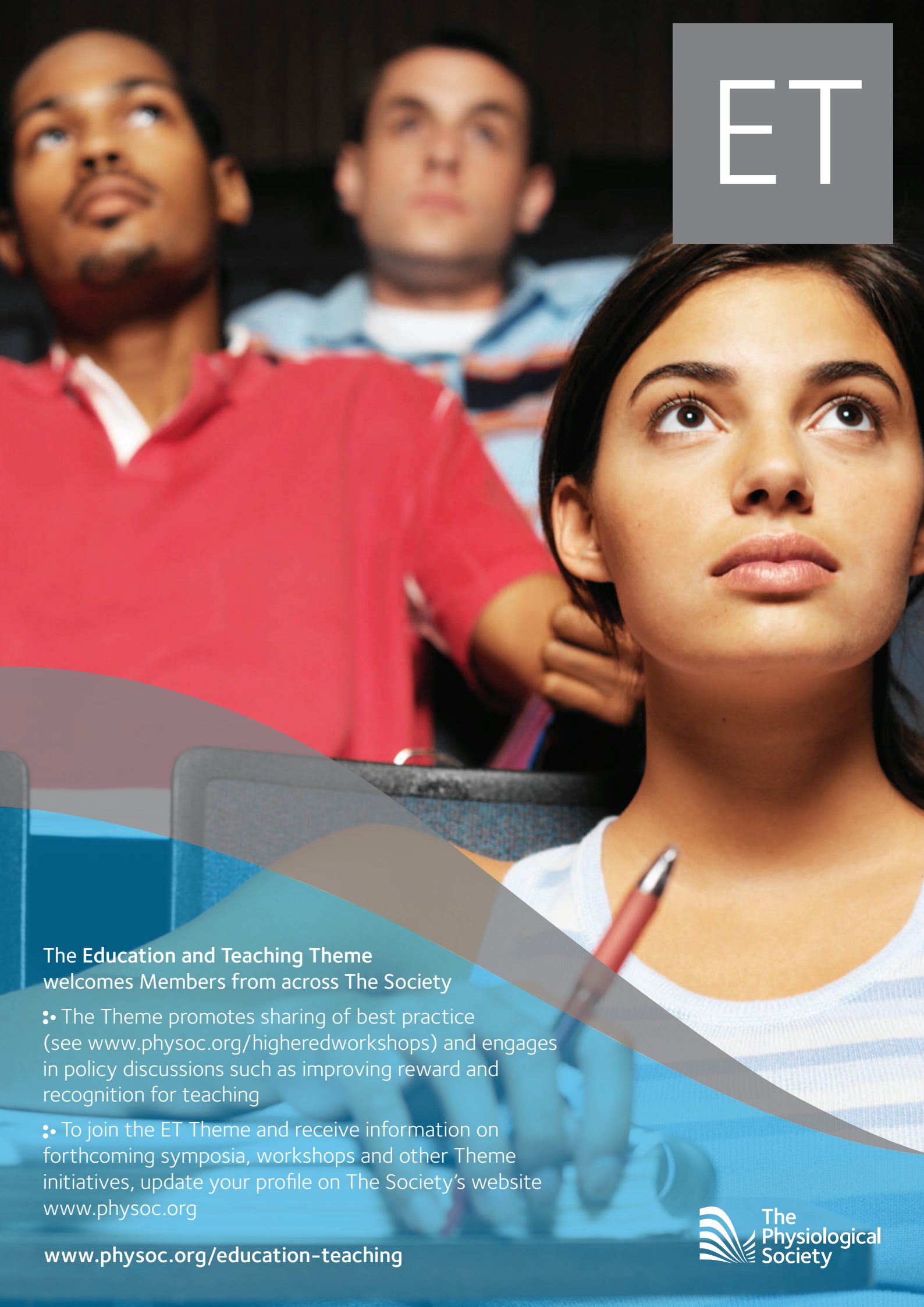

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The Physiological Society

Q&A: Back to school

Prominent figures in physiology share memories of their school days

Dame Nancy Rothwell

President, Vice-Chancellor and Professor of Physiology, University of Manchester

Nancy Rothwell, 1957

Brentwood School, Southport
1960–64

Penwortham Girl's Grammar School,
Preston
1966–73

Queen Elizabeth College, London
1973–76

What did your school reports say about you?

I can't remember my first school reports. The grammar school reports started off well, because in the beginning I was hard working and focused. But then I seriously got into sport and doing things other than work. So mostly the reports were, "If Nancy could apply herself more, she'd do better". There was an awful lot of "More effort and she could achieve a great deal more". They got a bit better when I got into studying specialist subjects. But, in general, "Could do better". That included science up until about 15. But I didn't like biology – I dropped biology from the age of 14/15. My favourite subjects were maths, physics, chemistry, art – all of which I did at A-level – and Latin. I know it was a strange combination!

What is your earliest memory of science at school?

My father was a biology lecturer at the technical college that became Central Lancashire University, so at home we had skulls and animals in cases and jars. As far back as I can remember, there were biology books that I read – even though I wasn't that keen on biology at school. It was all around me.

At school, I loved physics and chemistry, but biology was more interesting at home. I don't really have much recollection of biology at school. The early part of biology was an awful lot of classification and plants and things. It was a fairly classical education. I still can barely tell you the difference between one flower and another. I've always been more interested in animals.

What at school inspired you to pursue science or physiology?

In terms of formal education, I did come to physiology late. My first thought was to try to pursue a career in art – I went to art school to do my A-levels. But I wasn't really good enough to make money out of it. My second choice would have been maths. Physiology wasn't, in the end, a particularly well thought through decision!

My choice of subject and university were largely non-academic. I chose to do physiology and biochemistry, and changed to physiology. But that was only because of my father, who was a physiologist. My first practical at university I hadn't a clue what I was doing, because I hadn't done biology for four years. My father rightly advised me to stick with maths, physics and chemistry – you can pick up on the rest. My choice of university was largely social. I wanted to go to London. I went to Queen Elizabeth College, that later became part of King's, and it was on Kensington High Street. And that seemed like a fun place to go.

‘We had a chemistry teacher who often blew things up. He was good fun. We would play with mercury and break all the rules. In general, we did things that you wouldn’t be allowed to do now’

Nancy Rothwell and Mike Stock, 1979

Can you tell us about a particular lesson, experiment or incident in your science education that has stuck with you to this day?

We had a chemistry teacher who often blew things up. Mr Miller – Derek Miller. He was good fun. We would play with mercury and break all the rules. In general, we did things that you wouldn’t be allowed to do now. He was continually told off for doing things he shouldn’t. We had mercury on the desks, threw sodium into water and did all sorts of things. He was probably my most inspirational teacher.

We also had a physics teacher with a background in industry, so he could tell us all about how a nuclear reactor worked from first-hand experience. They were much more hands on than my biology teachers. I just happened to have chemistry and physics teachers who could talk about the real world. They also talked about the history of discovery, which I found fascinating.

Can you tell us about your first year at university? What impressed you the most?

At university, the first year I worked very hard. The second year I didn’t do much work – I missed most of the lectures. I just had a good time and I didn’t know what I was going to do. Then it was a research project in the final year with Mike Stock, who became Professor of Physiology, that completely changed things. I was looking at fat cell metabolism and how it changes in response to the physiological state of the animal. It was looking at rates of lipolysis and lipogenesis. It actually resulted in a presentation to a Physiological Society meeting, given by a final-year PhD student, Ian MacDonald (now Professor of Physiology in Nottingham). I went on to do my PhD with Mike and worked with him for a number of years. I’d gone to Mike Stock because he was an inspirational teacher and he taught human physiology, which was interesting to me. He worked on extremes: high-altitude physiology, hyperbaric physiology – so he worked a lot with the Navy. So I wanted to do a project on one of those, though I ended up doing one on energy balance regulation. I then worked with him until I left St George’s in 1987 to move to Manchester on a Royal Society fellowship.

Nancy Rothwell, 2012

Mike Shipston

Professor of Physiology, Centre for Integrative Physiology, University of Edinburgh

Mike and his younger brother at St Thomas's Church of England Primary School, 1976

St Thomas's Church of England Primary School, Lancashire, UK
1972–78

King Edward VII School, Lancashire, UK
1978–85

University of St Andrews, Scotland, UK
1985–89

What did your school reports say about you?

Certainly in my early days at senior school it would be along the lines of: "Quiet boy who is a good all-rounder, but hopeless at French!" My teacher despaired of my inability to speak French with anything but a broad Lancashire accent. However, inspired by a new teacher, I achieved a B grade at O-level – one of my proudest achievements!

What is your earliest memory of science at school?

Although I remember the typical 'sand and water' experiments at primary school, it was never something I associated with 'science'. 'Science', as I perceived it, was gained from books, TV (*Tomorrow's World*) and through a weekly children's magazine (now defunct) *Look & Learn*. In fact, I remember in those days that 'science' was the exciting new thing you were going to do at senior school.

At first it was taught as one subject that mainly seemed to involve looking at soil. It was not until the second or third year of senior school that we had separate biology, chemistry and physics classes and I felt that I was finally doing real 'science'. There was only one biology class and I had to fight hard to get a place in it.

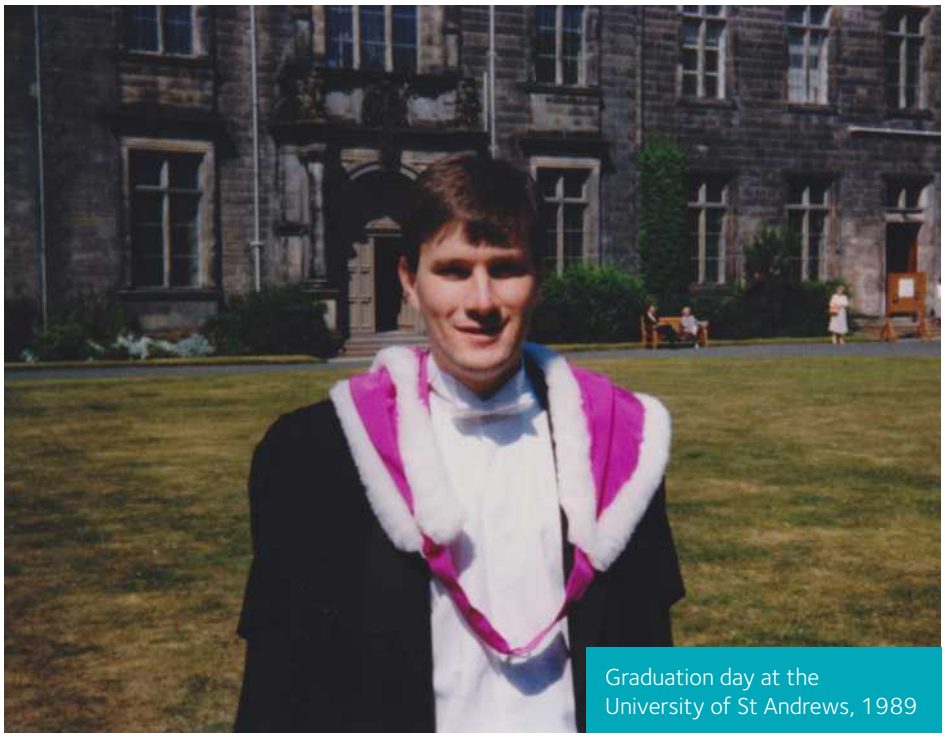
What at school inspired you to pursue science or physiology?

From an early age I remember wanting to be a chemist. I'm not really sure where this desire came from as science was not something that ran in the family. I remember 'helping' my father when he rebuilt a VW Beetle engine and I was fascinated by how these hard, inanimate objects fitted together to make something so dynamic and apparently alive. Receiving a chemistry set one Christmas led to the inevitable construction of stink bombs, minor explosions, vinegar and Alka Seltzer volcanoes and wonderful crystal gardens. The latter led to my interest in biology. I left a saturated jar of sugar crystals outside in the shed for too long and came back to see, not a great crystal, but an amazing array of fungi and bacteria spilling out from the top of the jar.

Around this time I was inspired by three publications: One holiday I picked up a copy of *The Protozoa* by Vickermann & Cox; Richard Dawkins' *The Selfish Gene* left its mark on me one summer in Cornwall; I then raided the library to find out more about cells and found a small book called *A Prelude to Physiology* – the combination of simple chemistry, physics and physiology had me hooked. This was reinforced in biology class at school with the classic experiments of taking a scraping of cells from the inside of your own cheek and observing them under the microscope, and making thin sections of leaves (using a razor blade to slice a leaf held between two bits of polystyrene) to observe the intricate cellular structure of leaves and their stomata.

Can you tell us about a particular lesson, experiment or incident in your science education that has stuck with you to this day?

In the first year or two at senior school we did an experiment with colour blindness charts. I vividly remember being the only student who could 'see' a particular pattern and being overjoyed at being the only one with my hand up. Of course, it turned out that I saw a



Graduation day at the University of St Andrews, 1989

Mike Shipston, 2012

‘I saw a different pattern to everyone else because I am red–green colour blind. Although teased mercilessly by my classmates afterwards, it left me with a sense of wonder at how diversity is generated’

different pattern to everyone else because I am red–green colour blind. Although teased mercilessly by my classmates afterwards, it left me with a sense of wonder at how diversity is generated – and also that being different was actually quite exciting. I remember getting a book from the local library with colour blindness charts, testing my family and tracking how it followed the X-chromosome.

Can you tell us about your first year at university? What impressed you the most?

I was taking biology, chemistry and physics courses – all of which allowed me to expand my horizons. It was the sense of freedom to explore these and other topics. While I was a fairly diligent student in attending my classes, and loved the practicals, I would often drop into the odd art history seminar that piqued my interest. Having a circle of friends whose interests spanned the arts, humanities and sciences certainly led to many interesting and lively discussions. With St Andrews being such a small place, you felt part of the fabric of the university.

Are there any teachers or tutors that had a particular impact on you?

At senior school my early chemistry and biology teachers, Mr Matthews and Mr Carah, were inspirational – they had very different teaching styles, but had a love of their subject and allowed you to explore and make the subject fun. Other teachers affected me in different ways – my final French teacher (I forget his name) never gave up on me and gave me the confidence to believe in myself. He was the polar opposite of my first French teacher, a dour French lady!

At university there were several lecturers who stood out, but perhaps most of all were Jim Aiton and Gordon Cramb. I managed to spend time in their labs during two summer vacations. Even though one project was assaying human urine, it was great fun and I learnt so much and developed a real love for trying to work things out for myself.

Holly Shiels

Senior Lecturer, Faculty of Life Sciences, University of Manchester

Holly with her parents on the French River in Northern Ontario, at the moment they say she realized she wanted to be a fish physiologist! 1973

St Mildred Lightborn School, Ontario, Canada
graduated 1985

Oakville Trafalgar High School, Ontario, Canada
graduated 1990

University of Western Ontario, Canada
graduated 1994

Holly Shiels, 1994: Eureka: Urea!

What did your school reports say about you?

"Enthusiastic, but lacks focus"! But also, usually, "A joy to teach"! The teachers thought that I should be more diligent, but I had a lot of interests. I really liked history and I really liked English, and I liked biology and I liked maths. The Canadian system is different because you don't have the same level of specialisation, but even by North American standards, I was very broad.

What at school inspired you to pursue science or physiology?

My best science memory from school was when I went to the Canada-wide science fair. That was in the first year of high school, at 13 years old. I presented a project on 'The most efficient airplane wing'. I re-did the Wright Brothers' experiments in my own model wind tunnel. It was really cool.

It went really well and it was fun. I won the school, and then the region, and then the province, but I didn't win Canada-wide. The province one was kind of embarrassing. I was so overwhelmed by winning that I got a nosebleed! I totally remember who won at the nation-wide event. It was a project on – I even remember the title – 'Spatial memory: scent or stimuli?' I remember thinking, "What a complicated title!" It was about brain function in mice in a maze. I figured it was fair enough! I wasn't hard done by at all.

It happened every year. That was the only year I ever got beyond the school competition. I did try again, but I didn't seem to have the knack in later years.

Can you tell us about a particular lesson, experiment or incident in your science education that has stuck with you to this day?

In my final year of high school, Marty Rich was my biology teacher and he was fantastic. I did well in the class and it made me want to continue with biology at university. Those were the days when in high school you still did major dissections. We all dissected cats. They were formalin cats and they absolutely stank, and when we opened mine it was really fat! I had the fattest cat in the whole class! Mr Rich helped me get rid of all the fat so I could find all the major organs, which was nice, because I was pretty grossed out! I was 17. We worked in pairs and each pair got their own cat. You don't even do that in university these days. We did a full dissection – took out every major organ!

Can you tell us about your first year at university? What impressed you the most?

University was also very broad. I took biology, history, maths, political science, philosophy. I finally decided to go for science before my very final year, when you have to decide on your major. I went to a marine station in New Brunswick on the east coast of Canada called Huntsman Marine Station. It was a three-week course and it was the first time that I felt I was doing my own experiments. The professors helped us to think about things, but we did them entirely independently – we researched them, made up a plan, did the experiments, collected the data and made a full report. It was looking at nitrogenous waste excretion in inter-tidal fish. Most fish excrete nitrogen across the gill as ammonia, but to do that you need lots of water. So for inter-tidal fish that get stuck hiding in crevasses when the tide goes out, there is no water. The idea was that they would switch from excreting nitrogen as ammonia to excreting it as urea. So I went out on the seashore and collected these little fish and stuck them in dark chambers on some mesh and removed the water. Then I let them sit there and sampled the water underneath the mesh. And it worked, which I thought was fantastic! Eureka: Urea!

The supervisor I worked with in New Brunswick said, "You're very enthusiastic! Would you like to do an honours project with me for your final year?" That was Louise Milligan, now one of the associate deans at the university, and also now a good friend. Louise was a wonderful mentor – and she was just as excited about things when they worked as I was. She spent a lot of time with me at the start, but let me get on with it once I could be trusted. We were basically chasing fish in a tank with a stick, but it seemed so high-tech! (That was to exhaust them so we could measure lactate accumulation in the muscle.) That was my first real study of fish muscle physiology.

Holly Shiels, 2012

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WILEY-BLACKWELL

The Physiological Society

Lab profile: Placental Research Laboratory, The Institute of Developmental Sciences, University of Southampton

Priscilla Day on the laboratory in which she recently completed her PhD

I undertook my PhD in maternal, foetal and placenta physiology in the Placental Research Laboratory at the University of Southampton, under the supervision of Rohan Lewis, Mark Hanson and Jane Cleal. The placental laboratory is based at the Developmental Origins of Health and Disease (DOHaD) centre in the Faculty of Medicine. The centre was set up following David Barker's proposal stating that the risk of developing some chronic diseases in adulthood is influenced not only by genetic and lifestyle factors, but also by environmental factors acting in foetal and infant life.

Today the centre boasts a broad collaboration of interdisciplinary research from the Medical Research Council Lifecourse Epidemiology Unit, the National Institute for Health Research Nutrition Biomedical Research Centre, and the Institute of Developmental Sciences (IDS). The collective work of these groups aims to understand early-life events that predispose individuals to chronic diseases (diabetes, cardiovascular diseases and some forms of cancer) and to develop interventions to reduce the burden of these diseases, in both developed and developing countries. The IDS is made up of small laboratory groups with various research themes including epigenetics, cardiovascular research and placental research.

The placenta group seeks to understand how various placental functional pathways work together as a system to support foetal growth, and how this determines pregnancy outcomes. This group uses isolated placental perfusions and placental fragment studies, together with a range of molecular and biochemical techniques to decipher important mechanisms involved in amino acid transport across the human placenta.

However, as in many organs, the crucial role of inter-organ metabolism has yet to be understood and incorporated into the proposed model of amino acid transport in order to understand factors contributing to net amino acid transfer to the fetus. My studies – which were carried out in collaboration with John Jackson and Alan Jackson – explored placental amino acid metabolism and its role in determining net transfer and also the partitioning of nutrients between the mother, the placenta and the fetus. Due to the complexity of the placental nutrient transfer model emerging, the group is also now collaborating with mathematicians and the Centre for Biomedical Research Mass Spectrometry Unit (University of Southampton) as well as staff at the Maternal and Foetal Health Research Group (University of Manchester) to model placental amino acid and fatty acid transport across the placenta.

As placental function is influenced by both the maternal and the foetal environment, the group is also carrying out research work in conjunction with the Southampton Women's Survey (SWS). The SWS was set up in 1998 to study how diet and lifestyle factors before and during pregnancy influence the health of women and their children. Data from the placenta group, which was generated during my PhD, have contributed to this work by suggesting that maternal body composition, pre-pregnancy smoking and exercise influence placental function, and also mRNA expression.

When the placenta laboratory was opened in 2005, it had three researchers, with Dr Rohan Lewis as the principal investigator, Dr Jane Cleal as a Postdoctoral researcher and Dr Ellen Burnett as Research Assistant. I joined the group in 2007 as a PhD student (sponsored by the Gerald Kerkut Charitable Fund). Today both Jane Cleal and Rohan Lewis are principal investigators; the laboratory has three new PhD students and a new Postdoctoral Research Fellow. The group is also extending its work into understanding the role of vitamin D in controlling placental amino acid transporters and whether epigenetic mechanisms are involved in placental amino acid transporter regulation. Currently, the research activities by the placental group are being funded by the BBSRC and the Gerald Kerkut Charitable Fund, and also in collaboration with an EU funded project.

While I am glad to have finished my PhD and graduated, I feel sad to leave the group and will miss all the fun we had singing to the placenta, "Loving you is easy 'cause you're beautiful"!

Member profile: Brenda Finney

Affiliate Member, **Brenda Finney,** Research Fellow at the University of Birmingham, on finding her way in physiology

Brenda with incredulity and joy on her face after passing her viva, 2008

When I graduated from my Ohio high school in 1995, I had an almost endless list of goals. I was going to be a writer, a veterinarian, an actress, a doctor, a traveller, a – you get the picture.

Well I'm in a different country, writing about my work and, as it turns out, I am a doctor! So the way I figure it, that's three out of five from my list. But my best title is a scientist, and it is one thing that it never occurred to my 18-year-old self that I could become. My path to physiological research has not been straightforward. I have had forays into accounting, veterinary nursing and even worked for my local fire department for a time.

I found the beginning of my path at the University of Cincinnati. Due to my experience with animals, Nancy Ratner hired me as a research assistant to oversee the maintenance of her mouse colony. What neither one of us anticipated, I think, was my interest in the science that was going on around me, of which 'my' mice were an integral part. Due to the encouragement I received in this lab, I began thinking about postgraduate study, choosing a Masters in Research at the University of Manchester. I chose this programme because I wasn't sure if I was ready to undertake the rigors of a doctoral thesis. But, by the end, I knew I could tackle the challenge and began looking for PhD projects.

At this point I hit a bit of a snag. Being from the US and wanting to do a PhD in the UK limited my prospects. But I found sympathetic supervisors in Paul Kemp and Daniela Riccardi who were setting up their lab at Cardiff University. It was in this lab that I really got a taste for physiology. It was also at this point that I joined The Physiological Society. I joined on the recommendation of Paul Kemp, who spoke very highly of the benefits of being a Member. One of the benefits I enjoyed straight away was the funding for new researchers to attend their first conference – even if they are not presenting. The whole lab went to Glasgow, and, because of The PhySoc, I was able to get my first conference experience as well as provide moral support for my friends who were speaking there!

I went to that first conference as a spectator because my project was evolving, as many projects do, into something completely different from what we had anticipated. I started working on ion channels, but soon moved over to the physiology of the developing lung. My work became focused on the role of the calcium-sensing receptor in the process of branching morphogenesis and I was even invited to write a synopsis of my work here in *Physiology News*. I was also accepted to present a poster at IUPS 2009 in Kyoto, Japan. Again it was thanks to the travel funds available from The PhySoc, and from the IUPS itself, that I was able to attend.

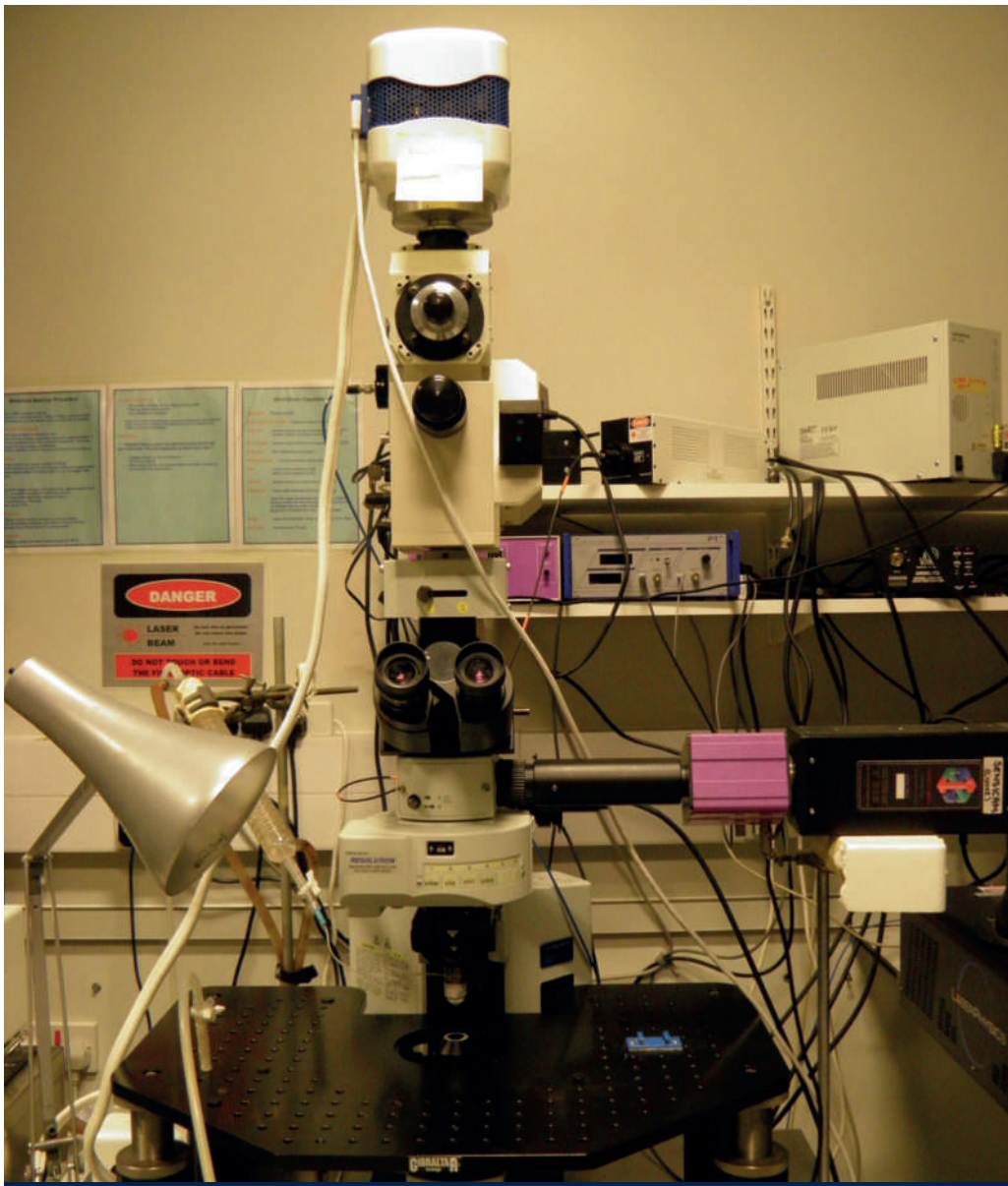
The vagaries of funding being as they are, I was unable to follow-up my PhD studies with a postdoctoral position continuing my work on the calcium receptor and the developing lung. So I set about trying to parley my skills in lungs, mice and dissection into a new avenue. I was able to transfer these skills to a new project with the Birmingham Platelet Group and Steve Watson, where I have been based since 2010. And it is partly due to The PhySoc that I am in Birmingham today. Remember I said they helped me get to IUPS? Well, the poster next to mine was from the University of Birmingham. Not from the Platelet Group, but another lab just down the hall. But if I hadn't chatted with them about their work, and about Birmingham as a place to do research, who knows where I would have ended up!

‘My path to physiological research has not been straightforward. I have had forays into accounting, veterinary nursing and even worked for my local fire department for a time’

When I joined the platelet group they had been working to breed a knockout from a recently acquired mouse line, but several litters had been produced without any viable knockouts. I knew that there had to be a developmental explanation. When I outlined my plan for looking at different developmental stages to determine when the loss of the knockout embryos was occurring, Steve seemed a bit dubious, but I persevered and he gave me the go-ahead. What I found was a phenotype which developed throughout pregnancy in several systems and ultimately resulted in knockout pups not living much past birth. As I was working through this phenotype, our lab was able to produce a non-lethal variant of the knockout and I have now moved into analysing *in vivo* platelet function in these mice. I use an injury model which requires some fairly intricate surgery before you even get the vessels under the microscope, but it is magnificent to see physiology happening before my eyes.

So now I have completed almost three years of a four-and-a-half year post and it is time to start thinking about where I am going next. Do I stay where I am? Or do I write a fellowship? Or look for an advertised post? How does my career work now that I am a mum and I am geographically limited as to where I can look for posts? I am approaching a difficult time for a postdoc, I think, one where there is a great deal of uncertainty about where my career is ultimately going to go. But I suppose I could always chuck it all in and pursue the old goal of being an actress.

Thanks to The PhySoc I have been put in contact with a mentor who gives me good and impartial advice, and I’m sure she’ll be of great help, although I’m pretty sure she’ll tell me to give the acting a miss.

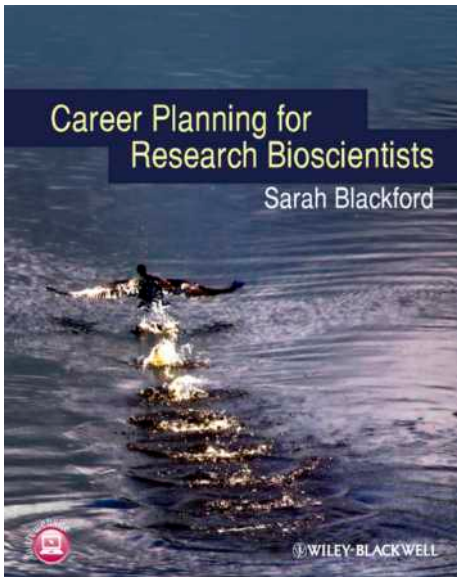


The rig for the intravital microscopy of platelet function

Book review: Career Planning for Research Bioscientists By Sarah Blackford

Lewis Dean

Physiological Society
Outreach Officer



Wiley-Blackwell
ISBN-10: 140519670X
ISBN-13: 978-1405196703

Everybody knows it: There aren't enough post-doc jobs for the number of people graduating with a PhD and the chances of getting a lectureship are even smaller. It has never been more important to think about your future, explore the options and make plans. This book is written by Sarah Blackford, who has experience in research and as a careers advisor; she is currently head of policy and education for another learned society and her depth of experience in the field is obvious.

The book is set out like a textbook – it can be dipped into for advice, with chapters logically guiding the reader through the process. Starting with career planning and self-awareness, the book then moves through assessing the job market and positioning yourself appropriately, to making applications and interviewing for jobs.

Self-awareness – thinking about your skills, interests and knowledge – is vital when you are making applications. Unfortunately, far too many undergraduates, postgrads, and even those with more experience, simply fire off applications almost at random, without thinking about whether they are suitable for, or interested in, the role or are selling themselves in the best way. Blackford guides the reader through some simple ways of assessing your attributes and desires, honestly and sensibly, and identifying your weaknesses. Through this process, we can hone our ideas, work on our weaknesses and make sure we emphasise those skills that potential employers are seeking.

The real strength of this book is to be found towards the end. It is here that Blackford's depth of knowledge becomes apparent. The final chapter, focused on decision making and action planning for early-career researchers, combines her knowledge of career planning with experience in the field. Unlike some guides, which attempt to give advice to people in a wide range of different sectors or age groups, this is written specifically for early-career bioscientists. The realities of life for early-career researchers are addressed and this forms the basis on which decision making and implementation is discussed. Following this discussion, the first appendix of the book features 20 career profiles, gathered from across a variety of industries. The individuals, all of whom have carried out a bioscience PhD, discuss what they do and how they got there, and their comments are neatly rounded-off by a brief analytical commentary from Blackford.

Of course, a book is never going to tell you what you want to do with your life, or answer questions at an interview for you, but these are tough times to be an early-career researcher. This book can help you to start thinking seriously about your current and future career plans, giving useful insight into where you should look for ideas and motivation.

There may be many of us for whom a book on career planning would not be on the top of our wishlist. However, I would argue that, in the long-term, it will be much better value than that edited volume, which all too often ends up sitting on the office bookshelf gathering dust.

Gabriel Horn

1927–2012

Sir Gabriel Horn

Sir Gabriel Horn, a member of The Society from 1963, was one of the outstanding neuroscientists of his generation. He was responsible for numerous advances in neuroscience encompassing diverse areas, but especially concerning neural mechanisms of learning and memory. He was a most gifted teacher, delivering lectures appreciated by generations of students. He will be remembered by many students, friends and colleagues for the generous warmth of his personality.

Growing up in Birmingham, Gabriel left Handsworth Technical School and became an assistant in the family shop at age 15. Through day-release, he obtained the National Certificate in Mechanical Engineering (with distinctions) and, after a period in the Royal Air Force, went to the University of Birmingham to study Medicine, graduating with Honours in 1955. In 1956, he became a Demonstrator in Anatomy at Cambridge, progressing via a lectureship to a readership. In 1974 he was appointed Chair of Anatomy in Bristol and in 1977 Chair of Zoology in Cambridge, being Head of Zoology from 1979 to 1994. He was Master of Sidney Sussex College from 1992 to 1999 and Deputy Vice-Chancellor of the University of Cambridge from 1994 to 1998. Amongst many distinctions, he was elected a Fellow of the Royal Society in 1986 and awarded its Gold Medal in 2001. He obtained an MD (1965), ScD (1975), and Honorary DScs from the Universities of Birmingham (1999) and Bristol (2003). In 1997 he initiated and became Committee Chair of the Cambridge University Government Policy Programme, promoting to government the importance of scientific research to a knowledge-based economy. In 2002 he was made a Knight Bachelor for his services to neurobiology and the advancement of scientific research.

Gabriel was an internationally recognised leader in the field of brain research in a career spanning over 50 years. His research was marked by both its rigour and originality, often publishing findings and ideas years ahead of the field. He was one of the early researchers who aimed to relate the activity of individual neurons to behaviour. Indeed, the theme of understanding how neuronal activity could explain particular behaviours is common to the many diverse problems that he tackled in a most varied and wide-ranging research career. His publications marked important advances in the fields of sensory interactions, perception, selective attention and memory. Most notably, through meticulous and imaginative research, Gabriel with his colleagues managed to uncover changes in the biochemistry of the brain that could be unequivocally related to learning. He was then the first to identify an anatomical region in the chick brain that was unambiguously a site of long-term information storage, a place where memories were formed and held. This work involved a synthesis of the results of anatomical, biochemical, physiological, pharmacological and psychological experiments. In turn, the findings led to further discoveries of particular biochemical and anatomical changes related to how learning altered neuronal connections and how the activity of nerve cells at the storage site changed during learning. Besides numerous papers he wrote the book, *Memory, Imprinting and the Brain* (1985), was joint editor of *Short-term Changes in Neural Activity and Behaviour* (1970) and *Behavioural and Neural Aspects of Learning and Memory* (1991), and authored reports on the *Origin of Bovine Spongiform Encephalopathy* (2001) and *Brain Science, Addiction and Drugs* (2008).

Gabriel is survived by his wife Priscilla and two sons and two daughters of his previous marriage to Ann Soper.

Malcolm Brown

Stephen O'Neill

1963–2012

Stephen O'Neill

Stephen O'Neill was born in Paisley, Scotland and was the first member of his family to go to university. He attended Glasgow University where he studied Physiology as an undergraduate before doing a PhD on the heterogeneity of sympathetic innervation in the heart with Neil Spurway. He then moved as a postdoc to University College London where he worked in David Eisner's laboratory.

Stephen made some of the first ever measurements of changes of intracellular calcium and pH during metabolic inhibition in the heart. One of his most influential studies showed that increasing the opening of the cardiac sarcoplasmic reticulum (SR) Ca release channel had no maintained effect on cardiac contractility. This paved the way for the concept that modifying release of calcium from the SR is *not* an inotropically useful target. Stephen then moved to a lectureship in Liverpool before transferring to Manchester University as Senior Lecturer in 1999. During this time he developed a major interest in the cellular mechanisms underlying the protective effects of fish oils on the heart. In particular, he identified the involvement of actions on the ryanodine receptor. Stephen's experimental approach often featured technically difficult experiments on single heart cells with rapid solution changes while measuring cell length, fluorescence and/or membrane potential. He remained personally involved in experiments throughout his career, teaching his students and colleagues by example.

Joining The Physiological Society in 1990, Stephen was one of the first convenors of the Cardiac Special Interest Group and regularly contributed to and attended meetings. Collaborators near and far-afield benefited from his enquiring mind and ever-willing practical help. His expertise in cardiac muscle Ca^{2+} dynamics, on which topic he published over 50 papers, was easily transferred to making several notable collaborative contributions to the understanding of smooth muscle Ca^{2+} signalling.

Stephen enjoyed playing and following football, he was a devoted fan of St Mirren FC, as well as exploring the outdoors and travelling widely. Trips to New Zealand and Chile to attend Physiological Society meetings were combined with vacations exploring wonderful landscapes and climbing mountains. He developed a great affinity for South America, working in both Chile and Venezuela, and became fluent in Spanish. His most permanent liaison with South America came when he met Mary Diaz with whom he studied the mechanisms of Ca^{2+} waves in the heart. Their scientific relationship developed into a deep love, marriage and the birth of their son, little Stephen.

Anyone privileged to know Stephen was struck by his combination of human decency and intelligence. He was one of the least prejudiced people we knew and always took one on their individual merits. He had many national and international PhD students and postdocs all of whom benefited greatly from his care and advice. No matter whether it was specific advice on an intricate experiment that was required or alternatively general pastoral guidance, he was always generous with his time.

Stephen was diagnosed with a brain tumour six years ago. Throughout the ensuing surgery, radio- and chemotherapy he maintained a positive attitude and continued working and publishing until a matter of weeks before his death (aged 49). Stephen's impact on those who met him can be gauged by the deep sadness felt on his early death. We are left with warm and lasting memories of an excellent physiologist and loyal friend.

David Eisner

Godfrey Smith

Michael Taggart

The Society also regrets to announce the death of:

William F Dryden

Bill worked in the Department of Pharmacology at the University of Alberta and was a founding member of the Division of Neuroscience. He was a long-time Member of The Society and is remembered as a true renaissance man and mentor.

Journal updates

New publishing contract

The Society has signed a new contract with Wiley-Blackwell for publication of *The Journal of Physiology* and *Experimental Physiology*. The new contract will come into effect at the end of the current contract in January 2014 and will provide The Society with financial stability for the next five years, a more joined up, forward-looking approach to developing and marketing the journals, and Wiley Blackwell's support for a number of other Society activities.

The publications office is moving

The publications office is breaking camp this winter when the team is moving from its old Cambridge base to London to join up with other Society teams in the new Hodgkin Huxley House. It is both the end of an era and the beginning of an exciting new one, allowing closer collaboration between Society functions.

The Journal of Physiology

Staff changes


Carol Huxley

The Physiological Society is saying farewell to Carol Huxley who retired on 12 November 2012. Carol is retiring after 25 years working on *The Journal of Physiology*. She has been a source of calm inspiration to staff and editors alike.

Current Editor-in-Chief, David Paterson, said: "Carol has been a fantastic Managing Editor for both journals. First during my time as Editor-in-Chief of *Experimental Physiology* and more recently in the same role with *The Journal of Physiology*. She has been instrumental in the evolution of both journals. I have valued her calm approach when the water becomes choppy, and her hard work and dedication in embracing new ideas and making things happen! I will certainly miss her."


Sally Howells

Carol handed over her duties to Emma Ward, Managing Editor EP, and Sally Howells, Deputy Managing Editor JP. Sally joined The Society in October 2012.

Sadly, The Society is also losing two other long-serving members of staff: Jill Berriman and Lynn Jeppesen.

Jill has been both Production Editor and Managing Editor during her 21 years with The Society. Jill became the first Managing Editor in 1995 and oversaw the introduction of online publishing and submission. She also oversaw the transfer of the publishing contract to Blackwell in 2003, after 125 years with Cambridge University Press. She retired from the post in 2004 when she relocated to New York, but returned to work for The Society later that year across our journals, the *Proceedings of the Physiological Society* and *Physiology News*.

Lynn Jeppesen has worked as Production Editor on The Journals for 24 years. Among other special projects, Lynn has overseen the introduction of *The Journal of Physiology* Faculty of 1000 Evaluations and Century Citation Club pages, aimed at helping readers identify useful content, and has project managed the production of the recent Statistical Reporting series in the journals.

Experimental Physiology

Online only in 2013

We are excited to announce that, from January 2013, *Experimental Physiology* will become an online-only publication — discontinuing the print versions in favour of a totally digital format and the opportunity for constantly evolving enhancements.

For some time now we have been watching the evolution of internet publishing and the effect on our readership. Unlike *The Journal of Physiology*, where demand for print is still strong, EP's readers have steadily moved away from print. Online publishing now offers related information and services that help put papers in context and take their place in the cannon of research – by comparison, print offers only the essential article.

In addition to all the existing online features that we all now take for granted – searching, content alerts, supplemental material, social bookmarking, citation management, and so on – we will be introducing the following new features.

Readers accessing the journal on their phones or tablets will automatically open a 'mobile optimised' version and an app for iPad users will be available for download in early in 2013.

Summaries of new findings will appear when readers 'hover' over research papers in the table of contents and readers will be able to comment on editorials and review articles.

For further details see the Editorial in the January 2013 issue of *Experimental Physiology*

Society of Biology launches new HE resources

This summer, the Society of Biology received funding from the Higher Education Academy and JISC – through their Open Education Resources (OER) Programme – to work with our Special Interest Group, the Heads of University Biosciences (HUBs), to identify, collect and promote educational resources to the bioscience community.

Although some OER are located in specific sites, such as the UK's national repository for OER, Jorum (**www.jorum.ac.uk**), many excellent teaching resources are hosted directly on institutions' own websites. Through this project, the Society of Biology are identifying and signposting resources to the teaching community via a new website, **heteaching.societyofbiology.org**, saving time, ensuring access to quality teaching resources, and introducing those who are new to OER.

Feedback from the teaching community has highlighted the huge variety in quality of resources. To address this, The Society of Biology has recruited a panel to peer-review all of the resources we find. The new website focuses on practical biology teaching resources and the site features lab and field protocols, data handling exercises, videos of techniques and multimedia alternatives to wet labs.

If you are creating resources, or know of a great resource that we have missed, then please let the Society know via the website.

Introducing...

Blair Grubb, Chair of the Education and Outreach Committee

The Society is pleased to announce that Blair Grubb, Senior Lecturer and Head of the Department of Cell Physiology and Pharmacology at the University of Leicester, has been elected Chair of our Education and Outreach Committee in July 2012.

Blair told *Physiology News*: "I was delighted to be elected as Chair of the Education and Outreach Committee and have really enjoyed getting to know the Committee Members and the office team in London.

"Louise Robson has done an excellent job as Committee Chair over the last four years and our role is to take that work forward, embracing new challenges as they arise. The Committee has set itself the task of identifying priorities within the Education and Outreach agenda that will become part of The Society's evolving five year strategy.

"We are at an early stage in this process, but there can be little doubt that we need to continue to concentrate on the national debate on the future of secondary education, including the consultations on GCSE and A-level reform, and the newly proposed English Baccalaureate. Other issues that are high on the agenda are reward and recognition for teaching – taking forward the excellent work highlighted in Judy Harris's article last year – and developing a clear strategy for our outreach and public engagement activities."

'We need to continue to concentrate on the national debate on the future of secondary education, including the consultations on GCSE and A-level reform, and the newly proposed English Baccalaureate'

"On behalf of all of our committees and staff, I'd like to send all of our Members seasonal greetings and best wishes for a very successful and exciting year ahead.

We look forward to welcoming you to Hodgkin Huxley House, the new home of The Society, in 2013."

Jonathan Ashmore, President

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