PN
Physiology News

Issue 87 / Summer 2012

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Is this my finger?

Testing our sense of body ownership

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Welcome to the Summer edition of *Physiology News*.

Annual General Meeting 2012

Thursday 5 July 2012 at 2.00pm at the Edinburgh International Conference Centre (EICC) – the Moorfoot Room on Level 0.

Ordinary and Honorary Members have the right to attend and vote at the AGM. Affiliates have the right to attend, but may not vote. Please note that you do not have to register for *Physiology 2012* to attend the AGM. Questions can be submitted in advance online.

A copy of the 2011 Annual Review is enclosed with this issue of *Physiology News*. The full Annual Report and Accounts, which received an unqualified audit opinion, should be consulted for a complete understanding of the financial affairs of The Society. The full accounts, along with the agenda for the 2012 AGM and minutes of last year's meeting, can be downloaded via the link below.

www.physoc.org/agm2012

The Physiological Society

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**

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.

Join now to support your career in physiology:
Visit **www.physoc.org/membership** or call **020 7269 5710**

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Editorial

As my term as President of The Society draws to its end, it is a good moment to reflect on what has been achieved over the last two years.

Mike Spyer

My predecessor, Clive Orchard, drove Council and Executive to develop a strategic plan for The Society and that, with modifications, is what has driven our activities over the subsequent period.

We have had some success in increasing the membership of The Society, and the benefits of membership have been sustained by increasing grant support and by enhancing The Society's meetings, which represent the cornerstone of our activities. The educational and outreach programmes have similarly been given greater support and The Society has endeavoured to communicate with the membership in a more effective way through the use of active surveys and regular newsletter updates.

The academic environment in the UK is certainly not getting any easier, and pressures on both research and teaching are increasing. Accordingly, efforts are being made to engage with Ministers and senior figures in the research councils to foster awareness of the importance of physiological science in the context of commitments to 'life sciences' and 'translational medicine'. In this we are working with cognate learned societies, particularly the Society of Biology and the Academy of Medical Sciences, but are concerned to ensure that we retain a separate and distinctive voice.

These activities require significant resources and The Society is fortunate that at this time it has sufficient funds to meet these challenges. The future is, however, less secure given that income from *The Journal of Physiology* is under threat from the growing clamour for open access publishing (OA) from research councils, the Wellcome Trust, NIH, government, and others. The financial impact of a change to OA is uncertain, but the Publications Task Force that was set up under Jonathan Ashmore's chairmanship is conducting an in-depth review of The Society's publishing activities. We have already reached one conclusion – we need to test the water in regard to OA. In line with our international strategy, we have embarked on much greater collaboration with the American Physiological Society (APS) and have decided to jointly launch a new OA journal in 2013. Full details of its structure, editorial policies and board remain to be defined, but you will be kept in informed of progress through *Physiology News*.

Physiology knows no borders and international collaborations are extensive at an individual and institutional level. In the past The Society has done much to foster physiology in developing countries and we seek to maintain this tradition. Support for attendance at meetings throughout the world is increasing for our Members and The Society is sponsoring sessions at numerous overseas meetings.

Our major task, however, remains IUPS 2013, where we have made a substantial financial commitment, but, even more, the personal commitment of members of the local organising and programme committees. This gives The Society the opportunity to both promote physiology in the UK and assist its development internationally. We have obtained a great level of support from many other societies, including APS, and I am confident that it will be an enormous success. It has, however, revealed the limitations of IUPS as an organisation to promote physiology. The Society recognises the importance of IUPS and its potential for promoting physiological sciences and international collaborations. Accordingly, we are playing a significant role in the debate about the future governance and direction of IUPS.

Over the last year, I have been chairing a Property Workforce, with external advisors as well as trustees, and the CEO. An exciting announcement on this work is in this issue (see p. 6).

This gives a flavour of the work of Executive and Council and the new opportunities that are afforded to The Society. I believe that Jonathan Ashmore has an excellent base from which to take The Society forward as our new President, and he certainly has an enthusiastic and skilled staff to implement The Society's objectives.

The new premises will provide not just office space for the administration of our Society, as before, but also a real home for physiology. Members and partners will visit and become familiar with the new property, and The Society will be stronger for it.

30–32 Farringdon Lane
Clerkenwell
EC1R 3AW

8100 square feet/2468 square metres

Freehold

- Air conditioning
- Raised floors (ground to 4th)
- Passenger lift
- Disabled access
- High ceilings
- Good natural light

Transport: Farringdon rail and underground station

New home for your Society

This month, contracts were exchanged on new premises for The Society in London. This will be the first time in its history that The Society has owned property in which it resides and the move promises significant financial and operational benefits.

The decision has not been taken lightly and is the culmination of over 12 months work by the Property Task Force established by Council in early 2011. This review was required as the lease on our Cambridge office ends in mid-2013 and in London in early 2014. As part of the process, the Task Force and Council considered many things, not least the cost of purchase and on-going cost of office space, but also the ability to support and deliver our charitable objectives and ease of access by public transport.

Using a property profile developed by the Task Force and approved by Council, the property search was initiated in January. After viewing a number of properties that did not fit The Society's requirements, the Task Force proposed the purchase of 30-32 Farringdon Lane to Council in March, which was approved.

The property in Farringdon Lane (presently called 'Priory Court') hits all the key points: it is close to Farringdon Station, which is easily accessible from all mainline rail stations and will also be a Crossrail Hub; we will have a flexible meeting space to host events with around 75 people; and for the first time we will be able to host all our Committee and Council meetings. We will also be able to sub-let at least two floors to like-minded organisations, reducing our net on-going annual office accommodation costs significantly from where they are now.

Over the coming months a design and fit-out operation will be initiated. The hope is to create modern premises that reflect physiology and The Society's history. As part of this we shall be seeking views from Members as we progress with the fit out, including naming of meeting rooms. More will be posted on The Society's website in the coming months.

A move from current offices off Gray's Inn Road (WC1) to the new premises on nearby Farringdon Lane (EC1) is planned for Winter 2012.

"It is very exciting to be taking this step – a massive first for The Society. It speaks volumes for the strength of The Society that we are able to do this now, and it also bodes very well for our future to secure an investment in a London property."

Mike Spyer, Society President

Physiologists of the future quiz MP panel

MPs Pamela Nash, Andrew Miller, Stephen Moseley, Sarah Newton and Gareth Johnson

Early-career scientists had an opportunity to put their questions to the Minister of State for Universities and Science, and the parliamentary Science and Technology Select Committee at *Voice of the Future 2012* in March. Three Affiliate Members attended as representatives of The Physiological Society.

Young scientists and early-career researchers quizzed the Rt Hon David Willetts MP, Minister of State for Universities and Science, Chi Onwurah MP, Shadow Minister for Innovation and Science, and the Science and Technology Select Committee, on matters relating to science and science policy.

The panel were grilled on issues such as career paths in science and funding for higher education.

The event was organised by the Society of Biology as part of National Science and Engineering Week. The participating Affiliate Members were:

- Teresa Kennedy-Lydon
- Hinnah Campwala
- Rima Patel

"It was a fantastic day with young scientists and engineers from all over the country coming together to discuss policies and issues at the heart of research today. I was honoured to be a part of it!"

Hinnah, PhD student, University of East Anglia

Further consultation needed on degree accreditation

Further consultation is needed on accreditation of bioscience degrees with an *in vivo* component following the conclusion of a pilot programme in which no courses were held to have met the standard.

The Society of Biology's programme has already accredited biochemistry degree courses at the universities of Bristol, Birmingham, Liverpool and Sheffield. Further work will now be undertaken on the *in vivo* strand of the programme, and The Physiological Society will provide input into this process as we did in the initial development stage.

As reported in the last issue of *Physiology News* ('Accreditation – will it make a difference without increased funding?', issue 86), there are concerns in the academic community about the criteria and the lack of MBiol courses that can offer the type of practical *in vivo* training required by the scheme.

"There remains a real opportunity to ensure we sustain and enhance physiology and related degrees with an *in vivo* component. However, if this is to be a success, as well as an appropriate accreditation framework, the courses should attract additional funding from government to support this resource-intensive training. It is critical to the UK's global position in life sciences."

Philip Wright, Chief Executive

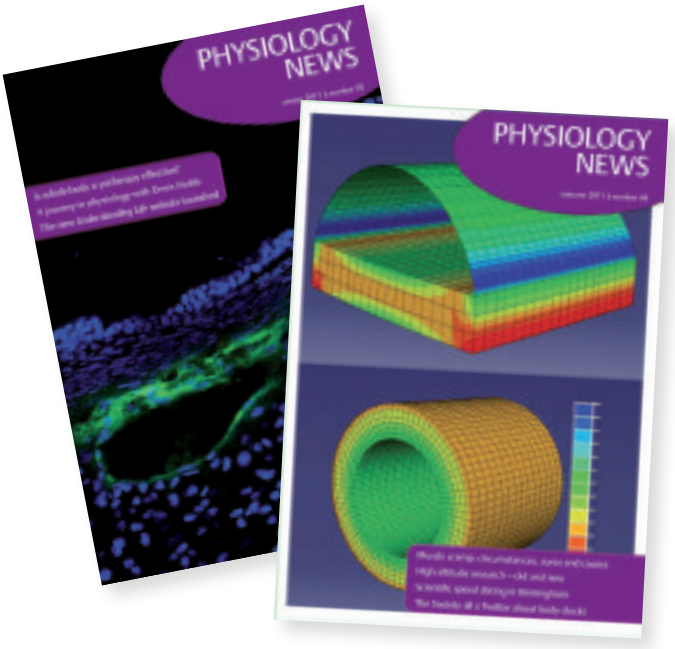
If you would like to contribute your thoughts on the accreditation programme generally, or the criteria for degrees involving an *in vivo* component specifically, please email our Policy Manager, **Michelle Brook**, at **policy@physoc.org**

Physiology News online

We are pleased to announce the launch of a new digital platform for *Physiology News*. From this issue, *Physiology News* will now be online and interactive, with a fully searchable archive dating from 2002.

The digital magazine will support social media integration and offers an optional PDF download for you to use on your iPad or other mobile device.

We hope you enjoy the new online version of *Physiology News* at **www.physoc.org/magazine** and invite you to let us know your thoughts.



Peter Watt and a Modern Pentathlon Challenge participant in Brighton, March 2012

The Modern Pentathlon Challenge

The Modern Pentathlon Challenge (MPC) is our touring activity that brings the physiology of sport to school students and families. Using a Nintendo Wii and an exercise machine, participants can simulate the running and shooting event in the Olympic Modern Pentathlon. Equipment provided by ADInstruments monitors breathing and heart rate. Physiological Society Members are on hand to describe the physiological changes that are happening, and provide further information about how The Society supports education.

Ultimately, we aim to engage with young people and their parents about the relevance of physiology to their everyday lives, and give them an idea of the sorts of careers that could follow a degree in physiological sciences.

This year, we ran the MPC at the national *Big Bang Fair, Norwich Science Day* and the *Brighton Science Festival's* family fun day.

At the *Big Bang Fair* we had over 100 participants in three days and the stand was visited by the *Big Bang* Director and the *Blue Peter* production team.

Special thanks to **Valerie Gladwell** from the University of Essex for devising this activity and running it at the *Big Bang*, **Dan Brown** for leading in Brighton, and **John Winpenny** for his initiative in running the MPC in Norwich without assistance from Society staff.

Valerie is now talking with *Blue Peter* about running a version of the MPC for their event surrounding the Olympic Torch route; Dan will be reprising the Challenge at the Royal College of Surgeons in August; and the Royal Institution have requested that we take part in their sports science-themed family fun day in July.

If any Members wish to run the MPC in their local area, or at the Royal Institution, please contact our Outreach Manager **Louise Crane: outreach@physoc.org**

Last chance to vote: 2012 Council elections

The Society has six vacancies on the Council of Trustees from July 2012 and there are still a few days left to cast your vote for candidates. You can vote online at **www.physoc.org/council-trustees-election-2012**. Voting closes on 27 June 2012.

Trustees are legally responsible for the overall governance, management and policy of The Society, ensuring that the charitable objects for which it was established are met. The Trustees are also the Directors of The Society.

Following a successful call for nominations earlier in the year, eight Members are standing for election.

The candidates, each nominated by five Society Members, are:

- Philip Aaronson
- Blair Grubb
- Judy Harris
- John Lee
- Ken O'Halloran
- Lucia Sivilotti
- David Thwaites
- Richard Vaughan-Jones

For candidate statements visit: www.physoc.org/council-trustees-election-2012

Paton Prize Bursary photographic competition

The Paton Prize fund promotes interest in an historical perspective on physiological research. Following the success of the previous photographic competition, under the auspices of the History & Archives Committee, a £100 prize is offered for the best photograph showing equipment in use or within a laboratory setting.

Suitable photographs should show equipment with modern or historical significance, either by dint of association with renowned experimentalists, or as items that are fascinating technically.

Where relevant, multiple images or a brief movie are acceptable. A photograph that is itself historic would be welcome, but one that shows experimental equipment and its users could be ideal.

The best examples offered, as well as the prize-winning entry, will appear in *Physiology News* and on The Society's website.

An early ECG recording system

Picture credit: the Ministry for Social Policy, Health, the Elderly and Community Care, Malta

Submissions

Please provide a jpg file or equivalent. Where the photograph itself is a venerable object, please arrange for scanning and enter it as an electronic file. Photographs need to be supported by a brief statement to explain the equipment and to highlight its claim to fame.

Address your entry to **Jonathan Goodchild** at **history@physoc.org**

I'm a Scientist: winner's report

Fiona Hatch, of the University of Hull, on her experience with the project

I'm a Scientist (IAS) is a fantastic competition-based event for scientists to communicate with school students across the UK. IAS is divided into zones and in March I took part in the Sports Zone, which was sponsored by The Society.

During the event there are two main ways to communicate with the students:

1: via fast-paced live chat sessions during class time

2: responding to students' questions posted on the IAS website (a more leisurely paced activity).

The live chat sessions were very hectic – kids were asking questions multiple times a minute, which was a lot of fun, but my fingers ached after each session!

Over two weeks, the five scientists in each zone were voted off by the students one by one. I was the last remaining scientist in the Sports Zone, which meant I won £500 to run a science communication project of my own.

Overall it was one of the best experiences I have ever had. The children were so interested in all aspects of science, with hundreds of questions that I have never thought of. This helped me understand the students' thirst for knowledge and made me want to continue with further science communication projects within schools. I now appreciate the gap between scientists and the public even better, and I'm so much more motivated to try to close this gap. With my £500 winnings, I hope to teach an interactive biology lesson in a local school, using real sheep's hearts to illustrate coronary heart disease and heart attacks.

I strongly believe it is vital to get children interested in science at an early age, when they are most receptive. The best way to do this is for scientists to directly engage with schools and show children how interesting science can be. IAS was an amazing project that allowed this interaction.

Experimental Physiology

New editors for Experimental Physiology

Mike White, Deputy Editor-in-Chief

Mike White (School of Sport & Exercise Sciences, University of Birmingham, UK) has been appointed as Deputy Editor-in-Chief of *Experimental Physiology*. He takes over from Julian Paton.

Mike has served on the Editorial Board of *Experimental Physiology* since 2006 and has already contributed greatly to its success, in particular through his involvement with the 2010 Winter Games themed issue and the 2012 Biomedical Basis of Elite Performance Meeting and Symposium issue.

Mike is a long-standing advocate of human integrative physiology. His work has covered many aspects of human physiology including thermoregulation, muscle fatigue, disuse and the ageing process, and latterly cardiovascular and respiratory control mechanisms during exercise in health and disease.

He was elected a Member of The Physiological Society in 1991, elected a member of its Council and a Trustee in 2009, and now is a member of the Meetings Committee. He is also a member of the American Physiological Society, American College of Sports Medicine and the British Society for Heart Failure.

Mike is firmly of the opinion that the scope of *Experimental Physiology*, with its orientation towards translation and integration, places it in a unique position to attract and publish the highest-quality work from around the globe.

Benedito Machado

Benedito Machado is Professor at the Department of Physiology, School of Medicine of Ribeirão Preto, University of São Paulo, Brazil.

He obtained his PhD in Physiology from the University of São Paulo (1984) and his postdoctoral studies at the University of Iowa (1988), USA, on the central neural control of cardiovascular function.

Most of his studies have been related to the neurotransmission of the peripheral chemoreflex afferents in the nucleus tractus solitarii of awake rats and, more recently, his laboratory is deeply involved in studies on the central mechanisms underlying sympathetic overactivity and, consequently, hypertension observed in rats submitted to chronic intermittent hypoxia. In this context, he is exploring possible changes in the synaptic transmission at different levels of the neural pathways in charge of generation of sympathetic and respiratory responses to acute and chronic chemoreflex activation.

> "By hearing explicit accounts of contradictory viewpoints, the listener gains a better understanding of the source of a controversy. This is a powerful and often entertaining method."
>
> Jerry Dempsey, CrossTalk Editor

The Journal of Physiology

Introducing CrossTalk

David Paterson
Carol Huxley

The *Journal of Physiology* is introducing short editorial articles debating controversial topics in physiology – CrossTalk.

Jerry Dempsey, the CrossTalk Editor, explains the thinking behind this new article series: "By hearing explicit accounts of contradictory viewpoints, the listener gains a better understanding of the source of a controversy. This dialectic process, whereby a thesis is advanced, then opposed by an antithesis, and subsequently arriving at a synthesis, is a powerful, and often entertaining, method for gaining knowledge and for understanding the source of the controversy."

The first CrossTalk explores the links between sympathetic activity, sleep apnoea and cardiovascular disease. Malcolm Kohler of the Sleep Disorders Centre at the University of Zurich and John Stradling of the Oxford Centre for Respiratory Medicine, Churchill Hospital, Oxford, propose that most of the cardiovascular consequences of obstructive sleep apnoea (OSA) are due to increased sympathetic activity. Opposing this view, Lena and Peretz Lavie of The Lloyd Rigler Sleep Apnea Research Laboratory at the Technion-Israel Institute of Technology in Haifa argue that ROS/oxidative stress is the initiator of and therefore mainly responsible for the cardiovascular morbidities. The authors independently explain their theses and were then invited to provide a rebuttal to the opposing view, engaging in the dialectic process that Jerry envisages and providing readers with an overview of current thinking on the question.

Jerry also sees the new series as an opportunity to engage readers in the discussion. We therefore provide a comment link beside each article on *The Journal*'s Highwire site. Readers are encouraged to contribute their thoughts to advance the debate, which will be subject to editorial oversight. Comments that contribute significantly to the debate will be published online only, as an addendum to the relevant article.

If you would like to suggest new topics for debate, contact **Jerry** at **jdempsey@wisc.edu**, suggesting both the controversial topic and suitable authors to lead the debate.

To see the CrossTalk articles go to:

jp.physoc.org/cgi/collection/crosstalk

Importing the EU Directive on animal research

The time is fast approaching; by November 2012 countries across the European Union will have to have new legislation in place relating to the use of animals in scientific research. In the UK this legislation will replace or update Animals (Scientific Procedures) Act 1986, and any changes may impact a significant proportion of The Physiological Society membership.

As the Government moves towards transposing EU Directive 2010/63 into UK law, The Society has been engaging with major stakeholders in the UK. This piece of European legislation will form the basis of the laws which will subsequently be adopted in EU Member States; stipulating, for example, cage sizes and restrictions on the use of certain animal species.

Last autumn, the Home Office ran a public consultation on the transposition of Directive 2010/63/EU, asking for insight and evidence as to how the UK should transpose individual articles. The Physiological Society submitted a response to this, additionally providing input into, and subsequently supporting, the response from the UK Bioscience Coalition (UKBSC[1]).

On 17 May 2012, the Home Office finally released their response. The Physiological Society has welcomed what we perceive as the Government's generally balanced approach.

There were no great surprises to those who have been working closely on the transposition of the Directive. Many of the proposals had been mentioned in previous discussions held between the Home Office and the bioscience community.

One such open discussion took place on 27 April at the 'Time for Change' event, jointly run by The Physiological Society, the British Pharmacological Society and Understanding Animal Research. Judy MacArthur Clark, Head of the Animals in Science Regulation Unit at the Home Office, gave the keynote speech, and indicated the likely direction that would be taken on many of the issues.

The Home Office plans to 'transpose' the Directive wording largely unchanged. However, the UK has in place various specifications and processes that are considered 'superior' to those determined in the Directive. Article 2 of the Directive permits Member States to keep such conditions if they wish, and so there has been much discussion over the extent to which the UK should do this, rather than go for maximum 'harmonisation' with other Member States. The UK Government has now determined that in terms of animal cages, all current 'higher' specifications will be retained. Where the Directive specifies larger cage requirements, those terms will need to be implemented by 2017, allowing some time to adjust.

In broad terms, the UK will see far fewer changes than will other Member States. However, the Directive will materially change some areas. Probably of greatest impact will be tighter rules on training, though the details (of this and also of confidentiality aspects) will not be sorted until 2013.

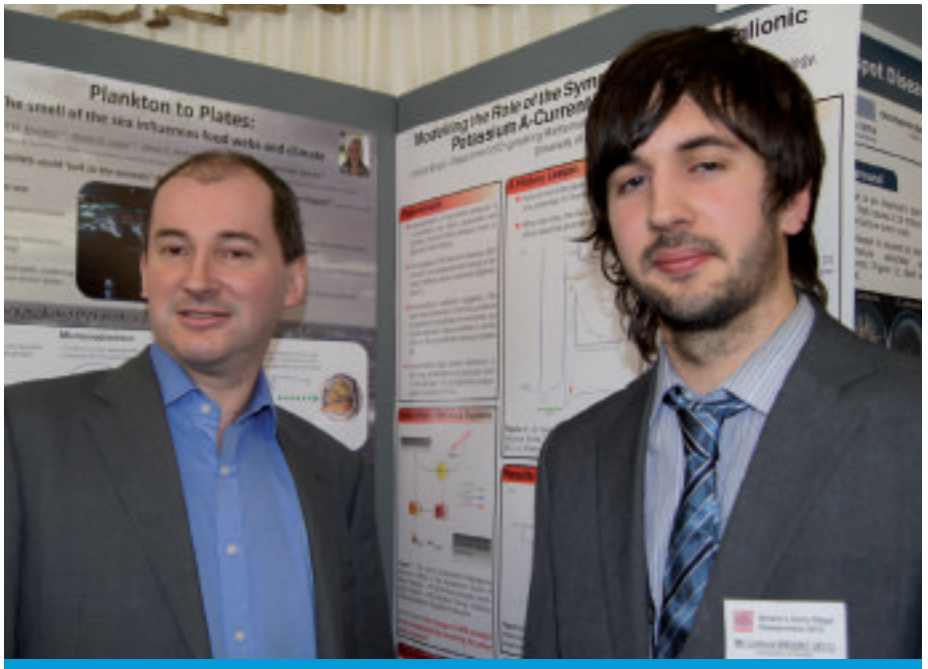
In some areas there is still space for discussion with the Home Office. The UKBSC will certainly be pushing on some aspects, including minimising red tape over personal and project licenses, and pushing for further clarification on a number of grey areas. Over the next few months, we will be continuing to work with these organisations and the relevant government bodies to reach resolution where possible.

It is thought the proposed UK legislation will be laid in front of Parliament in July 2012, before a yes–no vote in both Houses in the autumn. Once the timescale is announced, The Society will be calling on our Members to write to their Members of Parliament, and to the Lords, asking them to support the legislation as it stands and not require additional restrictions through associated documents such as the Codes of Practice or Home Office Guidance.

For further information on the EU Directive itself or the proposals being made by the UK Government, please contact the Policy Manager on **policy@physoc.org**.

[1] The UK Bioscience Sector Coalition comprises the UK's key bioscience organisations involved with the use of animals in scientific and medical research, and represents the perspectives of academia, industry, small and medium enterprises, charities and other research funders, as well as patient and medical groups.

SET for BRITAIN



Stephen Williams MP and Linford Briant

Two Members of The Physiological Society were amongst 54 early-career researchers chosen to present their work in the highly competitive biological and biomedical session at the annual SET for BRITAIN poster competition on 12 March 2012. The Society was a major sponsor of this event.

Linford Briant, of Bristol University, and Anastasia Chalkidou, from King's College London, were selected from over 170 applicants to take part in the prestigious event at the House of Commons. The day was divided into three sessions: biomedical and biological sciences, engineering, and physical sciences. Following a two-hour poster exhibition, with entrants presenting and explaining their posters to an esteemed judging panel, politicians, and representatives from the House of Lords, each session ended with a reception and prize-giving ceremony.

Bronze, Silver and Gold awards for £1000, £2000 and £3000 respectively were presented to the three entrants in each session who were deemed to have best met the criteria, including clarity of both written and oral communication (with the parliamentary audience in mind) and quality of the work being presented. This year's overall winner, chosen from the three Gold Winners, was Nicolas Love of Manchester University with a poster entitled 'Hydrogen peroxide as a novel and necessary regulator of appendage regeneration'.

The biological and biomedical session showcased a wide range of research – from carbon emissions to the creation of nanotools. Although neither of our Members were amongst the prize-winners, physiology was well represented.

The event was well attended by members of both the House of Commons and Lords, including the Rt Hon Frances Maude.

Andrew Miller MP, Chair of the Parliamentary and Scientific Committee which helps run the event in collaboration with various learned societies, including The Physiological Society, was also present for most of the day.

"This year's SET for BRITAIN was a fascinating event, showcasing some of the best work from the UK's early-career researchers. It's a privilege to be involved in bringing the strength of the research in the UK to the attention of my fellow parliamentarians."

Andrew Miller MP, Chair of the Parliamentary and Scientific Committee

Linford Briant on his experience at SET for BRITAIN

The hammer chimed midday on Big Ben outside the Houses of Parliament. Time to go in. Time to properly don my tie and struggle with the top button of my shirt. It was a gorgeous day in mid-March and I was about to enter the Palace of Westminster in order to present my research to MPs and peers!

After being warmly received in an ornate meeting room, we were lead through the Westminster Hall to the terrace marquee where we set up our posters. In front of me was some very interesting research, both directly related to my field and in other biological and biomedical fields. There was some fascinating physiological research, including work on hypertension and craniofacial development, to name just a few of the subjects represented. By the time I'd done the rounds and talked to a number of people, I realised that my local MP, Dawn Primarolo, was waiting by my poster!

I was pleasantly surprised by how animated and enthusiastic the MPs were towards my research and my background. I had prepared a lay explanation, but it wasn't good enough – they all wanted more and were asking all the shrewd questions I should have asked my supervisor in the first few weeks of my project!

The winning posters were, as expected, of an excellent calibre, displaying great research. SET for BRITAIN was an excellent opportunity for me to present my work and experience public engagement at one of the key interfaces between scientific research and the public. I left with a couple of people I'd met to enjoy some food somewhere in Westminster, and am hoping to come again next year.

SET for BRITAIN aims to help politicians understand more about the UK's science and engineering research base, and increase interaction between parliamentarians and early career researchers.

Chinese conference invitations: spam, scam, sham or con?

David Furness

School of Life Sciences, Keele University

Carole Hackney

Biomedical Sciences, Western Bank, University of Sheffield

Like us, you have probably received an email invitation to a conference in China. A lot of them seem to originate from a company called BIT Life Sciences, sometimes with a contact email address in a western country, such as Canada. For the most part, we have ignored these invitations, assuming they were spam.

But a particular conference on peptides, to which the organisers invited Carole, did interest us, so we responded to the invitation to speak and asked if David could go as well.

They responded positively and asked us to submit titles and abstracts. We checked out the conference website and it seemed genuine enough – the conference centre in the Olympic village looked inviting and the hotel was right next to it. We wrote back asking what costs would be covered. They were delighted that we wanted to come and they gave us the impression they would probably waive the registration fee – possibly for both of us – and would look into further support.

After some time, we submitted an abstract. They replied to confirm receipt. A few weeks later we looked at the programme online, but our abstract title was not included. By this time, we had booked tickets to fly to Beijing. We wrote back asking about the programme and were told that, as we had not registered (we had assumed we did not need to), it had not been included. Carole then tried to register online, but the cost was around $2500. We contacted them again to ask how to claim their offer of free registration, but they were adamant that we pay the full cost.

On further investigation, we found a number of blogs and an article in *The Scientist*[1] magazine indicating that others thought these conferences were a scam.

We decided to go to China anyway, without registering, and booked the hotel online. However, the night before departure, we contacted the hotel and they had no record of our booking. LastMinute.com saved us and we got a room for £60 per night in a centrally located hotel.

On the day of the conference we went out to the Olympic village and were very impressed by the 'Bird's Nest' stadium and other fantastic architecture. From the outside, the conference centre was also impressive. Inside, it was noisy and chaotic. There appeared to be several conferences on different floors with guides dressed in cuddly-toy costumes. Our conference did exist (we were surprised). Though there was a registration desk, a few trade displays, and at least one room filled to overflowing with delegates, the facilities in no way equated to a $2500 registration fee.

We asked about registration and explained our situation. They would not let us in without paying the day rate of about $900 each. We said we would think about it, wandered about for a bit, and then went off to explore Beijing. It just didn't seem worth going into the conference. Instead we saw the Great Wall, Tiananmen Square and some ancient tombs.

It was a great trip, but the conference – was it a con? Well, you decide...

[1]The article can be accessed at: classic.the-scientist.com/blog/display/56185/

Networking at Kingston University

Mark Carew
Kingston University

Forty physiologists from four universities met at Kingston University (Penrhyn Road Campus) on 11 January for a poster and networking event. The event, organised by myself, as the Society Representative for Kingston, allowed Members and Affiliates of The Society, as well as other scientists interested in physiology (pharmacologists, biochemists etc.), to meet and discuss their work with colleagues from Kingston, Surrey, Reading and St George's, University of London. The Society funded the catering costs of the event, which started with a buffet lunch and a welcome. Colleagues then viewed the posters and spoke with colleagues, old and new, and later I presented the benefits of membership of The Society.

The event was a simple way of getting physiologists in the local area to meet, and find out who was doing what research. Such an event was perfect for an institution like Kingston, with only a few physiologists who can easily become isolated, and need to club together to form a critical mass of interested colleagues. The poster and networking afternoon was a sort of 'meeting-lite' event that solved that problem. There were no formal scientific talks, and the informal atmosphere made it the perfect space for students, lecturers and professors to meet for the first time and discuss physiology. We hope that such networking will open the way to research collaborations and funding proposals. The event was straightforward to organise, and I would like to thank the other Reps (Chris Fry, Gary Stephens and Iain Greenwood) for encouraging their colleagues to attend; indeed, many more promised to come next time.

Colleagues are very interested in further events of this type, and there are plans to repeat the event at Reading and Surrey in the coming year. Kingston, Reading and Surrey will also club together to apply for the Departmental Seminar Scheme, now that the networking event has shown that there are sufficient physiologists at these three institutions. Anyone who wishes to arrange a similar event should contact Louise Crane, the Society Outreach manager at **outreach@physoc.org**

Kingston and Surrey reps: Chris Fry (left) and Mark Carew (right).

Edinburgh International Conference Centre, venue for this year's Main Meeting

2012
Forthcoming events

12–13 Jul
60 Years of Hodgkin and Huxley. Trinity College, Cambridge, UK
www.cnsorg.org

13–17 Aug
8th World Congress on Active Ageing. Scottish Exhibition and Conference Centre, UK
www.wcaa2012.com

24 Aug
Young Life Scientist's Symposium 2012. Cardiff, UK
www.therapeutics2012.com

Physiology 2012

2–5 July 2012, Edinburgh, UK

A year has passed since our record-breaking Main Meeting – over 1200 international physiologists joined us in Oxford, July 2011. This year we expect to set a new record, as we take our annual meeting to Edinburgh, Scotland.

There are 21 scheduled symposia to choose from, as well as 109 oral communications and some 365 posters.

As usual, *Physiology 2012* offers a stellar line-up of plenary lectures, including:

- Jere Mitchell
- Cori Bargmann
- Peter Ratcliffe
- Gareth Leng
- Eugene Lloyd
- Diane Lipscombe

For last-minute registration, or for the latest programme information visit:
www.physoc.org/p12/physiology-2012

The Welcome Reception will take place at The Hub, while the conference dinner and disco will be hosted by Our Dynamic Earth. A few surprises are in store for participants who have signed up to attend either or both of these social events.

There will be our traditional Young Physiologists' Symposium focusing on integrative physiology on Monday 2 July, followed by an early-career social at the Edinburgh International Conference Centre that evening. In addition we will have a special lunchtime seminar for participants who wish to learn more about engaging with public audiences and, for the first time ever, undergraduates will be presenting posters for the inaugural Rob Clarke Undergraduate Abstract Award.

Finally, watch out for Camp Physiology – a free crèche service, operated by qualified carers for delegates with childcare needs. Spaces are limited and will be offered on a first-come, first-served basis.

Inside The Hub on Edinburgh's Royal Mile

"I'm not sure why they chose me, but it's obviously a massive honour! I feel quite nervous because my work is in comparative physiology, which is, I think, a bit unusual these days. It's lovely that The Physiological Society is recognising someone in this field."

Holly Shiels, who will be delivering the GSK Prize Lecture

FEPS Congress

8–11 September 2012, Santiago de Compostela, Spain

To register, and for further details, please visit: www.feps2012.org

The beautiful and historic city of Santiago de Compostela, declared a World Heritage City by UNESCO in 1985 and the destination of Christianity's greatest pilgrimage from the 11th to the 18th century, will be the location of this year's annual FEPS meeting. The meeting is being hosted by the Spanish Physiological Society and will take place within the School of Medicine of the University of Santiago de Compostela. A superb line-up of plenary speakers and symposia has been scheduled, including the FEPS Young Investigator Symposium, taking place on 8 September, with guest speakers Daniela Cota and Matthias Tschöp.

Confirmed Plenary lecturers include:

- Rafael Yuste: Dendritic spines and distributed circuits
- Suzanne Dickson: The neurobiology of food intake and food addiction
- Joey P Granger: Pathophysiology of hypertension in preeclampsia – a lesson in interactive physiology
- Ramón Latorre: Spying the molecular workings of ion channels using fluorescence
- Frances Ashcroft: ATP-sensitive K channels, from molecule to disease

Other topics to be covered include:

- Cardiovascular, respiratory and autonomic control
- Skeletal, cardiac, and smooth muscle physiology
- Cellular and molecular physiology: Ion channels, signalling pathways and regulation of gene expression
- Transport physiology: Secretion and absorption, epithelial and membrane transport
- Stem cells
- Microvascular and endothelial physiology
- Endocrinology, neuroimmunoendocrinology and metabolism
- Neurophysiology – cellular and integrative, containing the following aspects: Cellular neurophysiology; sensory functions
- Human physiology and pathophysiology
- Placental and perinatal physiology
- Teaching in physiology
- Aviation, spaceflight, and diving physiology
- Integrative physiology.

The Society is also proud to sponsor two symposia at this meeting:

- Calcium activated Cl^- channels in health and disease (organised by Deborah Baines and Bonnie Blazer-Yost)
- Molecular physiology of ageing and longevity (organised by Jose Vina and Giovanni Mann)

Metabolism & Endocrinology themed meeting

11–13 December 2012, London, UK

This event is in partnership with the Academy of Medical Sciences and will feature a focused symposium entitled 'Brown adipose tissue: a new human organ?'

This event, held in the headquarters of the Royal Society, is being organised by Toni Vidal-Puig (Cambridge, UK), Michael Symonds (Nottingham, UK) and Jan Nedergaard (Stockholm University, Sweden).

The Meeting will provide an excellent platform to enable a wide range of clinicians and basic scientists working in diverse inter-related research fields. It will cover the subject from a multi-disciplinary standpoint and will include a focus on endocrinology, development and ageing, appetite and metabolic control, tissue imaging and thermoregulation. Leading international experts working on brown adipose tissue will discuss its role in energy balance and body weight regulation.

Confirmed speakers:

- Jan Nedergaard (Stockholm University, Sweden)
- Michael Symonds (University of Nottingham, UK)
- Patrick Seale (University of Pennsylvania, USA)
- Leslie Kozak (Polish Academy of Sciences, Poland)
- Martin Klingenspor (University of Munich, Germany)
- Francesc Villarroya (University of Barcelona, Spain)
- Antonio Vidal-Puig (University of Cambridge, UK)
- Malcolm Parker (Imperial College London, UK)
- Wouter van Marken Lichtenbelt (Maastricht University, The Netherlands)
- Susanne Klaus (The Institute of Human Nutrition, Germany)
- Jan Kopecky (University of Prague, Czech Republic)
- Joerg Heeren (University of Hamburg, Germany)

For more information: www.physoc.org/me2012

Meeting Notes

Liverpool–Manchester Inter-University Postgraduate Symposium

29 March 2012

Liam Cheeseman

University of Liverpool, PhD student and event organiser

On 29 March, the first Liverpool–Manchester Inter-University Postgraduate Symposium took place at the University of Liverpool. Over 150 students and researchers from both universities attended this one-day symposium which focused on physiology and cell biology.

The event was tailored to the needs of postgraduates. The meeting aimed to offer PhD students a platform to practise their presentation skills in front of peers in an environment less intimidating than a national or international conference.

Ten PhD students were selected to deliver oral presentations, and a further 50 postgraduate students presented their work through a poster exhibition. In addition, two exceptional guest speakers attended: Erik Sahai (London Research Institute), who described cancer cell invasion in complex environments; and Sir Michael Berridge (Babraham Institute, Cambridge), who gave an overview of calcium as a signalling molecule in health and disease. Their presentations described the cutting-edge of research in their fields and outlined the challenges facing the younger generation of scientists.

The symposium was very well received by all attendees, who particularly enjoyed the broad topics of the presentations which remained within the scope of physiology and cell biology.

The prize for best talk was awarded to Alexander Ryan from the University of Manchester. The prize for best poster was awarded to Hayley Dingsdale from the University of Liverpool.

We are very grateful for the financial support of our sponsors, including The Physiological Society, without which this meeting could not have taken place.

Meeting Notes

The Biomedical Basis of Elite Performance

19–21 March 2012, London, UK

Carolyn Greig

Human and Exercise theme lead and member of the Scientific Programme Committee

Paul Greenhaff

Chair of the Scientific Programme Committee

Elite performance is on many agendas this year and to mark the London 2012 Olympic Games, this joint meeting of The Physiological Society, the British Pharmacological Society and Wiley-Blackwell was held to showcase the most recent and internationally excellent research into the biomedical basis of elite performance.

The three-day meeting was conceived nearly three years ago, organised by a scientific programme committee chaired by Paul Greenhaff (University of Nottingham, UK) and sponsored by the Biotechnology and Biological Sciences Research Council, Medical Research Council with generous support from the Gatorade Sports Science Institute. Internationally recognised speakers were invited to present their research on cardiac, respiratory and vascular aspects of performance, drugs in sport, neuromuscular function/phenotype and regulation of muscle mass, exercise metabolism, thermoregulation, genomics, and sport and exercise medicine.

More than 500 people attended the meeting, contributing to 16 oral communications and 107 poster presentations (winners were Katharina Tilgner – oral communication, and Thomas Wuthrich – poster).

Each day concluded with a plenary session. These were delivered by Frank Booth (University of Missouri, USA), Scott Drawer (UK Sport) and Bengt Saltin (University of Copenhagen, Denmark), who brought the meeting to a fitting conclusion with his lecture on a lifetime contribution to the understanding of the elite athlete.

The meeting also featured The Physiological Society's Bayliss–Starling Prize lecture by Jerome Dempsey (University of Wisconsin-Madison, USA). Selected speaker manuscripts have been published in *The Journal of Physiology, Experimental Physiology, British Journal of Pharmacology* and the *Scandinavian Journal of Medicine and Science in Sports*, and were made available to all attendees (along with abstracts) at registration.

Another highlight was the Schools competition, *The Science of Sport: How to win Gold*. The standard of all posters and demonstrations was exceptionally high; the winner was Three Directions from Northgate High School. Perhaps some of the students who presented their work so enthusiastically will be seen again at future scientific meetings!

The Queen Elizabeth II Conference Centre was an excellent venue. Feedback from participants has been very encouraging: the success of this new meeting format perhaps sets the tone for future scientific meetings – larger-scale, jointly organised and with commercial sponsorship.

BBEP organiser Paul Greenhaff addresses delegates

The San Diego Convention Center

Meeting Notes

Experimental Biology 2012

21–25 April 2012

Nick Boross-Toby

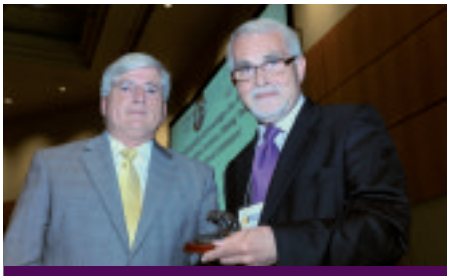
Physiological Society Director, Events and Marketing

Brilliantly sunny San Diego, fish tacos and *Arrogant B*****d* ale greeted Members of the Executive Committee and staff who travelled to this year's Experimental Biology (EB) for high-level meetings with our American Physiological Society (APS) counterparts.

This year marked the 125th anniversary of the founding of the APS, which has grown over that time from 28 members to more than 11,000. The local mayor proclaimed the 21 April to be 'American Physiological Society Day' throughout San Diego County. Our Society's President, Mike Spyer, presented APS President, Joey Granger, with a Society Dog, inscribed '*In celebration of the 125th anniversary of the American Physiological Society and our continuing partnership. From the Council and Members of The Physiological Society*'. Readers of *The Journal of Physiology* will also have seen the congratulatory editorial written by Kim Barrett and David Paterson (15 April 2012, *J Physiol* 590, 1771–1772).

Our regular attendance at EB, now facilitated by formal guest society status, allowed us to take part in a number of strategic discussions of mutual benefit to our two societies. From a joint meeting of executive committees, to attendance at the programme, policy, publication, ethics and education committees, a number of continuing strategic priorities and activities were reported on and a number of new areas were identified to explore in the future. In addition, The Society, as an exhibitor, took the opportunity to meet with a couple of hundred scientists to showcase our journals, Member benefits, forthcoming events and the first of our *Journal of Physiology* Consulting Editor videos.

The Society will once again be a guest society at EB2013 in Boston. Members are reminded that they will benefit from APS member rates when they register. See you there next year for Red Sox, clam chowder and Samuel Adams!



Presenting The Society Dog: President Mike Spyer (right) with APS counterpart, Joey Granger

"I am grateful indeed to my counterpart Martin Frank and to the entire APS executive and council for their very kind invitation to join them on the occasion of their 125th anniversary celebrations in San Diego. There is simply no substitute for these kinds of regular, face-to-face collaborations and, as a result of this visit, both Societies have discussed and agreed a number of very exciting initiatives which we hope will take more concrete form over the coming months."

Philip Wright, Chief Executive

Brain glycogen decrease and central fatigue during prolonged exercise

Hard physical exertion impacts not only on the body but also on the mind. The metabolic changes in neurons reveal, as in muscle, that glycogen plays a crucial role.

Takashi Matsui
Hideaki Soya

Laboratory of Exercise Biochemistry and Neuroendocrinology, Institute of Health and Sport Sciences, University of Tsukuba, Japan

Prolonged exercise can induce central fatigue, the mechanisms of which have yet to be elucidated. The definition of fatigue is a 'failure to maintain the required or expected force' or 'a reduction in muscle force and/or power-generating capacity', and should be acknowledged as a complex phenomenon influenced by both peripheral and central factors (Nybo & Secher, 2004). It is well known that depletion of skeletal muscle glycogen contributes to peripheral fatigue during exercise. The brain also has glycogen, stored in astrocytes, which is an energy source for neurons. The hypothesis that brain glycogen is used during exercise has remained untested until now.

Energy sources for the brain: astrocyte–neuron lactate shuttle

The astrocyte–neuron lactate shuttle hypothesis posits that lactate released from astrocytes into the extracellular space is metabolized by neurons (Oz *et al.* 2009). Until recently, only blood-borne glucose was considered an energy source for the brain. However, current studies have shown that when there is neuronal activation, lactate is released from astrocytes and the neurons consume it predominantly for energy. Furthermore, culture experiments have shown that glycogen localized in astrocytes is degraded into lactate by excitatory neurotransmitters such as noradrenaline and serotonin, and can contribute to the release of lactate from astrocytes to neurons through aerobic glycolysis (Brown, 2004).

Brain glycogen assays

Not so long ago, it was believed that the brain glycogen levels were so low that they could not play a significant role in cerebral metabolism during some physiological stimulations including exercise. Further, there are technical difficulties involved in determining the post-mortem brain glycogen levels in animal tests because brain glycogen is metabolized rapidly following death. The current optimal method is to snap-inactivate glycogen-metabolizing enzymes using high-power (10 kW) microwave irradiation (MI) (Kong *et al.* 2002; Matsui *et al.* 2011). Here, MI enabled us to inhibit glycogen metabolism after animal death by elevating brain temperature to approximately 90°C within 1 s, which allowed us to take accurate measurements of brain glycogen levels.

120 min

After 120 min, brain glycogen levels decreased significantly by an average of 34–60% in five discrete brain loci (the cerebellum, 60%; cortex, 48%; hippocampus, 43%; brainstem, 37%; and hypothalamus, 34%) compared with those of pre-exercise levels.

Physiological role of brain glycogen

Animal studies using MI have shown that astrocytic glycogen is degraded into lactate to provide fuel for neurons during hypoglycaemia, sleep deprivation and memory formation (Brown, 2004). Interestingly, neuronal activation in the cortex during hypoglycaemia was prolonged when the basal level of brain glycogen was elevated (Suh *et al.* 2007). Furthermore, the inhibition of hippocampal glycogen degradation in rats with 1,4-dideoxy-1,4-imino-D-arabinitol (DAB, a glycogen degradation inhibitor), interdicted long-term memory formation (Suzuki *et al.* 2011). Collectively, these results show that astrocytic glycogen is a critical energy source for neurons when the glucose provision from blood is insufficient and when there are sudden increases in energy demands during neuronal activation.

Acknowledgements

This work was supported in part by Grant-in-Aid for Challenging Exploratory Research of the Japan Society for the Promotion of Science (No. 21650166), by Grant-in-Aid for JSPS Fellows (No. 10J00513), by a grant from the Kozuki Foundation for Sports and Education, and by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) for the Body and Mind Integrated Sports Sciences (BAMIS) Project (2010). Takashi Matsui is a Research Fellow of JSPS.

Brain glycogen decreases during prolonged exercise

Exercise increases the brain's energy demands through neuronal activation, and prolonged exercise induces hypoglycaemia, leading us to postulate that brain glycogen decreases during exercise. To test this hypothesis, we exercised male Wistar rats on a treadmill for different durations (30–120 min) at moderate intensity (20 m min^{-1}) and measured their brain glycogen levels using MI (Fig. 1*A*). At the end of 30 and 60 min of running, blood glucose levels did not decrease compared with those of pre-exercise, but at the end of 120 min, blood glucose was 46% lower than pre-exercise levels (Fig. 1*B*). After 30 and 60 min, brain glycogen levels remained unchanged from resting levels, but liver and muscle glycogen decreased (Fig. 1*C* and *D*). After 120 min, brain glycogen levels decreased significantly by an average of 34–60% in five discrete brain loci (the cerebellum, 60%; cortex, 48%; hippocampus, 43%; brainstem, 37%; and hypothalamus, 34%) compared with those of pre-exercise levels (Fig. 2*A*). Figure 2*B* shows image data of brain glycogen staining, and we can see that glycogen decreases especially in the cortex, hippocampus, cerebellum and brainstem. The brain glycogen levels after running in all five regions were significantly correlated with the respective blood glucose (positive) and with brain lactate levels (negative) (data not shown). Further, in the cortex, the levels of metabolites of noradrenaline (methoxyhydroxyphenylglycol; MHPG) and serotonin (5-hydroxyindoleacetic acid; 5-HIAA), which are potentially involved in the degradation of brain glycogen, increased during prolonged exercise and negatively correlated with glycogen levels (data not shown). This supports the hypothesis that brain glycogen decreases with prolonged exhaustive exercise, and suggests that increased noradrenaline and serotonin together with hypoglycaemia are associated with glycolysis in the brain (Matsui *et al.* 2011).

Brain glycogen decrease and central fatigue

Brain glycogen decrease may be an integrative factor of central fatigue during prolonged exercise. Until now, hypoglycaemia with muscular and liver glycogen depletion, an increase in brain serotonin (serotonin hypothesis) and a high brain temperature (hot brain) have been recognized as factors inducing central fatigue during prolonged exercise (Newsholme *et al.* 1992; Nybo & Secher, 2004). These are interesting as complex phenomena under the influence of both peripheral and central factors. On the other hand, hypoglycaemia and serotonin are not only inducing factors of central fatigue but also enhancing factors of astrocytic glycogen degradation. Thus, brain glycogen decreases with prolonged exercise led us to postulate that hypoglycaemia together with brain activation with noradrenaline and/or serotonin metabolism may be involved in the development of decreased brain glycogen, and may shed light on studies examining how brain glycogen metabolism is involved in central fatigue during exercise (Fig. 3) (i.e. understanding how enhancing the effects of brain glycogen storage and availability may delay exercise-induced exhaustion).

In this article, we introduce animal experiment data regarding brain glycogen metabolism and central fatigue during prolonged exercise. A human study using nuclear magnetic resonance (NMR) also showed that brain glycogen only decreases during hypoglycaemia (Oz *et al.* 2009). Thus, it is possible that exercise-induced brain glycogen decrease also occurs in humans. We have also observed that brain glycogen recovers to above pre-exercise levels ('supercompensation') following prolonged exhaustive exercise, as does skeletal muscle glycogen (Matsui *et al.* 2012). It may soon be possible to propose new concepts such as 'brain glycogen loading' to mitigate central fatigue during exercise.

Fig 1.

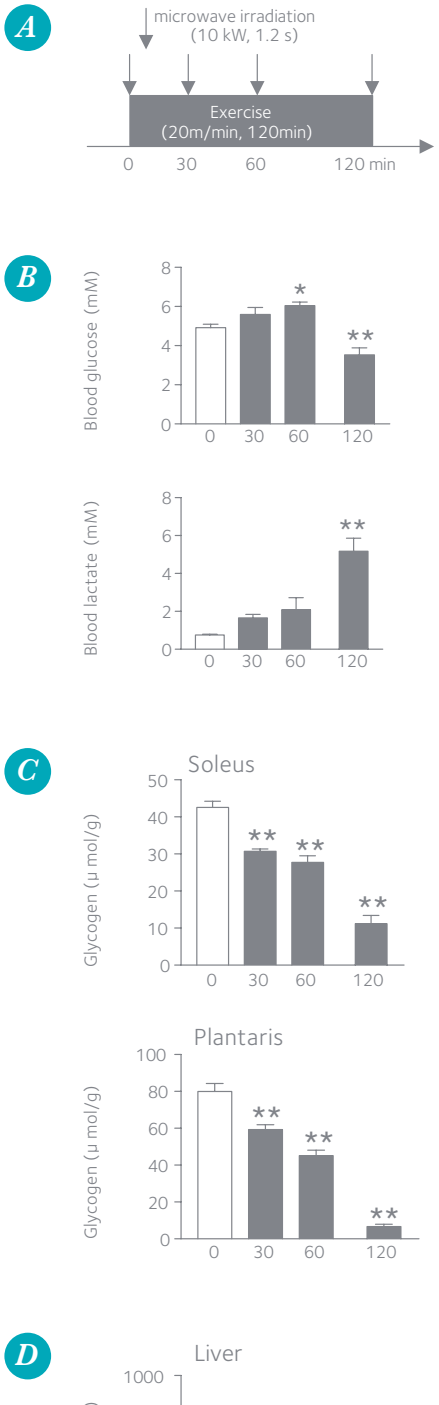


Figure 1. Depletion of glycogen in skeletal muscles and the liver, and hypoglycaemia during prolonged exercise. *A*, experimental procedure. *B*, blood glucose and lactate levels. *C*, glycogen levels in skeletal muscles. *D*, liver glycogen levels. Data represent the mean ± SEM ($n = 5–6$ rats). *$P < 0.05$; **$P < 0.01$ compared with pre-exercised rats (Dunnett's *post hoc* test).

Fig 2.

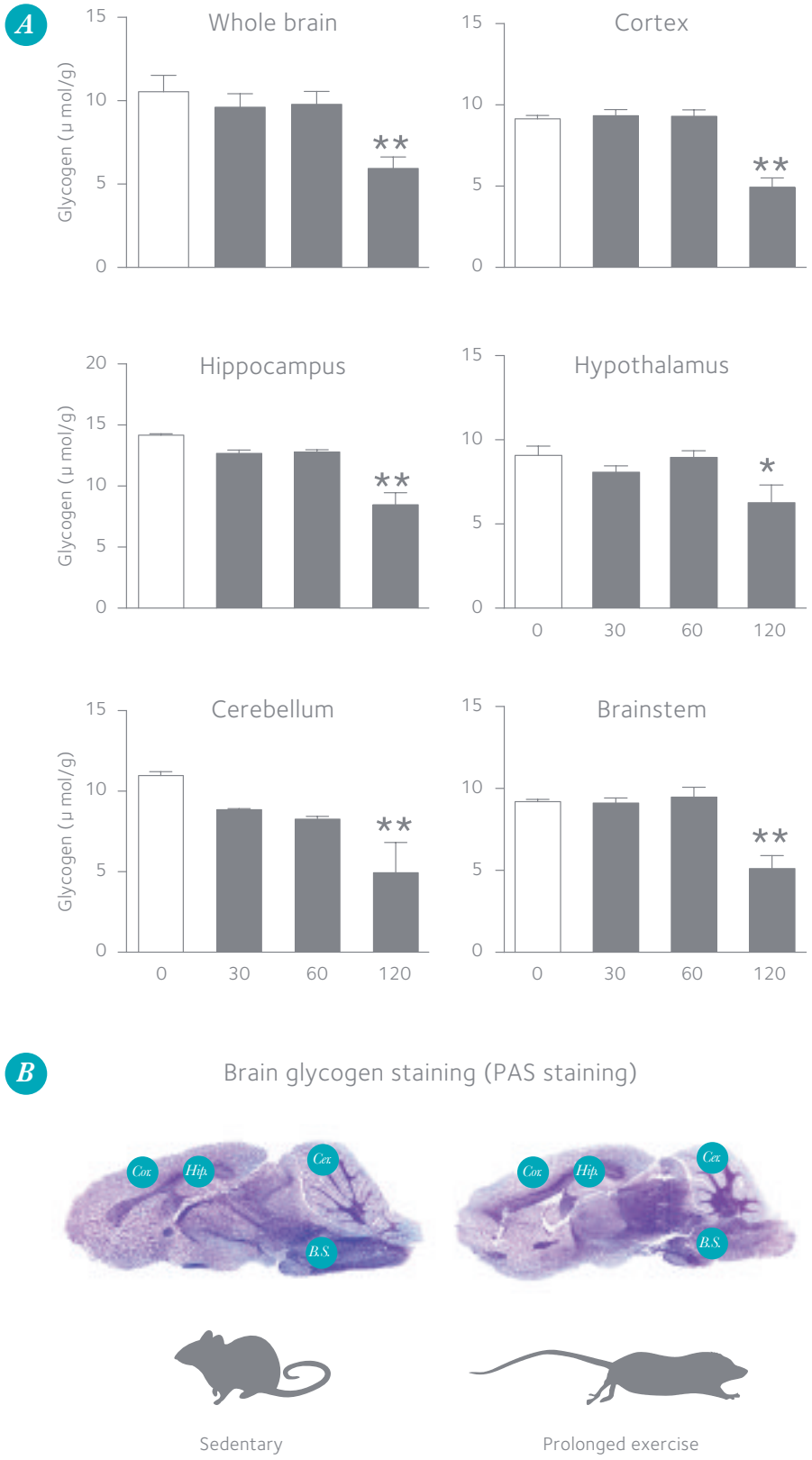


Figure 2. Brain glycogen decreases during prolonged exercise. *A*, brain glycogen levels. Data represent the mean ± SEM ($n = 5–6$ rats). *$P < 0.05$; **$P < 0.01$ compared with pre-exercised rats (Dunnett's *post hoc* test). *B*, brain glycogen staining (periodic acid-Schiff (PAS) staining).

Fig 3.

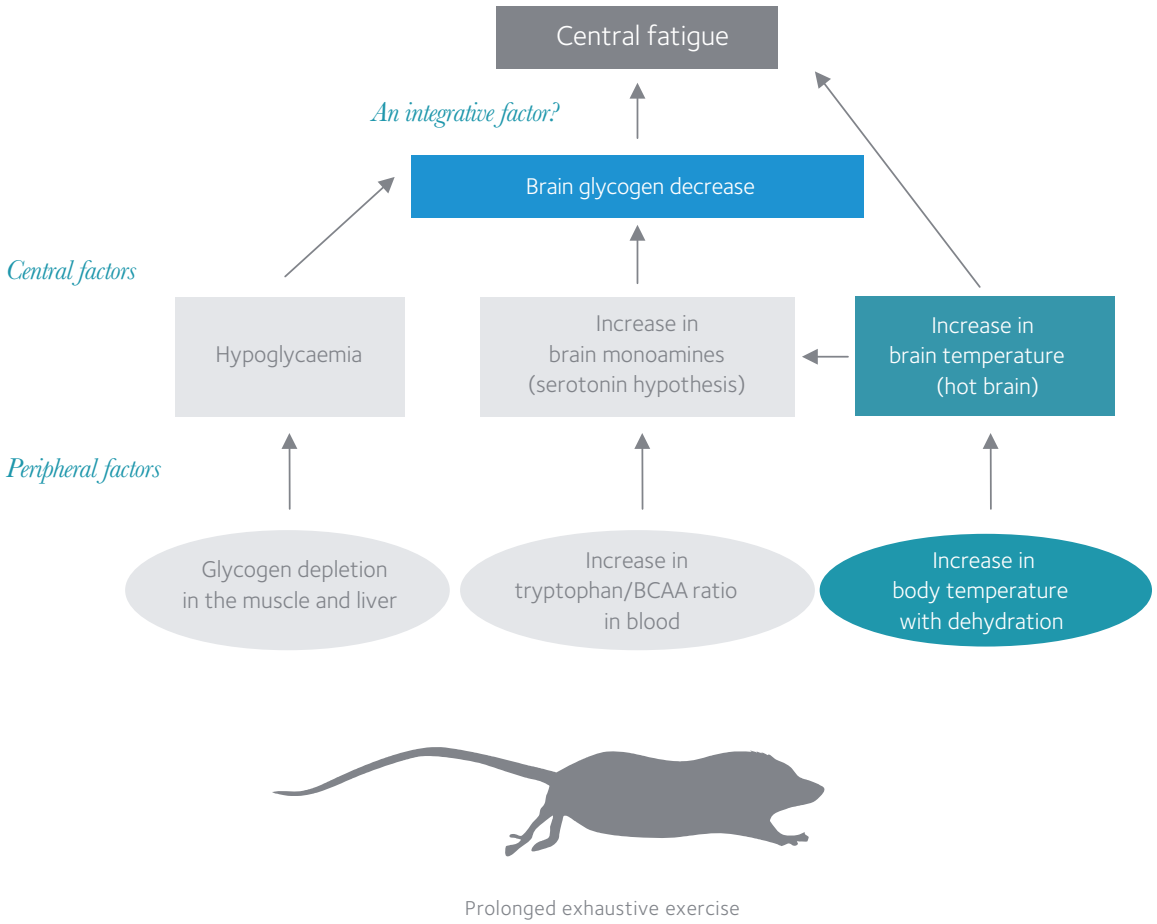


Figure 3. Hypothetical diagram showing the brain glycogen decrease as an integrative factor of central fatigue during prolonged exercise. Prolonged exercise induces glycogen depletion in the muscles and liver, and hypoglycaemia, which causes peripheral fatigue. Hypoglycaemia elicits energy shortages in the brain, and probably induces central fatigue. An increase in brain serotonin due to a rise in tryptophan/branched-chain amino acid (BCAA) ratio in blood also induces central fatigue by eliciting lassitude (serotonin hypothesis). Furthermore, increases in body and brain temperature attributed to dehydration induces central fatigue directly and/or indirectly through increases in brain noradrenaline and serotonin. Hypoglycaemia and serotonin are not only inducing factors of central fatigue but also enhancing factors of astrocytic glycogen degradation. Indeed, we observed that brain glycogen levels after running were correlated with the respective blood glucose and increased serotonin metabolism (Matsui *et al.* 2011). Exercise-induced brain glycogen decrease could be an integrative factor of central fatigue.

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The importance of being in the right spot

Glycogen is distributed differently in distinct fibre phenotypes, glycogen utilization is different at distinct localizations, and the role of glycogen in working skeletal muscles depends on its localization at a subcellular level.

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Hans-Christer Holmberg[2]
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In the subcellular architecture of skeletal muscle cells, glycogen is distributed heterogeneously next to contractile proteins and compartments responsible for energy delivery and ionic transmembrane flux. Recently, we have demonstrated that glycogen is distributed differently in distinct fibre phenotypes, glycogen utilization is different at distinct localizations, and the role of glycogen in working skeletal muscles depends on its localization at a subcellular level. Thus, considerations of the subcellular localization have implications for the understanding of glycogen metabolism in skeletal muscle cells.

Glycolysis occurs in virtually all living organisms, both in the absence and presence of oxygen. The wide occurrence of glycolysis suggests that it is one of the most ancient metabolic pathways, providing a primary mechanism by which energy from glucose can be converted to ATP and drive fundamental cellular processes. Glycogen is a branched polymer of glucose and the substance in which cells store and mobilise glucose, providing fuel for the glycolysis. Glycogen hence stores and provides the fuel (i.e. glucose) for glycolysis. In connection with most forms of work performed by skeletal muscle, glycogen is a major source of energy and, indeed, depletion of glycogen is strongly associated with exhaustion (Bergström *et al.* 1967). Despite the fundamental acceptance of this vital role of glycogen, the underlying mechanism(s) still remain unknown.

In almost all previous investigations glycogen levels in muscle have been determined using muscle homogenates, which provides an overall or average value. However, it is becoming increasingly clear that glycogen is not evenly distributed in muscle cells. For instance, transmission electron microscopy (TEM) reveals that glycogen exists in the form of discrete particles that are distributed heterogeneously within the cell (Wanson & Drochmans, 1968).

5–15%

Despite intramyofibrillar glycogen constituting only 5–15% of the overall muscle glycogen content, we reason that intramyofibrillar glycogen is a significant determinant of muscle endurance capacity.

The structural organization of skeletal muscle cells consists of contractile filaments arranged in thousands of parallel longitudinally oriented myofibrils that occupy 70–80% of the cell volume. Interspersed between these myofibrils are networks of mitochondria and triads of sarcoplasmic reticulum, as well as invaginations of the surface membrane, the so-called T-tubuli, which together create an intermyofibrillar space. In this cellular architecture, glycogen is distributed both within the myofibrils (intramyofibrillar (Intra) glycogen) and between the myofibrils in close proximity to mitochondria and sarcoplasmic reticulum (intermyofibrillar (IMF) glycogen). In addition, glycogen is also found just beneath the surface membrane primarily near the mitochondria and nuclei (subsarcolemmal (SS) glycogen). Until now, very little information was available regarding glycogen localization in skeletal muscle: an observational study suggested that the utilization of glycogen during exercise is localization dependent (Fridén *et al.* 1985) and one quantitative study showed a preferential increase in Intra glycogen during post-exercise recovery (Marchand *et al.* 2007).

Recent studies in our laboratory were performed to investigate by quantitative unbiased methods the localization of glycogen before and after exercise in muscle fibres of different phenotype (Nielsen *et al.* 2011), and the role that glycogen localization plays in muscle function *in vitro* (Nielsen *et al.* 2009; Ørtenblad *et al.* 2011).

Both prior to and following a high-intensity cross-country race lasting approximately 1 h, biopsies were taken from the highly trained arm muscle (triceps brachii) of 10 elite Norwegian cross-country skiers (22 ± 1 years, $\dot{V}_{O_2max}$ = 68 ± 5 ml kg^{-1} min^{-1} (means ± SD)). TEM revealed that before this race 75–85% of the glycogen was located in the intermyofibrillar space, whereas only 5–15% was present in each of the intramyofibrillar space and subsarcolemmal space (Nielsen *et al.* 2011). The oxidative type I fibres contained 80% more Intra glycogen than the glycolytic type II fibres (Fig. 1). Thus, in elite athletes training in an endurance discipline, the distribution of endogenous glycogen in skeletal muscle fibres of two distinctive phenotypes differs.

After the race, the overall muscle content of glycogen, determined biochemically, was 70% lower than before this exertion. However, the levels in different subcellular fractions were reduced to varying degrees (Fig. 1): the minor depot of Intra glycogen fell by 85%, while the decreases in IMF and SS glycogen were only 70%. Consequently, the relative contribution of Intra glycogen to the overall muscle glycogen content decreased from 11% before the race to 6% after the race in the oxidative type I fibres, and from 7% to 4% in the glycolytic type II fibres, demonstrating that Intra glycogen was preferentially used during the race in both type I and type II fibres (Nielsen *et al.* 2011).

Fig 1.

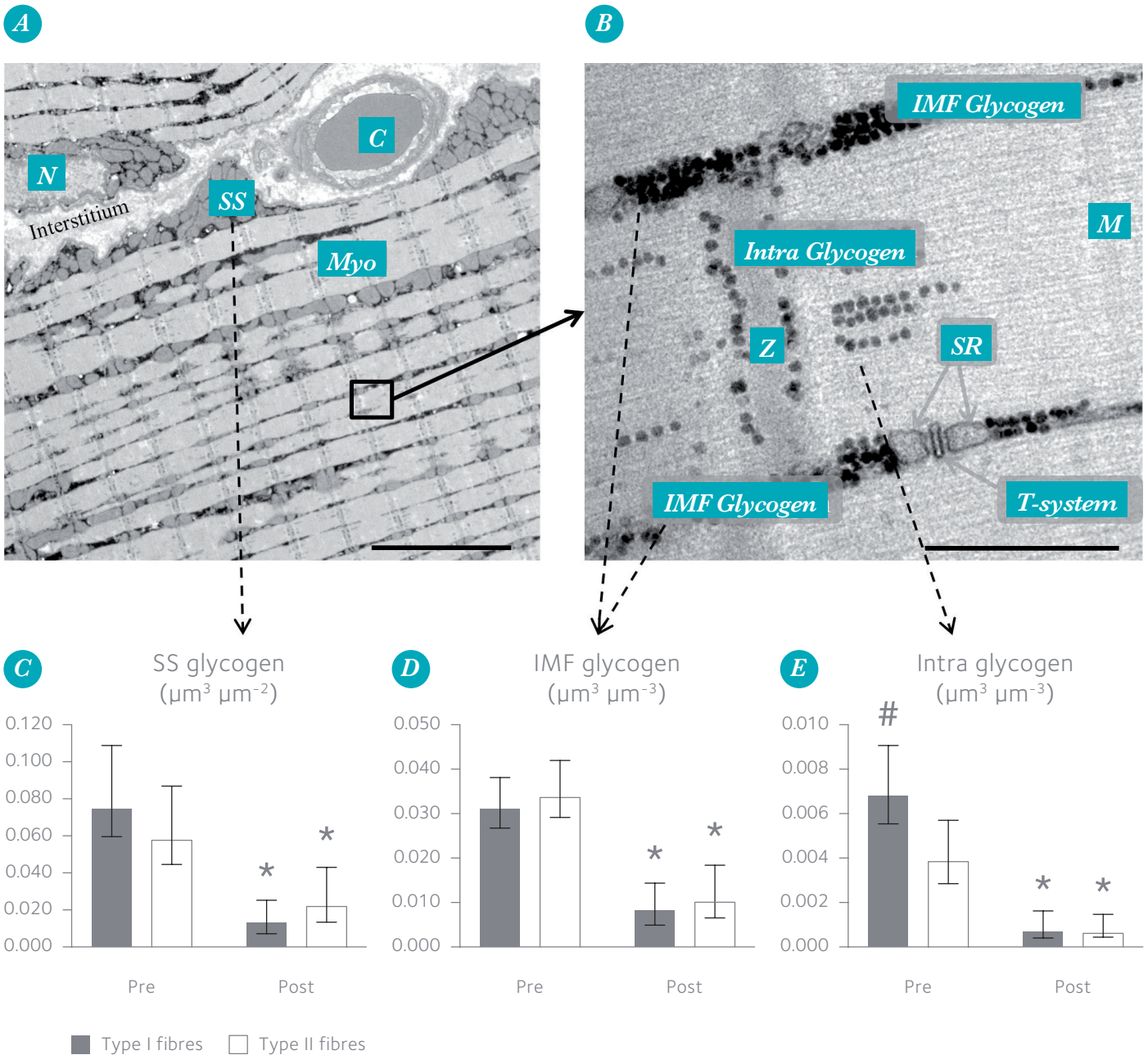

Figure 1. The localization of skeletal muscle glycogen in different subcellular compartments and in fibres of different phenotypes before and after exercise. *A*, this transmission electron micrograph shows the myofibrillar space (Myo) and subsarcolemmal space (SS) in a fibre. At the top, a nucleus (N) in an adjacent fibre can be seen and a capillary vessel (C) is present in the interstitial space between the two fibres. All of the grey structures within the fibre are mitochondria and black areas are spaces filled with glycogen. Scale bar, 5 μm. *B*, this transmission electron micrograph illustrates the typical pattern of localization of IMF and Intra glycogen (both seen as black dots) in skeletal muscle. Z, Z-line; M, M-band. Scale bar, 0.5 μm. The bar graphs above depict the levels of SS (*C*), IMF (*D*) and Intra (*E*) glycogen in type I fibres (filled bars; 29 and 28 biopsies taken Pre and Post exercise, respectively, from 10 subjects) and fibres obtained from type II fibres (open bars, 30 Pre and 26 Post fibres obtained from biopsies taken from 10 subjects). In the three defined compartments, glycogen volume is expressed relative to different reference spaces or surfaces. SS glycogen volume is expressed relative to the fibre surface area, IMF glycogen volume relative to the total myofibrillar space (Inter- and intramyofibrillar space), and Intra glycogen volume relative to the intramyofibrillar space. The bars represent the geometric means and the vertical lines 95% CI. **P* < 0.0001 compared with the corresponding Pre value. #*P* < 0.05 compared with the corresponding value for type II fibres. Adapted from Ørtenblad *et al.* 2011 and Nielsen *et al.* 2011.

Biopsies were taken from the highly-trained arm muscle of 10 elite Norwegian cross-country skiers

Despite Intra glycogen constituting only 5–15% of the overall muscle glycogen content, we reason that Intra glycogen is a significant determinant of muscle endurance capacity. This is based on the two findings – i.e. a preferential depletion of Intra glycogen during exercise and more Intra glycogen in the relatively fatigue-resistant, oxidative fibres than in the glycolytic fibres. Further support for this conclusion is provided by our two recently published *in vitro* observations that the level of Intra glycogen influences the capacity of rat muscle fibres to resist fatigue (Nielsen *et al.* 2009) and that a low level of Intra glycogen is associated with impaired release of Ca^{2+} by the sarcoplasmic reticulum, which is considered to contribute to muscle fatigue (Ørtenblad *et al.* 2011).

Together, our observations indicate that the relatively minor depot of glycogen located in the intramyofibrillar space plays an important role in muscle function. Although the mechanistic explanation for this significance of glycogen compartmentalization remains to be elucidated, these findings are intriguing with regards to possible co-localization of glycogen and compartmentalized energy transfer through glycolysis, as well as the function of glycogen-associated proteins in cellular processes. This may be of crucial importance in cells with a high and fluctuating metabolism, including excitable tissues such as muscles, the heart and nerves.

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Is this my finger?

We know our body is ours, but which signals does the brain use to work out which things are part of 'us' and which things are not?

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Healthy people know which things are part of their body and which things are not. For example, when we look down at our hands we know that they are 'ours', a part of our body, but we also know that the table on which the hands are resting is not part of our body.

We know that a hand we shake is not ours. We can make these judgements because the brain maintains representations of the body that store information such as body size, limb position and body 'ownership'. Presumably these representations are built up and maintained using sensory information, but it is not always obvious which sensory signals are involved. We have a clear sense of 'ownership', but there is no peripheral receptor for 'ownership'. Which sensory signals the brain uses to generate a sense of ownership, and how they combine and interact with one another is not well understood. Clinical conditions, in which the sense of ownership of parts of the body is disrupted, range from patients who neglect a limb (for example, following a stroke) or suffer chronic pain and report that the painful limb is not theirs, to patients who request (or attempt) amputation of a healthy limb because they feel that it is not theirs and they find it alien and offensive. Treatment of these conditions requires better understanding of the mechanisms contributing to the sense of ownership and how they can be disrupted.

For something so obviously personal, it is surprising that the sense of body ownership is easily manipulated, and so one way to investigate this sense is to induce illusions of body ownership. The most common and well-known illusion is referred to as the 'rubber hand' illusion, first described by Botvinick and Cohen (1998). It involves making subjects perceive an artificial rubber hand as being their own. The rubber hand illusion is typically induced with combined visual and tactile stimulation, in which a rubber hand and the subject's hand are brushed with synchronous strokes while the subject looks at the rubber hand but not at their own. After the rubber hand illusion develops, the subject will report that they feel the rubber hand is theirs. The illusion is so strong that threats made against the rubber hand induce a physiological response (e.g. Armel & Ramachandran, 2003; Ehrsson *et al.* 2007). It could be argued that this illusion is simply vision dominating tactile sensation, but the rubber hand illusion can be induced without vision, using touch alone (Ehrsson *et al.* 2005). Thus, information from rapidly adapting cutaneous receptors activated by brushing contributes to the sense of body ownership.

Fig 1.

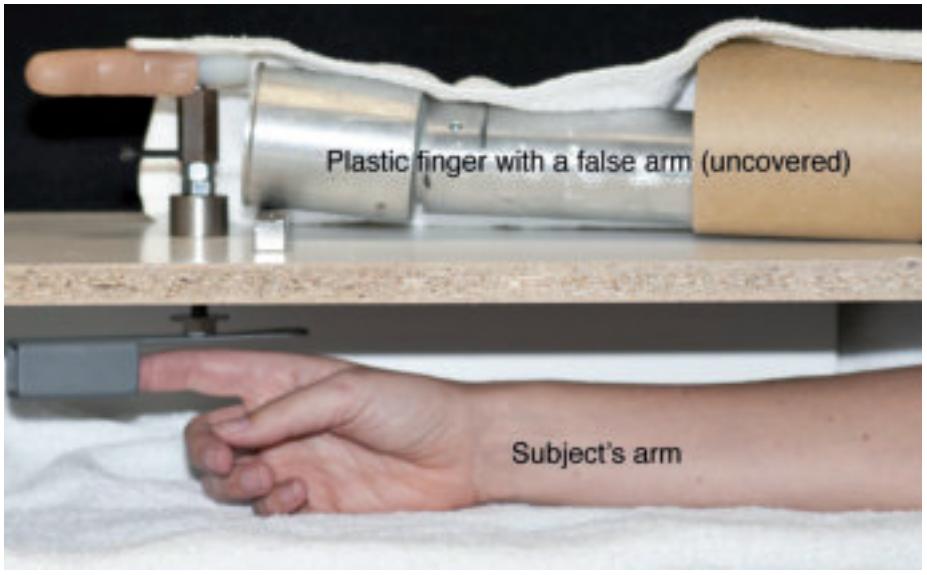


Figure 1. A photograph of the experimental set-up. The subject's right hand rested on a table, concealed by a second table placed above. The subject's right index finger was held by a piece of pipe that was attached to a plastic magician's finger on the upper table. The connecting shaft was co-linear with the proximal interphalangeal joint of both the subject's finger and the plastic finger. When the shaft was 'locked', movements of the plastic finger and the subject's finger were synchronised. When the shaft was unlocked, movements of the two fingers were unrelated. A false arm was constructed on the upper table, hidden by a towel, to give the visual impression that the subject's arm could be resting on the upper table.

Cutaneous receptors seem ideally placed to signal body ownership, because they only signal events that occur at the body. In contrast, the senses of vision and audition receive information about both events occurring at the body and events occurring away from the body. Thus, simply seeing a hand does not tell you whether it is your own or belongs to someone else. However, cutaneous receptors are not the only receptors that only signal events occurring to the body; muscle receptors also exclusively signal events at the body.

The most common and well-known illusion is referred to as the 'rubber hand' illusion, first described by Botvinick and Cohen (1998). It involves making subjects perceive an artificial rubber hand as being their own.

Do muscle receptors also contribute to the sense of body ownership? Our recent paper (Walsh *et al.* 2011) showed that physiological activation of muscle receptors powerfully affects the sense of body ownership. We developed a 'plastic finger' illusion in which the subject's right hand was concealed below a table with their right index finger connected, via a shaft, to a plastic finger similar to that used by magicians. This was visible to the subject and located above the table (Fig. 1). The plastic finger was 12 cm higher than the subject's finger. So that the subject saw only the plastic finger, a false hand and arm were placed behind the plastic finger and covered with a towel. The plastic finger could be coupled to the subject's finger so that movement of the proximal interphalangeal (PIP) joint of both the subject's finger and the plastic finger moved in synchrony (i.e. congruent movement). The experimenter held the plastic finger, which the subject could see, to apply movements. The experimenter moved the plastic finger continuously into flexion and extension through an arc of ~30 deg.

19 of 20

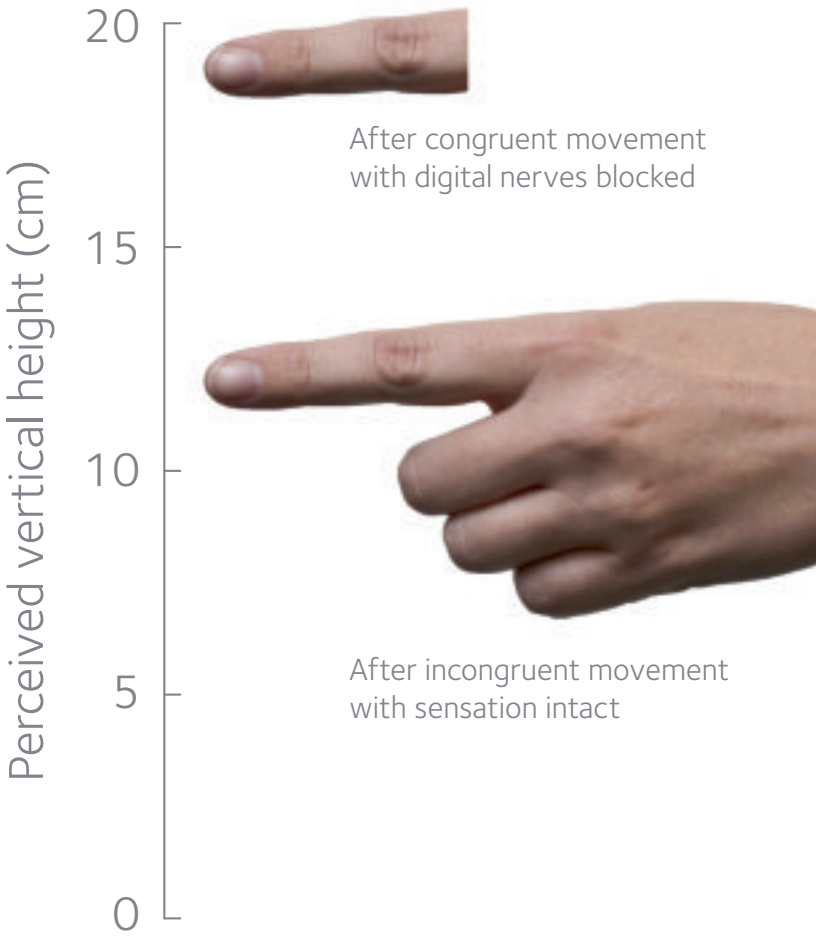
After 3 min of congruent movement 19 of 20 naïve subjects felt some ownership of the plastic finger. Fourteen reported on a questionnaire both that they felt the movement of their finger at the location of the plastic finger (i.e. elevated above their real finger) and that the plastic finger was their finger.

Figure 2. The change in perceived height after congruent movement. After 3 min of incongruent movement between the plastic finger and the subject's finger, the index finger was reported to be, on average, 11.5 cm above the table. After the digital nerves of the index finger were blocked and 3 min of congruent movement was applied, subjects perceived that the plastic finger was their own and that their finger was on average 19 cm above the table, significantly closer to the actual location of the plastic finger at 21 cm above the table. Adapted from Walsh *et al.* 2011.

After 3 min of congruent movement 19 of 20 naïve subjects felt some ownership of the plastic finger. Fourteen reported on a questionnaire both that they felt the movement of their finger at the location of the plastic finger (i.e. elevated above their real finger) *and* that the plastic finger *was* their finger. Another five of the subjects reported either one or the other of these feelings. These results occurred when the subjects' hands were intact, which means that the signals involved in inducing the illusion could be derived from skin, joint or muscle receptors. However, similar results were achieved when the digital nerves of the right index finger were blocked using local anaesthetic to remove sensation from the finger.

Furthermore, in a separate study in which the nerves of the finger were also blocked, 9 out of 10 subjects indicated on an external scale, that their index finger was much closer to the plastic finger after congruent movements than during the control conditions. In the control condition the plastic finger and the subject's finger were moved simultaneously but the direction and speed of motion were unrelated (i.e. incongruent movements). On average the group of subjects reported that their index finger was 7.5 cm more elevated after congruent movement (Fig. 2).

Fig 2.



Thus, simply seeing a hand does not tell you whether it is your own or belongs to someone else.

During finger movement, sensory receptors in the skin and joints of the finger, and in the muscles that move the finger but are located in the hand and forearm, all give signals related to the movement. Thus, the 'plastic finger' illusion created by congruent movement with the nerve pathways of the hand intact might be caused through cutaneous signals like the rubber hand illusion. However, digital nerve block stops cutaneous and joint receptor signals arising distal to the block from reaching the central nervous system. Having removed signals from the skin and joint of the finger, only signals arising proximal to the metacarpophalangeal joint from muscle receptors in the muscles that move the index finger remain to detect the movements imposed on the joint by the experimenter. These results show that muscle receptors can contribute to the sense of body ownership and, because our stimulus was a passive movement, muscle spindles are the most likely receptors to be important here.

So we now know that muscle receptors, like cutaneous receptors, can generate the sense of body ownership. However, we don't yet know if visual input is required or whether muscle receptors can contribute on their own. Furthermore, now that we know that multiple types of signal *can* contribute to the sense of body ownership, we need to determine whether they *actually do*, and whether they do so all the time, or just some of the time (e.g. during particular types of movement or when the arm is in a particular posture). Better understanding of how these multiple signals interact to generate the sense of ownership is needed to give insight into our perceptions of our bodies in health and how this might go wrong in disease.

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From gunnery to homeostasis: is physiological constancy controlled intermittently?

Negative feedback mechanisms are fundamental for the regulation of movement, as well as systemic and cellular variables. Recent research shows that serial ballistic action provides a new physiological paradigm for interpreting sustained control.

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Homeostasis is the physiological control of variables such as body position, blood pressure and body temperature. It is founded on negative feedback mechanisms involving nerves and hormones to communicate signals. In the 80 years since the physiologist WB Cannon coined the word 'homeostasis', physiologists have drawn their conceptual models and theoretical analysis from engineering control theory. Homeostatic control at all levels from cells and molecules to integrative systems to the control of posture and movement, has been interpreted on the assumption that control is continuous, leading to the servo mechanism and its modern relative the continuous optimal controller using internal models (Fig. 1).

However, these engineering controllers were designed for machine systems in which usually measurement is usually precise, actuators and loads are consistent, time delays are short and computation is fast. The opposite is generally true in physiological systems that can be characterised by long neuro-motor and hormonal delays, essential variability, history dependence and fatigue.

Since 1945, there has been much interest in modelling the human operator as a control system. Largely this interest was motivated by the desire to interface humans to machines, in particular to provide the optimal interface between skilled pilots and fighter aircraft. In seminal studies of the archetypal tracking task, the aiming of guns at moving targets, Craik observed that the human operator can be described as a servo system. However, he noted that the human servo operated intermittently rather than continuously. He proposed serial, ballistic action which means that smooth control proceeds as a sequence of sub-actions each planned using current sensory information but then executed 'open loop' i.e. without being influenced by feedback of the result. Using 'smoked drums' to record results, he demonstrated the refractory nature of tracking following an initial response to an unpredicted, discrete step stimulus and proposed the ubiquitous nature of serial ballistic control in humans at a rate of two to three actions per second (Craik, 1947). In this scheme the feedback loop is 'closed' intermittently to correct errors of prediction.

With the advent of digital computers in the 1950s and 60s, machine control using discrete sampling of signals developed within engineering. There was initial excitement over whether human control could be explained in this fashion: indeed, sampling would provide a natural explanation of the low bandwidth of voluntary manual control at around 2 Hz. However, experiments proved inconclusive (Navas & Stark, 1968).

Fig 1.

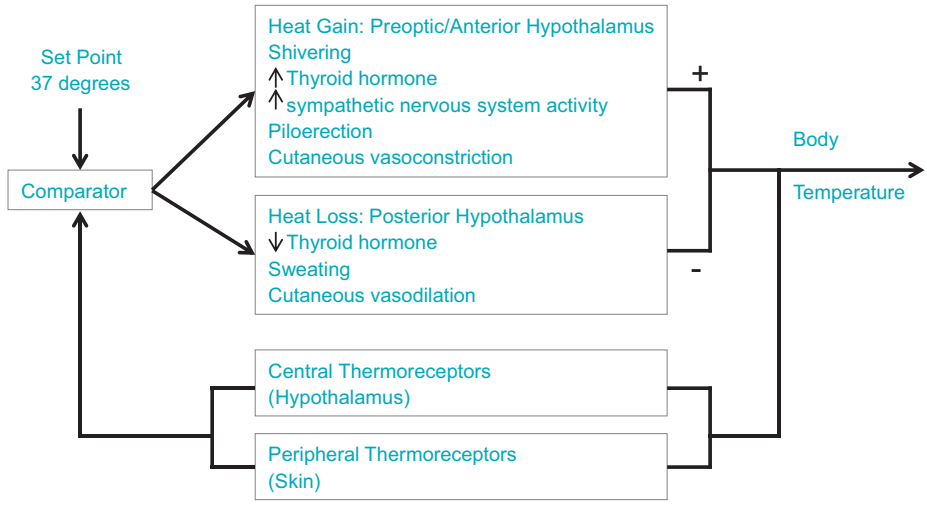

Figure 1. Concept and example of homeostasis.

Discrete actions such as throwing, reaching and pointing are known to be initially pre-planned and ballistic because there is inadequate time for sensory information to inform execution of the task.

Discrete actions such as throwing, reaching and pointing are known to be initially pre-planned and ballistic because there is inadequate time for sensory information to inform execution of the task. This distinguishes them from sustained tasks such as postural control which are thought to employ continuous 'closed loop' feedback. Such sustained tasks involve peripheral feedback mechanisms that are known to respond continuously to joint rotation and other external stimuli up to high frequencies such as 10 Hz and beyond. Since the initial incontrovertible demonstration of central refractoriness (Craik, 1947), the postulated integration of continuous peripheral and intermittent ballistic mechanisms to perform sustained tasks such as steering vehicles, helming yachts and postural control has remained debated (Navas & Stark, 1968; Hanneton *et al.* 1997; Loram *et al.* 2011) and unresolved. Even if sustained control is serial ballistic, refinement as the task is learned would tend to smooth the joints between successive sub-movements, leaving the spectre of an un-testable hypothesis. Gawthrop *et al.* (2011) use the term 'masquerading' to describe the phenomenon of smooth serial ballistic control becoming indistinguishable from continuous control. It is easy and popular to describe physiological control using continuous models such as the servo mechanism and to label the unexplained portion as remnant or noise. The default assumption has become that control is continuously closed loop: it requires experimental evidence to disprove this and to establish the role of intermittent control.

In the absence of a methodology that will unambiguously distinguish continuous from serial ballistic control, we have attempted to break the impasse by taking a different approach and by creating an experiment where the human control system cannot be continuous (Loram *et al.* 2011). First, we study the classic postural task – sustained control of an external inverted pendulum-like load. Our innovation was to use gentle taps of a joystick, since this approach is explicitly serial ballistic. Continuous knowledge of load position had no effect on the control signal (joystick) apart from when the hand was intermittently in contact. Using standard methods models, we compared this tapping form of serial ballistic control with normal control using continuous contact of the joystick and we asked whether normal control is very different or is a 'masquerading' form of intermittent control. Second, we examined the circumstances appropriate for serial ballistic control in both its tapping and smooth forms. Do these conditions apply physiologically?

Using visual manual tracking of an unstable load, we showed that control using gentle, intermittent taps is entirely natural and effective (Fig. 2). The gentle tapping method resulted in slightly superior position control and velocity minimisation. Clearly, for this classic postural task control by continuous feedback is unnecessary, irrespective of whether continuous contact is continuously closed loop or smooth serial ballistic. When optimising position or velocity regulation, a modal contact rate of 2 s^{-1} was observed.

Figure 2. Representative control using continuous and intermittent contact. The subject was instructed to regulate 'position'. Left panels show continuous contact; right panels show intermittent contact. A disturbance was applied in both cases though only shown for the continuous case. Joystick movement is 2.5 mm V^{-1}. *A* and *D*, load position; *B* and *E*, joystick position; *C*, external disturbance. For *D* and *E*, vertical dashed lines show initiation of contact. *F*, incidence of contacts binned according to 'instant frequency' i.e. 1/tapping interval.

Fig 2.

This modal rate is nicely consistent with the ideas of Craik. It exemplifies a process of serial ballistic trajectories in which it is postulated that trajectory planning limits successive actions to an optimum rate of 2 s^{-1} when they would ideally be more frequent to improve performance (Loram *et al.* 2011).

Furthermore, control using tapping contact was substantially more robust to unpredicted changes in the actuator (Fig. 3 and Loram *et al.* 2011). It seems that in human control intermittency is an advantage and this advantage indicates the underlying theoretical rationale.

By design, serial ballistic control in general (intermittent predictive control) is an appropriate solution for bandwidth-limited systems such as those with long time delays (Gawthrop *et al.* 2011). Examples include controlling roving Martian explorers remotely, controlling a super-tanker with massive time lags, and controlling mechanically fast systems such as robots if control requires a time-consuming online computation. It makes sense to use a trial-and-error form of control – for the result of an action to be observed before updating the plan if the prediction was inadequate. Furthermore, because the system is usually 'open loop', the controlled system is easier to understand: one can discriminate changes in the system from effects caused by one's own actions (Fig. 3). This may explain why serial ballistic control using tapping is more robust in this experiment.

Our results do not prove that normal control is intermittent. However, normal sustained control shows all the hallmarks of intermittent control (coherence limited to low frequencies, significant, variable time delays) and contains all the reasons for which intermittent control is appropriate – significant time delays, substantial computation, low bandwidth, a need for prediction, inconsistent actuators and sensors. Logically, the default assumption should be that control is intermittent. Disproof would require experimental evidence that control is genuinely continuous (Loram *et al.* 2011).

Returning more generally to homeostasis, why assume that gene expression, immune response, hormone release and motor plans are updated continuously? When delays are significant and system conditions are unpredictable, the serial ballistic solution is in principle more robust, economical and effective. These seem like advantages likely to have been preserved by evolution.

Fig 3.

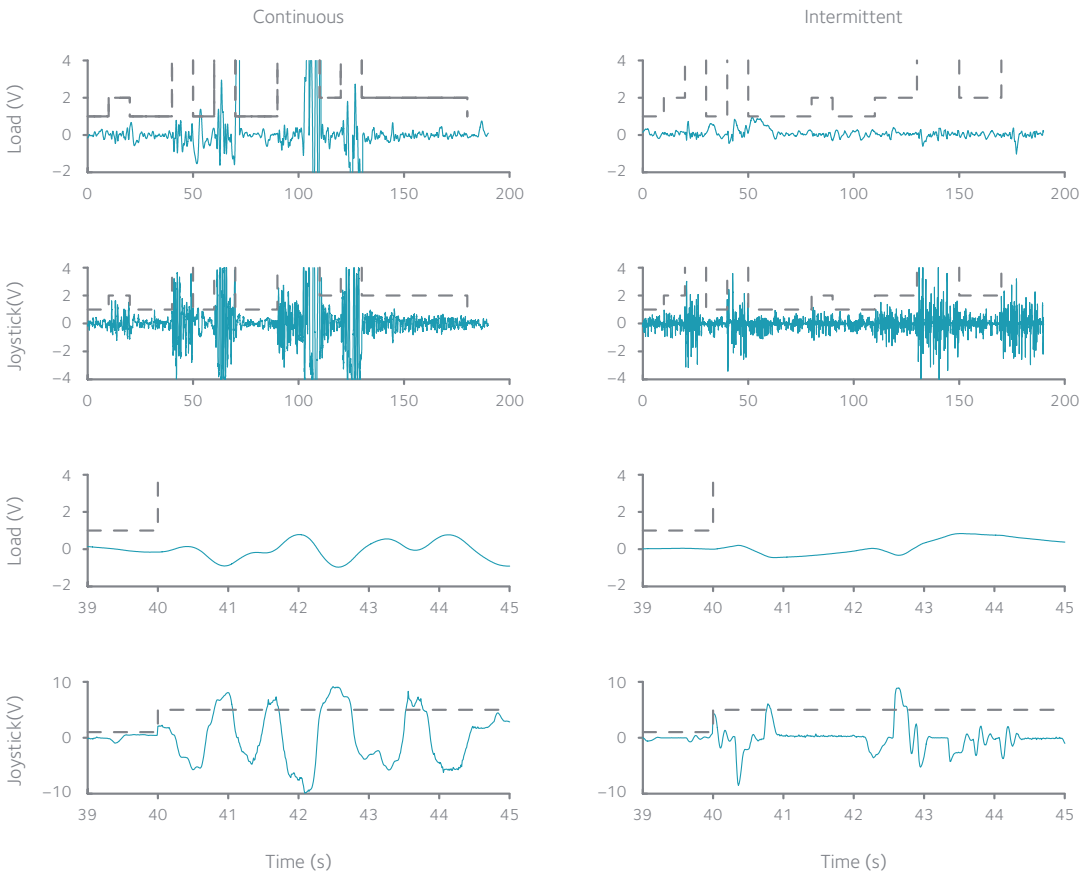

Figure 3. Intermittent contact is more robust to changing joystick gain. The participant was regulating 'position'. Continuous and intermittent contact is shown in left and right panels, respectively. Rows 1 and 3, load position (blue continuous lines), joystick gain (grey dashed lines); Rows 2 and 4, joystick voltage after applying joystick gain (blue continuous lines), joystick gain (grey dashed lines). Load and joystick movement are 20 mm V^{-1} and 2.5 mm V^{-1}, respectively. Joystick gain is quoted relative to normal gain in Figs 1–2. Upper two rows show 190 s duration. Lower two rows show one illustrative change in joystick gain. Note how the gain changes at 40s: the hand is in contact in both cases, and the change in gain causes deviation of the load, to which the participant subsequently responds. Uncorrected oscillation occurs with continuous but not intermittent contact.

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Q&A: David Eisner, IUPS

With just over a year to go before the next IUPS in Birmingham in 2013, Thelma Lovick caught up with David Eisner, Chairman of the International Scientific Programme Committee, to find out how the programme is shaping up.

It must be quite a daunting prospect to organise the programme of an international meeting on a topic as broad as physiology. Where do you start?

Yes, it's quite a challenge. Obviously my expertise is in a rather focused area of physiology (calcium and cardiac function), but physiology and the IUPS meeting are so broad. It is the job of the Programme Committee to try to cover all areas.

How many people do you have on the Programme Committee and how do you choose them?

What one does is to get as many people involved as possible to get a broad perspective. There are 35 on the committee. About half are officers from IUPS and IUPS Commission Chairs and we have nominees from FEPS (the Federation of European Physiological Societies, the Scandinavian Physiological Society, The European Society for Microcirculation and the European Vascular Biology Organisation, all of whom are partners in the congress). Then we filled in the gaps in subject coverage, also aiming to get a good gender balance.

Tell me something about the format of the meeting. Will there be any surprises?

The format won't be that different to a standard physiology meeting. But for the keynote lecturers, who have already been decided on, we tried to avoid just inviting the same people that you've already heard at other meetings. One innovation is that each symposium will contain three established speakers and two who are at the start of their careers. We want to keep it fresh and we're also keen to have a good geographical and gender balance. For example, about a third of our plenary lecturers are women.

Is that because you are discriminating in favour of women?

No, not at all. We just tried to make sure that we were not overlooking people.

How do you decide what the hot topics are that are going to be crowd pullers?

It starts by people on the Committee thinking about topics and speakers in their own field.

"We had suggestions for about 300 symposia in response to the call that went out late in 2011. We'll end up with about 100."

So does that mean that the programme is actually a reflection of the Committee?

Good question. Inevitably there's going to be some bias. But with 35 people on the Programme Committee, we should have a pretty broad representation. We put out calls for suggestions and probably around 200 keynote speakers were suggested. We took all of these suggestions very seriously. It is also worth noting that, in order to avoid 'cronyism', anyone on the Committee is not eligible to give a keynote or plenary lecture.

The international physiological community is quite a broad church. Who are you aiming the meeting at?

We deliberately aim to be as broad as possible. There are lots of specialist meetings that one can go to, but IUPS is unique, precisely because it covers such an enormous breadth. I think this is one of its strengths. While we want to make sure that everyone will find lots in their own specialist area, I also hope that people will come because they have a general interest in physiology in its widest sense, to help their teaching or simply because their own research is interdisciplinary. We're particularly keen to attract delegates from emerging physiological communities and there is some provision for financial aid. As always, we will run a stand-alone teaching workshop in the week before the meeting. This will be held in Bristol and we're keeping an international flavour.

What about symposia?

We're having lots of symposia. We had suggestions for about 300 symposia in response to the call that went out late in 2011. We'll end up with about 100.

How do you whittle them down?

Members of the Programme Committee have now looked at all the submissions. As well as requiring first-class science, we were looking for a balance of geography and gender. Where there was overlap between submissions we combined the ideas.

And posters?

I want to make posters central to this meeting. The thing about the International Conference Centre in Birmingham is that you don't have to walk miles to posters like you do at some venues. They will be right in the centre of things and we're going to have them up all day. The idea is that the posters will form an active hub of the meeting with people talking science around them all day. I see them as a sort of catalyst for new ideas and interactions, which can then be cemented in the many cafes and bars that are located within a few minutes walk of the conference centre, which has a really attractive canal-side location. It's a great venue.

Finally, will there be satellites?

We're taking a rather relaxed approach here. Satellites will be independent of IUPS. If people want to hold them then the deal is that we will promote their satellite in exchange for them advertising IUPS. In fact, there are plenty of smaller venues in and around Birmingham, which could be used to host satellites in the weeks before and after the meeting.

It sounds like it's all coming together nicely.

Well, I hope so. I'm sure there will be obstacles on the way that cause me a few sleepless nights, but I'm confident of putting on a good show. We're certainly working hard towards it.

For more details on the meeting visit:
www.iups2013.org

The website will be updated regularly as the programme is finalised.

Q&A: Kim Woodruff, Daphne Jackson Trust fellow

PN speaks to Kim Woodruff, who won a Society-sponsored fellowship to help her resume a research career following six years off to raise her family. How hard is it returning to the cutting edge of physiology after so long away?

In 2011 The Society sponsored a Daphne Jackson Trust Fellow. This scheme helps scientists looking to return to the laboratory after a career break. The Daphne Jackson Trust secured further funding for the fellowship from the Leverhulme Trust.

Following a rigorous selection process, Kim Woodruff won the fellowship and is now working part time on a research project at Manchester University.

Before her career break, Kim completed a PhD at the University of Central Lancashire, exploring the effects of ketamine on synapse formation and synaptic transmission. She lives in Preston, Lancashire with her partner and two sons, aged 4 and 6.

Daphne Jackson was Dean of the Faculty of Science at the University of Surrey. She was the first female professor of physics in the UK and a lifelong campaigner, encouraging women into science. In 1985 she established a fellowship scheme to help women returning to careers in science after having a family. The Daphne Jackson Trust was established in 1992 following her death.

What is your background in science/physiology?

I did a degree in applied bioscience, then a masters in electrophysiology – which was neuroscience combined with pharmacology. Then a PhD in the same field, all at the University of Central Lancashire (UCLan). That's when I decided it would be a good idea to take a career break to have children.

I took about 18 months off initially. Then I was asked to do some lecturing at UCLan. So I was working part time.

How did you hear about the Daphne Jackson fellowship?

I was out of research. As soon as you're out, it's very difficult to get back in. And as soon as you mention children...! You're up against people who've published 40 or more papers – you've got no chance.

So I was trawling the internet. I'd applied for loads of jobs and was just getting nowhere. I was looking for information on women in science, bursaries, grants, when I found the Daphne Jackson Trust.

I applied for the fellowship originally in 2009. You have to apply to apply! To check that you're eligible. They looked at my application and said that they thought I'd be able to get back into research without a fellowship. I carried on for another year. After feedback from the one interview I did get, I called them back and asked them to reconsider.

What was the selection process for the fellowship like?

It's quite a lengthy process. You have to demonstrate that you're eligible. Then you have to submit a project proposal, and provide a supervisor and a host.

It so happened that my old supervisor at UCLan, Robert Lea, had a colleague at the University of Manchester, Jaleel Miyan, who was working with molecular bio-technology in hydrocephalus. He suggested that I might work with him.

They'd previously drawn up a research grant proposal, looking at normal pressure hydrocephalus, which affects the elderly. I have an interest in this because my father had dementia (he died 3 years ago). Working with Jaleel and Robert, I drew up a new proposal based on the original.

The Trust review your proposal. It then goes to an external reviewer, and then you have an interview.

You have to pass all these things before the proposal even goes to the trustees for a decision. After the trustees have awarded the fellowship, they have to find funding. I waited nearly two years!

Why were you selected?

I think I was selected because I'd really tried to stay in science, but just didn't get anywhere. I'd shown dedication and desire. But the barriers to my returning were clear.

"So I was trawling the internet. I'd applied for loads of jobs and was just getting nowhere. I was looking for information on women in science, bursaries, grants, when I found the Daphne Jackson Trust."

How has it helped you return to an active scientific career?

You're put in an ideal position. They make you put a proposal together to get your skills up to date. So that helps me compete with others who haven't taken a career break. The Trust provides workshops, and they fund some training courses and conference travel. I have done courses in proteomics training and work – life balance – you can do whatever is relevant to your field within reason! You couldn't ask for more.

What is your research project?

The project is looking at hydroencephaly patients over the course of 24 hours after the cerebrospinal fluid has been drained. Some patients respond to the treatment, some do not. If they do, they can be fitted with a permanent shunt. But it's not really understood why the treatment relieves symptoms in some patients, but not in others.

The project is looking to take samples from patients at the beginning of the procedure and at the end, trying to look for anything different between responders and non-responders. We're just waiting for ethical approval to take samples.

Was it challenging re-entering research? Did you feel you were recovering from a setback in your career or your expertise?

Just the opposite! I had gained so much experience through teaching. I've almost completed a higher-education teaching qualification. I've lectured in so many subjects: physiology, pharmacology, immunology, micro-biology. I've gained so much knowledge. I've also done a lot of work supervising undergraduate projects, which gave me experience in trouble-shooting protocols.

I absolutely love it! I'm doing what I want to do. If you're a researcher, a scientist, it's a vocation: you can't see yourself doing anything else.

My partner has been very supportive, and being part time helps, especially as I am commuting. I think I have been lucky to have the best of both worlds really, being able to spend time with the children when they were really young and now hopefully getting my career back on track after they started school. I think being a positive role model for the boys is important. You have to be very organised, and plan ahead. Personally I find working allows me to enjoy the time I spend with the children more – I am a happier and more tolerant mum!

What more can be done to help women combine a scientific career with a family?

The University of Manchester is quite pro-active. When I've spoken to other female researchers here – one of whom is pregnant – they agree that the University is quite supportive. There is a 'women in science' group, for instance. And a group for women returning from maternity leave.

The problem is, not everyone has a permanent job. I thought it was a good idea to have children before tying myself to a position. I couldn't have been more wrong! If you haven't got your foot in the door...

Why should hard-working, intelligent women in any field have to choose between children and a career? You're writing off a pool of skills, you're wasting their efforts and state money that went into their training. And you gain skills from being a mother that help you when you return to work. That's all waiting to be tapped.

A day in the life of... the Mobile Teaching Unit

Lauren Hughes, Teaching Fellow and outreach teacher at the University of Bristol, recounts a typical day with the Society-sponsored 'lab-in-a-lorry'.

The University of Bristol's Mobile Teaching Unit

The day starts early when you are travelling the length and breadth of the country with the Mobile Teaching Unit (MTU). The MTU is an 18-ton HGV lorry that transforms into a science classroom and contains all the equipment necessary to teach and demonstrate physiology to a wide audience.

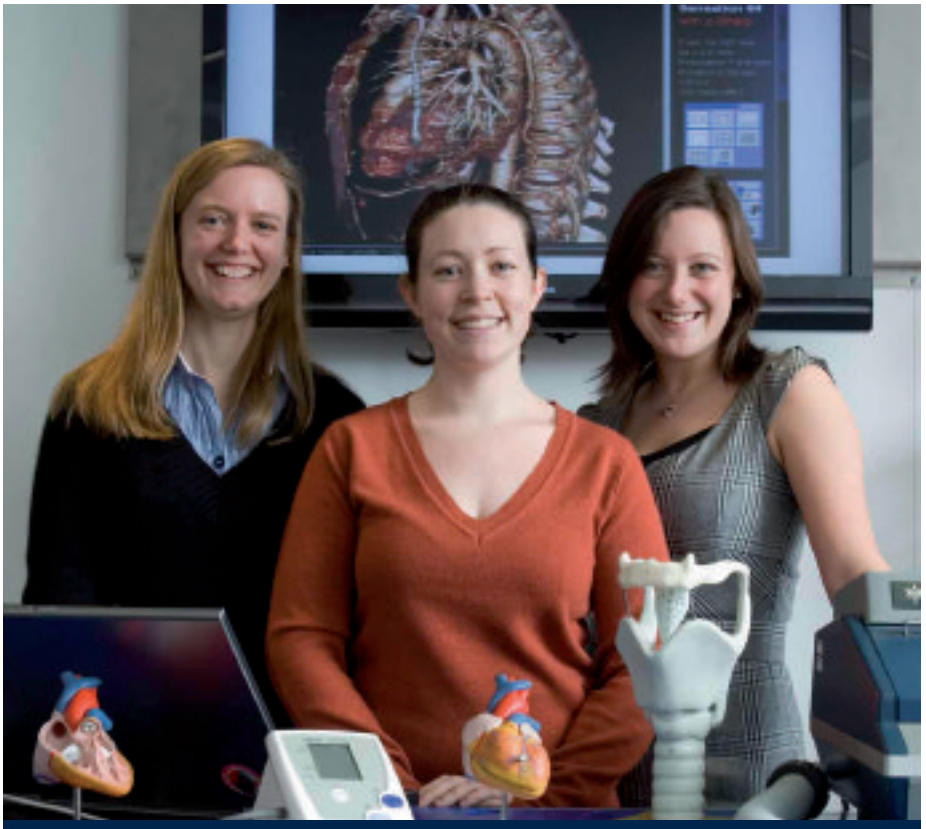
Meeting new people and travelling to new places makes each visit with the MTU unique and makes the job great fun. For example, back in February the MTU was headed for The Latymer School in North London for the day. By 5 am the MTU was travelling down the M4 from its base at the University of Bristol – and for the teaching staff the travelling began much earlier, arriving in London by train the day before to ensure that everyone was wide awake to be able to teach all day.

After arriving at the school at 7.30 am there was plenty of time to be treated to a school breakfast and a cup of tea in the canteen before teaching began. A warm welcome by the school upon arrival is always a great way to start the day. The MTU was parked in a corner of the school's playground, the side pod expanded to accommodate up to 20 pupils for each interactive teaching session.

Teaching in the MTU is entirely self-sufficient; the only resource we asked the school for on the day was a bowl full of ice and water, for purposes which would become clear later on. Before the arrival of the first group of pupils, all the equipment was set up – a laptop and TV screen which run the teaching presentation together with a PowerLab for ECG recordings, a Vitalograph for lung function measurements and other physiological equipment including stethoscopes and pulse oximeters. Anatomical models, formalin-fixed animal specimens and posters were also on display to help link structure to function when explaining how the body works.

Across the day we taught all the Year 12 pupils in the school who were studying Biology AS level; pupils were split into groups and each attended a 1-hour-20-minute teaching session called 'Beating and Breathing' which covered the physiology of the cardiovascular and respiratory systems.

The aim of the MTU is to supplement the teaching provided in school, to allow pupils to explore aspects of the subject that are not covered in the syllabus and to gain hands-on experience of using physiological equipment.



Lauren Hughes, Kimberley Khanna and Sarah Gosling

The first session began at 9.30 am and started with revision of the pupils' knowledge of the anatomy of the respiratory tract, including the use of histological images. The pupils also watched a video on how a spirometer works and considered which factors may affect lung volume. With this in mind, the pupils then designed their own experiment to investigate some of these factors by measuring each other's height and using the Vitalograph to measure forced vital capacity. The pupils plotted their data on a wall graph and discussed the correlations that were apparent, not only between height and vital capacity, but also with respect to gender. Following this, the pupils explored the cardiovascular system using models and specimens to look at the structure of the heart together with pulse oximeters, stethoscopes and sphygmomanometers to record cardiac function. To finish, the group watched a demonstration of an ECG being recording on a willing volunteer on the large TV screen and investigated factors that affect heart rate. The teaching ended with a question-and-answer session before the pupils returned to the classroom for normal lessons.

Before the second group arrived the equipment was reset, the MTU put back in order and within five minutes we were ready to receive the next group of pupils.

After the next session we broke for lunch. Navigating our way across a school playground amidst flying footballs was the most dangerous part of the day, but a successful arrival at the canteen ensured we were rewarded with a two-course school lunch (and that has certainly improved since the old days of school dinners). Lunchtime was also a good chance to meet the teachers and find out how they thought the day was going.

After lunch we taught another two sessions of 'Beating and Breathing' to the rest of the pupils. It was amazing that, by the end of the day, word still hadn't spread from the earlier groups that at the end of the session an unwitting volunteer would find themselves hooked up to the ECG machine with their face dunked in a bowl of ice-cold water to demonstrate the diving reflex – always a great way to end a session!

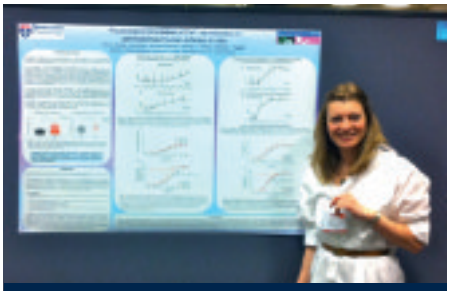
At the end of the school day, 3.45 pm, it was time to pack up and wave goodbye. Seventy-eight pupils from the school had visited the MTU during the day and all pupils had been very keen to fully engage in the sessions.

Arriving back in Bristol at 8 pm, the weary staff headed home and the MTU was parked up back at the university. Following the visit, feedback from the teachers confirmed that the day had been one of the highlights of the biology department's calendar. As this was the fifth visit to the school since 2008, the MTU and its team must be doing something right and we look forward to many more visits to this school and others round the country.

For more information please visit:
www.bristol.ac.uk/cetl/aims/mobileteachingunit

Travel grant connections

Ana Dordea, Affiliate Member, on her experience presenting a poster at her first international meeting – enabled by a Society grant.



Ana and the poster she presented in San Diego, entitled 'Physiological processes of Ca^{2+}-sensitisation in permeabilised human arteries *in vitro*'.

The 59th International Society for Gynecological Investigation (SGI) Annual Meeting 2012 assembled around 3,000 scientists and clinicians whose research interests span over many matters of women's well-being. My arrival at the meeting marked the beginning of my first international conference experience. It was held in the sunny Californian city of San Diego, which was an enticing bonus.

I am in the final year of my PhD at the Institute of Cellular Medicine at Newcastle University studying Ca^{2+}- and PKG-related signalling mechanisms in human arteries of the uterus and placenta. This conference was a welcome alternative to my daily routine of scientific experimentation. Additionally, this meeting presented a good opportunity to widen my knowledge on obstetric and reproductive biology ahead of my impending viva assessment.

The presentations at the event included descriptions of the potential molecular mechanisms and clinical advances for the prevention of pre-term birth (Nancy Hassan, Detroit), the functions of prostaglandin in the myometrium, and depictions of the endocrine signals participating in physiologic inflammation and labour onset (Oksana Shynlova, Toronto).

Of particular interest was the lecture given by Will Lammers (Al Ain), introducing the concept of a pacemaker site governing contractile patterns in the pregnant uterus of rats and guinea pigs.

The following three days were split between poster sessions in the mornings and mini symposia in the afternoons. In one of the sessions, the focus was placed on placental dysfunction as the primary consequence of common pregnancy complications. Victoria Clifton (Adelaide) presented an interesting notion that the placenta might function in a sex-specific manner and that the future of tocolytics may reside in the development of sex-specific treatments directed with this in mind. Another interesting session discussed the effects of ageing on reproductive function. Michael Varner (Salt Lake City) illustrated the consequences of delayed childbearing on pregnancy and fetus, whilst Nanette Santoro (Denver) explained how pregnancy might be managed in post-reproductive women who utilise egg donors to conceive.

Morning poster sessions afforded plenty of opportunities to interact with senior scientists and I valued the lengthier (and challenging) discussions with experienced scientists such as Peter Mitchell (Edmonton), Mark Wareing, (Manchester) and Rachel Tribe (London), as their rigorous questioning of my results and methodology was a good foretaste of what will probably befall me during my viva. Ultimately, as young scientists, these interactions are a significant part of our academic development; we're here to learn and develop our critical thinking.

I wish to thank The Physiological Society as my participation at this meeting was enabled by its financial generosity. Affiliate Members, such as myself, are encouraged to apply for the Travel Grant Schemes (for both Society and non-Society meetings) and a maximum of £500 is usually awarded.

I am grateful that The Society shows such support for young scientists and stimulates our participation at international meetings to expand our knowledge and generate new ideas and collaborations. This meeting provided an exciting interactive experience filled with stimulating discussions as well as a chance to travel to the sunshine! I urge every young scientist and Member of The Society to apply for the grant schemes available and report back on their exciting experiences.

Lab profile: The Reproductive & Vascular Biology Group, Newcastle University

Ana Dordea, PhD student, describes the work of the The Reproductive and Vascular Biology Group (RVBG), part of the Institute of Cellular Medicine within the Faculty of Medical Sciences.

From top left, clockwise: Michele Sweeney, Leo Gurney, Chris Nicholson, Magda Karolczak-Bayatti, Julie Martin, Ana Dordea, and Aiqing Chen.

For the past three and half years, I have had the pleasure of working under the supervision of two leading academics, Michael Taggart and Stephen Robson. I was their first jointly supervised student, joining two researchers, Michèle Sweeney and Julie Martin. Within a year, two post-docs joined, Aiqing Chen and Winnie Tong. My third year saw the arrival of Christopher Nicholson – a second PhD student – closely followed by Leo Gurney, a clinical research associate on a 12-month placement. The team works in close collaboration with Nick Europe-Finner and his senior researcher, Magda Karolczak-Bayatti.

Our lab is adjacent to the Royal Victoria Infirmary Hospital. A well-established collaboration with research midwives and consultants there allows for plentiful access to human placentas and uterine (pregnant and non-pregnant) biopsies.

From these, our group prepares an array of material, from microdissected tissue explants to single cells and protein, or RNA isolates. My research concerns the functioning of smooth muscle within small arteries of the uteroplacental organs and, in particular, the mechanisms, and possible differences, in relaxatory signalling mechanisms of human myometrial and placental arteries. For this, blood vessels of <400 µm diameter are micro-dissected under the microscope and then meticulously cleaned, before mounting on small-wire (40 µm diameter) myograph chambers.

Thereafter, I assess the contractility and endothelial-dependent relaxation of the arteries before performing particular interventions to assess the actions of protein kinase G (PKG) mimetics. From the time of obtaining the biopsy, my experiment can last 10 hours.

The signalling mechanisms or sensitivities regulating placental and myometrial vascular tone may differ, as these circulations remodel or develop in gestation with particular organ specificities. As current therapies for complications of pregnancy often affect both mother and baby, such studies help identify new pregnancy-related pathophysiologies. A principle finding of my work is that differences in endothelial-mediated relaxation of intact human myometrial and placental arteries are actually reflected in alterations of PKG signalling at the level of smooth muscle cell myofilaments of each artery type.

Other research conducted in the lab includes using primary immunoprecipitation and Western blotting techniques to assess protein targets of the acetylation signalling mechanisms in vascular and non-vascular smooth muscle tissues from human, rat and guinea pig. Acetylation is increasingly recognised as a significant post-translational modification, and Magda has recently published on the likelihood of it regulating myometrial protein activity during pregnancy, whilst Aiqing is presently exploring the possibility of a similar role in arteries. Julie is developing an expression profile of proteins in the myriad tissues used in our experiments.

As an MRC Training Fellow in Bioinformatics, Winnie has developed a biophysically detailed computational model of uterine smooth muscle ion channels and is currently trying to apply new imaging techniques to follow electrical and contractile patterns in myometrium of pregnant guinea pigs.

Meanwhile, Chris has been looking at the effects of ageing and oestrogen receptor activation on vascular function of small arteries from the myometria of pre- and post-menopausal women and comparing these to young and old mice. It is thought that age affects structure and function of vasculature, and that these changes may contribute greatly to the risk of cardiovascular disease. There is controversy as to the nature and/or extent of gender influences on this risk, and developing a greater understanding of how the vascular actions of oestrogens are affected by age may allow for the development of different cardio-protective treatment options.

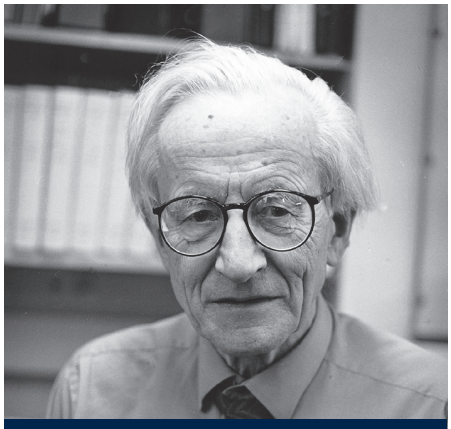
Finally, Leo, in conjunction with Michèle, and Arwyn Jones at the School of Pharmacy in Cardiff University, is currently using live-cell fluorescent tracking and biochemical assays to generate preliminary data on the use of cell-penetrating peptides as vectors for potential drug delivery in human smooth muscle tissues.

Whilst my scientific endeavours have not always yielded positive results, I will be sad to leave the lab at the end of my PhD. I have enjoyed every moment and I am thankful not only for the demanding scientific knowledge acquired during the last three and a half years, but also for the confidence it has given me to face the outside world.

Rolf Niedergerke

1921–2011

Picture credit: Martin Rosenberg



Rolf Niedergerke

Rolf Niedergerke, a pioneer of cardiac muscle physiology and co-discoverer of the sliding filament mechanism, died in December 2011. Born in Mülheim an der Ruhr, Germany, Rolf studied medicine throughout the War, receiving his MD in 1945. From 1947, at Göttingen, he researched the electrical activity of nerves and then, in Bern, he learned from Robert Stämpfli how to dissect single myelinated fibres. He studied threshold and rheobase effects in nodes of Ranvier (with Stämpfli and Eduard Coraboeuf).

Stämpfli recommended Rolf to Andrew Huxley, then in Cambridge, as the ideal partner to dissect single muscle fibres and operate a complex set-up involving the interference microscope constructed by Huxley to study living skeletal fibres. They showed that the anisotropic ('A') striation bands do not change length during muscle shortening or stretch. They postulated that actin and myosin filaments must slide alongside one another during contraction. Uncovering the sliding filament mechanism triggered a revolution in muscle research and, ultimately, for cell motility overall.

In 1955, Rolf reported how electrophoretic injection of Ca^{2+} into skeletal fibres provoked localised shortening, implying a Ca-specific link to contraction. Never published in detail, these pioneering findings were neglected, but signalled Rolf´s new field – Ca^{2+} and muscle activation. Later that year, he joined the Biophysics Department, University College London, and shifted his interest to cardiac muscle. He recorded action potentials (APs) and tension from frog ventricle and defined the tension–voltage relationship employing high-K^+-induced depolarisation.

In 1956, Hans-Christoph Lüttgau joined Rolf at UCL. Together they quantified the antagonistic effects of Ca^{2+} and Na^+ on contractility as a function of the quotient $[Ca^{2+}]/[Na^+]^2$. They suggested Ca^{2+} and Na^+ attach to membrane sites that, even when combined with either ion, bear net charge, move within the membrane during the AP and, when Ca bound, promote contraction. Utilising ^{45}Ca-tracer, Rolf showed (with EJ Harris) that this mechanism evokes net Ca uptake at increased $[Ca^{2+}]/[Na^+]^2$. These results established fundamental features of the Ca^{2+}–Na^+ exchange mechanism.

As the senior author, Rolf was invited to several heart meetings but invariably declined – with characteristic reticence – to promote his fundamental discoveries, to the regret of those keen to promote his career.

In the mid-1960s, with Dick Orkand, Rolf focused on the AP, concluding that Ca^{2+} must be a current carrier. Then, with Reg Chapman, he reported the kinetic responses of frog heart to Ca^{2+} and heart rate, combining his ideas from tracer work with the role of Ca stores in EC coupling. His 1977 paper (with Davids Gadsby and Ogden) addressed the electrogenic Na^+ pump in skeletal fibres. Collaborating with Sally Page, Rolf advanced radioactive tracer methods and deployed cardiac ultrastructure to underpin their interpretation of the actions of adrenaline and ATP.

Rolf published fewer than fifty papers in his long career. This might seem a modest total nowadays. However, ten studies have been cited more than 100 times. Surely, a strong case can be made that his ground-breaking discoveries on cellular Ca^{2+} and muscle contraction were far more influential than even this impressive citation rate attests.

Rolf was elected a Member in 1959 and an Honorary Member in 1987.

Hans-Christoph Lüttgau
David Miller

An extended version of this article is available online at:
www.physoc.org/late-members

Alison Douglas

1961–2012

Alison Douglas

Alison was born and grew up in Northern Ireland. She obtained her PhD in uterine physiology at Queen's University of Belfast, under the supervision of David Goldspink, on mechanisms of adaptive growth of the myometrium, with additional studies of skeletal muscle physiology in the context of low gravity (published under her maiden name of Morton).

Alison moved to Scotland in 1986 to work with Geoffrey Walsh as a postdoctoral research fellow at the University of Edinburgh. Three years later she joined John Russell's research group on a BBSRC Link Grant, with John Bicknell and Gareth Leng, at the Babraham Institute. In 1995, Alison was appointed as a temporary lecturer, and soon after, in 1999, she was appointed to a full lectureship. She was promoted to senior lecturer in 2003, to a reader in 2008, and just last year to a personal chair in Reproductive Neuroendocrinology.

Over the past 20 years Alison had studied the importance and control of oxytocin neurons in pregnancy, parturition and lactation, and contributed to our understanding of the role of oxytocin in multiple behaviours essential to successful reproduction, including maternal behaviour and aggression, sexual behaviour, appetite and anxiety.

Amongst her many contributions is the elucidation of dynamic adaptations in oxytocin neuron responses to changing internal and external environments (e.g. pregnancy, hunger or stress) to facilitate appropriate brain responses that optimize body reactions or prevent further adverse physiological consequences.

In recent years, Alison's interest focused on the contribution of uterine signals feeding back to the hypothalamus during parturition-related events that may lead to inappropriate preterm labour. With integrated studies on neuronal activation and secretion mechanisms, she investigated the role of stress and immune mechanisms in spontaneous abortion. In her research career she became a leading international authority on the neuroendocrine adaptations in pregnancy that lead to successful delivery.

Alison was a member of several societies; she joined The Physiological Society in 1990 and remained a loyal member until her death. She continued as Chairman of the British Society for Neuroendocrinology, despite illness. She was especially concerned to support younger scientists at early stages of their careers.

Alison built an extensive network of national and international collaborations and warm friendships. Within the Neuroendocrinology group here in Edinburgh, she was a cherished colleague, always cheerful, positive and supportive – attributes sometimes hard to find in the academic environment. I have always felt that we have something special here in Edinburgh – a team of academics with their groups working in related fields, competing but maximizing collaboration and support. Alison was a corner stone of this.

Alison loved her husband Stephen, and her two golden retrievers, Sasha and Suki. She worked with the girl guides, and, in the little spare time left, she liked to go sailing.

Sadly, in 2009, she was diagnosed with breast cancer and, despite all recent advances in treating this disease, her positive attitude and remarkable courage, she died at the Marie Curie Hospice in Edinburgh on 9 May 2012. Her untimely death has robbed us all of not only a gifted and prolific scientist, but also a wonderful friend and colleague.

Mike Ludwig

James Vincent Halliwell

1946–2012

James was a long-standing Member of The Physiological Society and an innovative 'hands-on' neurophysiologist. He graduated in 1971 with a BSc in Psychology at Birkbeck College and completed a PhD (1974) in the Physiology Department at University College London (UCL) on the functional circuitry of the guinea-pig olfactory cortex under Ivor Gartside's supervision.

After a postdoc at the Institute of Psychiatry (1974–8) James joined the MRC Group in the Department of Pharmacology at the School of Pharmacy. Following a brief return to UCL in 1987, he was appointed Reader in Physiology at the Royal Free Hospital School of Medicine. By default he rejoined UCL when the medical schools merged in 1998, and relocated his lab to the UCL main campus when he retired in 2003. James was still doing experiments at UCL, and at the School of Pharmacy with Andy Constanti, when he died of a stroke in March of this year.

James did trail-blazing research on many neurophysiological topics. His most highly cited paper (894 citations) was that with Paul Adams, in 1982, on membrane currents in voltage-clamped hippocampal neurons. This contained two 'firsts' – the identification of the M-current in a mammalian central neuron and the detection of the hyperpolarization-activated cation current in any neuron. This latter current they termed the 'queer current', I_Q, by analogy with the just-described cardiac 'funny' current, I_f (both now designated I_h). The difficulties in doing this work at that time (before slice patch-clamping) cannot be over-estimated, involving fine micro-electrode impalement plus the then-new (and temperamental) Dagan switch-clamp amplifier. James subsequently used the same skills to obtain the first recordings of M-currents in human brain cells.

Another novel piece of research was that with Reg Docherty on transmission in the interpeduncular nucleus (IPN). Although innervated by the densest cholinergic tract in the brain (the habenulo-interpeduncular tract, HIT), it turned out that direct transmission from HIT to IPN was mediated by glutamate, not by acetylcholine. Instead, the principal effect of acetylcholine was on the presynaptic fibres in the HIT. These conclusions have been amply confirmed and only very recently has a slow postsynaptic nicotinic current been detected in the IPN.

Other examples of James' pioneering work include: (1) the identification with Oliver Dolly of the 'A-current' as a target for α-dendrotoxin (α-DTX), generating the basis for Oliver's subsequent use of α-DTX to purify Kv channel proteins and their associated α-subunits; (2) his highly cited work with Asun Colino dissecting the multiple actions of 5-HT on hippocampal pyramidal cells; and (3) the discovery of postsynaptic excitability changes accompanying LTP (with Laura Chavez-Noriega). James' last published paper was as recent as 2010, and there is still much material awaiting publication.

James was the epitome of the well-rounded scientist. He was a delightful person to have around in a lab, totally unselfish, full of information and always willing to help and advise his colleagues (both junior and not-so-junior). He also had wide interests outside the lab, with a refined taste for food (and its preparation), wine and coffee, a love of France and Spain, and a passion for old motorcycles and jazz. His untimely death not only robbed us all of a consummate experimentalist and wonderful colleague, but also deprived him and his wife Sheila of the opportunity for fully enjoying these fruits of a good life.

David Brown

A fully-referenced version of this article is available online at:
www.physoc.org/late-members

Ainsley Iggo

1924–2012

Ainsley Iggo, Emeritus Professor of Veterinary Physiology at the Royal (Dick) School of Veterinary Studies, died in Edinburgh in March. He was born in New Zealand, where he obtained a Masters in Agricultural Science and a BSc. He then moved to Scotland, getting a PhD from The University of Aberdeen in 1954 and a DSc from Edinburgh in 1962.

Among other achievements, he was an FRS, an FRSE (winning the Bicentenary Medal in 1997) and an FRCP(E). He became a Member Academia Europaea in 1991.

Ainsley did pioneering electrophysiology on the organization of the dorsal horn, and on sensory cutaneous receptors and their afferents. These studies included the discovery of thermoreceptors in the skin. He also produced the first system for classifying C fibres and mechanoreceptors. True to his antipodean origins, these latter investigations extended to the skin of the snout of the echidna.

Ainsley was elected a Member in 1956. He was a member of the Editorial Board of *The Journal of Physiology* from 1962 to 1969, and a member of the Editorial Board of *The Quarterly Journal of Experimental Physiology* from 1980 to 1983.

Ann Silver

The Society also regrets to announce the deaths of:

Sir Andrew Huxley

renowned for his breakthrough work on the generation of the action potential, has died aged 94. A full obituary will be published in our next issue.

Vernon Rycroft Pickles

at one time professor and head of department at Cardiff. He became a Member in 1950.

Anne Warner

who was elected a Member in 1968 and served on the Committee (1975 to 1979) and on the Editorial Board of *The Journal of Physiology* (1980–1987).

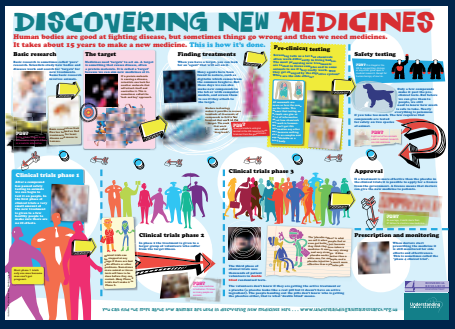
Full obituaries can be found on The Society website at:
www.physoc.org/late-members

One London teacher responded to UAR to say: 'These posters are bright and wonderful to have within classrooms. Would it be possible to have four more please?'

Congratulations to Gareth Leng on his election to the Royal Society of Edinburgh

Society Member, Gareth Leng, Professor of Experimental Physiology at The University of Edinburgh, has been elected as a Fellow of the Royal Society of Edinburgh (RSE). He said: 'Many thanks to all those who have written to congratulate me on my election – I think that shows just how much respect the Royal Society of Edinburgh has and what an honour it is to be elected.

"I expect to be active in public understanding of science through the RSE. Two years ago we launched a first year cross-disciplinary undergraduate course at Edinburgh that might interest Members (www.ocw.ed.ac.uk), not least because the videoed lectures are on iTunes and youtube, and have been downloaded more than 400,000 times worldwide. Visitors to Edinburgh might also like to know that our Anatomical Museum is now open to the public once a month and has been gathering a lot of attention (www.anatomy.mvm.ed.ac.uk/museum/index.php)."



Discovering New Medicines: UAR poster for every school

A brilliant new poster from Understanding Animal Research is here to help students understand the complex drug discovery process.

The poster is big, bright and bold. It complements UAR's programme of school visits by scientists and technologists and stands alone as a valuable addition to any science classroom. Full of facts and information, the poster places the vital role of animal research in context, balancing a sometimes over-heated subject.

A copy of Discovering New Medicines has been sent to every UK secondary school and FE college and feedback has been excellent.

To get your own copy of the poster, contact Alex at ajenkin@uar.org.uk.

Introducing...

Physiology News is pleased to announce two new members for our editorial board.

Siobhan Dennis
I am excited to have joined the *Physiology News* editorial board as an industry representative. I aim to contribute by providing topics of interest to scientists currently in industry and those considering a career change.

I studied for my undergraduate Masters degree in Biology at the University of Bath and pursued a future in neuroscience by completing a PhD at the University of Bristol. I am now undertaking my first postdoc at Eli Lilly, where I continue to work with the University of Bristol to maintain a strong academic link to aid my research.

I am an *in vitro* electrophysiologist and spend much time recording from hippocampal neurons to better understand hippocampal network activity. However, I ensure that I take time to participate in outreach programs away from the lab, including teaching, mentoring and participation at science fairs.

John Lee
I have been a Member of The Physiological Society since 1990, previously completing a BSc and PhD in Physiology, both at UCL. I have also trained in medicine, specialising in pathology.

I have always had an interest in the wider dissemination of scientific research, since I believe that this is hugely important for the health of both scientific endeavour and society as a whole. *Physiology News* is an important part of The Physiological Society's work in this area. I have previously served on the Editorial Board of *Physiology News* and am delighted to be able to continue to contribute.

The discipline of physiology is as central to biological understanding today as ever, so it is vital that we continue to explain, at all educational levels, why having people with a focused interest in how organisms work is still so important.

What our Members say

"For me, the most important role of The Physiological Society is the meetings it organises. I urge you to join up, attend meetings and talk to people – you'll be surprised by the outcome of such conversations."

Society Member

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