PHYSIOLOGYNEWS

summer 2003 | number 51

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UCL report

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Large multi-protein complexes

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An outback experience

Women in science

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Neuroscience centre inquiry

Sydney Ringer's grave

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Contributions and Queries

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PHYSIOLOGYNEWS

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EDITORIAL

War in Iraq

By the time this issue reaches you, the war in Iraq may well be over, although the fall out from it may last for decades. We are very lucky to live in a democracy (although somewhat flawed) where we can make our views known without fear of reprisal. Let us hope that is what the future holds for the people of Iraq.

Peer review responses

Physiology News exists to act as a channel for communication between the Society and its members, to provoke thought on a whole variety of issues and to act as a forum for discussion. The editorial on peer review that appeared in issue 49 produced the largest response that we have ever had about any article (see issue 50). It clearly struck a chord with many people and the response was overwhelmingly in favour of open peer review. Whether this is the case both for journal articles and for grant proposals is not fully clear. A questionnaire has been sent by the Editorial Board of *The Journal of Physiology* to all those who have acted for them as expert referees seeking their opinion. The results of this questionnaire should be available by the time the next issue goes to Press. It will be interesting to gauge the opinions of Society members in this way and, who knows, it might even help to formulate future Society policy.

Participation in the magazine

The editorial board very much values contributions from members and clearly *Physiology News* is being read by lots of people, even if only to find some of the errors and omissions! Please continue to let us have your views - at least the printable ones.

Take a pic and get it published

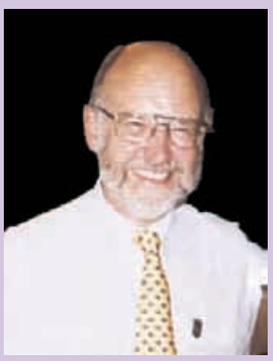
We often hear comment that there are not enough photographs in *Physiology News*. If you have interesting pictures from your experimental work, of your colleagues or items of general interest to physiologists, let us have them for publication so that you can share them with as wide an audience as possible.

Austin Elliott, Editor Elect

New Editor elect

At the end of December this year I complete my five year term as Editor of *Physiology News* and I proposed to Council on 6 February that a successor ought to be named so that we could arrange the handover of responsibilities well in advance. It was agreed unanimously that Austin Elliott, the current deputy editor, should be appointed to the position. I congratulate him and hope that he enjoys the job as much as I have done. The post is both rewarding and interesting and, apart from the occasional brickbats, I'm sure that he'll relish it.

Bill Winlow



Bill Winlow, retiring Editor

Welcome to Trinity College Dublin

Christopher Bell

Trinity College campanile

Trinity front gate

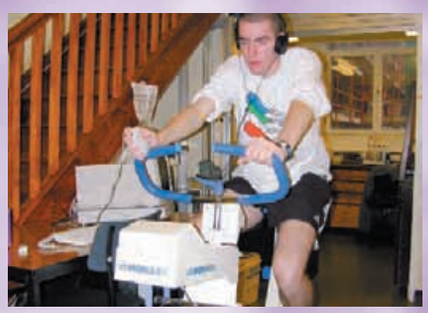
Trinity College Dublin was founded by Elizabeth I in 1592. Its first medical graduate qualified in 1658, its first lecturer in preclinical sciences was appointed in 1711 and its Department of Physiology dates from 1922 when Harold Pringle, who had worked previously as assistant to Sharpey-Schafer, was appointed as the inaugural professor.

The Department is part of the School of Physic (Medicine) within the Faculty of Health Sciences. We have 12 academic staff and nine support staff, with a current complement of around 35 postgraduate students and research staff. Our teaching responsibilities include delivery of undergraduate courses to students in medicine and allied health sciences (physiotherapy, occupational therapy, clinical speech and language science, pharmacy, therapeutic radiography and dentistry), representing a total student population of around 550. As well, we teach in the second, third and final years of the four-year honours course in natural sciences (*aka* Moderatorship) and admit 12 students to specialize in physiology over the last two years of their degree.

Since the Society last met at Trinity in 1997, the Department has seen several changes of personnel. Veronica Campbell and Stuart Warmington are now both old hands, having taken up post in 1998. In 2001, Simon Green joined us from the Queensland University of Technology and Áine Kelly was appointed in 2002, having previously been a postdoctoral research fellow in the Department. Over the same period, several other colleagues have left; most recently Pat Hartigan retired in 2001, although we are delighted that he retains a close relationship as a research associate and continues to be involved in teaching.

Approximately 20 students are currently undertaking research towards PhD degrees by research, with around 50% having come from the departmental graduating class and 50% from other institutions. Additional cohorts of students are enrolled for specific postgraduate courses. A part-time MSc programme in exercise science was set up in 1996 to provide training for individuals employed in health care and education. The programme runs over two years, with the first year consisting of taught courses and the second involving a research project and dissertation. Candidates who wish only to take the taught components can graduate with a diploma after the initial year. This programme is coordinated by Stuart Warmington. A second, full-time MSc in mammalian cellular physiology was set up by Veronica Campbell in 2001. In addition, the Department has recently developed an MSc in cardiac rehabilitation in collaboration with the School of Physiotherapy and the Department of Cardiology.

Research in the Department focuses on two main areas. One of these is *exercise science*, with an emphasis on muscle function (Stuart Warmington,



Top: Lecturer Áine Kelly

Centre: Postgrad Barry Boland in the tissue culture laboratory

Bottom: Exercise testing in the cardiovascular health unit

Roger Luckwill, Bernard Donne) and cardiovascular function (Simon Green, Christopher Bell). The second is *cellular communication*. Here, interests are primarily neurobiological - synaptic plasticity at postsynaptic (Roger Anwyl) and presynaptic (Marina Lynch) levels, apoptosis in neurodevelopment and neurodegeneration (Áine Kelly, Veronica Campbell, Marina Lynch) – but also include cell signalling in cartilaginous growth (Veronica Campbell) and endothelial turnover (Christopher Bell).

In October 2002, we were delighted to welcome two new staff to the Department as part of strategies to foster collaborative research and teaching. The first of these appointments is a joint research lectureship between Physiology and the TCD Department of Cardiology. When the post was created, it was envisaged as reinforcing research and research training, undergraduate and postgraduate teaching and providing also an element of service delivery in some area that would help enhance clinical research. In particular, it was seen that the incumbent should have a significant role in establishment of the Trinity Cardiovascular Research Institute, a Faculty-wide initiative in health sciences. We have been fortunate to be able to appoint an outstanding young cardiologist, Niall Mulvihill. Niall graduated from UCD in 1992 and holds an MSc in Diagnostic and Investigational Cardiology and an MD from Trinity and came to us from the Clinique Pasteur, Toulouse. His interests in intravascular investigation and endothelial function meld well with ongoing work in both the exercise and cellular communication areas of research in the Department. As well, he will have an important role in validating a graphics-based diagnostic package for cardiac injury that is being developed jointly by Physiology and the Department of Computer Science.

The second appointment is in neuroscience. Tom Connor has come to us from NUI Galway, with particular interests in the cellular biology of cerebral inflammation and the actions of drugs of abuse; themes which are reflected also in the work being carried out in Veronica Campbell's group. Tom's post arose from government recognition that neuroscience is such a strength within Trinity that it warrants a dedicated undergraduate degree. Departments across the faculties of science (Zoology, Biochemistry, Pharmacology), health sciences (Anatomy, Physiology) and humanities (Psychology) will contribute and Tom was appointed as overseer of the structure. Although a well-established pathway in many institutions, the cross-disciplinary nature of this course is a quite revolutionary proposal for our university, where departmental and faculty boundaries to undergraduate education have traditionally been fairly firm.

Those familiar with Trinity will know that, as with most city-centre campuses, shortage of physical space is a recurring problem. Over the last seven years, research staff and postgraduate student numbers in Physiology have risen by 400%, and departmental research funding has increased nearly 10-fold. However, there is very little capacity for creation of additional usable floor space within the existing building, making it difficult to provide satisfactory working or teaching facilities. Recent government strategies to encourage Irish science are going some way towards alleviating this situation through capital funding for building two multidisciplinary institutes, for neuroscience and bioengineering. Members of the various departmental research groups involved with cellular communication have been active in both these initiatives and the new buildings will provide dedicated space for some of their activities. We have hopes that in the medium term funds will also become available for

internal modernization of the Physiology building itself but, for the forthcoming meeting in July, we regret that even Irish hospitality will not allow us to use the Department as a site for any substantial activities.

The Society's 1997 meeting at Trinity was in the spring and participants will no doubt remember sampling those notorious dark brown Irish Easter eggs with creamy collars. The same product will be on offer this summer, but be warned that the marketing trend nowadays is to chill it beyond any vestige of recognition, regardless of the season. Connoisseurs are advised to consult a local gustatory physiologist to locate the preferred dispensaries. Those who were here in 1997 may notice two other changes that have taken place in Dublin since that time. A government ban on free provision of plastic carrier bags by shops has succeeded in making the city (and the surrounding countryside) look rather less like a badly dressed set from *Blade Runner*. In addition, there has been a dramatic rise in the standard and number of restaurants – it might be harder now to track down a plate of Dublin coddle, but at least there are more alternatives on offer.

To reinforce the Dublin experience, meeting coordinators Simon Green and Bernard Donne have been working hard to ensure that the scientific programme will match your expectations and Stuart Warmington is guaranteeing that the social programme will be equally exhausting. Among the scientific offerings will be two symposia: *Synaptic Plasticity and Signalling*, organized by Marina Lynch and *Exercise, Inflammation and Cardiovascular Disease*, organized by Simon Green. An added bonus for early arrivals will be the 7th July Festschrift for Ronan O'Regan *Sensing and Adaptation to Alterations in Respiratory Gases*, organised by his colleagues at our sister department in UCD and held at Earlsfort Terrace. The members of both Departments look forward with pleasure to seeing you in July and hope that your visit is a memorable one.

Christopher Bell
Trinity College, Dublin

Plenary lecturers in Tenerife

Meetings Secretary, Bridget Lumb, at the dinner (right); Len Best, Manchester prepares to introduce plenary lecturer Bernat Soria, Alicante (below); Plenary lecturer Mario Galarreta, Stanford, bottom left; and Erwin Neher delivering his plenary lecture (bottom right)

Plenary speakers Bernat Soria (Alicante) and David Eisner (Manchester) with Susan Wray (Liverpool)

Tenerife uncut...

Austin Elliott reflects on an enjoyable joint meeting with the Spanish Physiological Society

Austin Elliott

No-one really needs telling what a visit to the Canary Islands in February is about: sun, sea, sand and science.

Yes, science. Because it was, of course, purely and simply a burning desire to attend a scientific meeting that brought a large number of British physiologists, together with their suntan lotion, to Puerto de la Cruz in Tenerife a couple of months back for a joint meeting with the Sociedad Española de Ciencias Fisiológicas.

And so they came. From England, from Scotland, from Wales, from Ireland. Crusty veterans, hopeful newly-minted lecturers, battle-scarred postdocs on Prozac and fresh-faced PhD students. Instantly recognisable by the rocket-launcher style poster tubes they carried, fighting their way through the hordes of tourists, they came to Puerto de la Cruz.

Puerto de la Cruz: the meeting site

At first sight Puerto de La Cruz can look like your package-tour nightmare: a stereotypical super-resort, with mile upon mile of multi-storey hotel complexes. But this is deceptive - the nuances of Canaries mass tourism actually mean that Puerto de la Cruz is a rather more tranquil place than you would expect. Definitely not the resort for the 'Jimmy's-English-Bar-All-Day-Fried-Breakfast-satellite-football-24-hour-disco-pub'' Canaries experience. For that you have to head down to Playa de las Americas and Los Cristianos in the south-west of the island. Puerto de la Cruz is much more sedate, and a favourite with Northern European tourists of more mature years – when we arrived these appeared to be almost exclusively German retirees, typically tanned to a deep orange-brown colour. Some hints of the old town of Puerto de la Cruz remain under the high-rises, but most of the place has been thoroughly remodelled by tourism. If the German influence predominates now, the British were probably the first major-league tourists, building the Casino Taoro – the meeting venue – on a hill above the town in the 1890s.

Puerto de la Cruz, a favourite with tourists of mature years

Who's making the next speech?

Spectacular view from the meeting venue to Puerto de la Cruz

The meeting - and that hill

The hill deserves a mention. Despite the steps, it was a pretty steep climb up to the Casino, especially in 20˚C heat. The climb presented meeting participants with a particular dilemma around lunchtime. The vast majority of eating places are down in the town, at the bottom of the hill. Easy enough getting down there – the challenge was getting back up to the venue, especially after a filling helping of local cuisine (specialty: shrunken salted potatoes with green and red *mojos* or sauces - coriander and garlic for the green one, red

peppers, ground almonds and garlic for the red). People arrived at a variety of solutions to the lunch problem, but attendance at the afternoon sessions was considerably lower than at the busy morning ones. Wisely, the plenary lectures had been scheduled for 12.00, or last thing before lunch. This guaranteed a good turnout, and the speakers generally did it justice with lucid and interesting talks. The poster sessions, straight after lunch, also drew a good crowd (although the poster approval sessions at 6.30 pm proved less popular).

The meeting venue - the Casino Taoro - on a hill above the town

BOX 1

Charles Darwin and other visitors – explorers, pirates and naturalists

Tenerife has a long history of British visitors. After the Spanish conquered the island in 1493-5 it – and the other Canaries - became a staging point for ships en route to Africa, America and the Caribbean. The islands also became a target for numerous British raiders. The last and most celebrated of these was Horatio (later Lord) Nelson, whose first independent command of an expedition was an ill-fated attack on Santa Cruz de Tenerife in 1797 that cost him his right arm. [As a consequence modern British tourists on the island favour legless over armless].

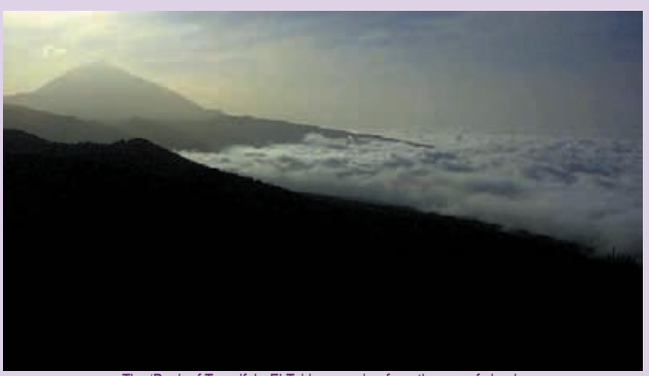
One of the first British scientists to visit Tenerife in search of winter sunshine was Charles Darwin, on the famous voyage of the *Beagle* in 1831-3. However, 'visit' is actually the wrong word; the *Beagle*'s crew were unable to land in Santa Cruz de Tenerife since the *Tinerfeños* were worried that the ship might have brought cholera from England. The Spanish authorities insisted on a 12 day quarantine period. This was too long a wait for Captain Fitzroy of the *Beagle*, and the ship sailed on for the Cape Verde Islands and beyond.

Darwin was crestfallen at being unable to land in Tenerife, as visiting the island and climbing the peak had been a cherished ambition of his. This probably stemmed from Darwin's having read the travel journals of the great German naturalist Alexander von Humboldt (1769-1859) as a student at Cambridge. Von Humboldt, probably the most famous biologist and explorer of the first third of the 19th century, had stopped in Tenerife in 1799 at the beginning of his great South American journey. Later Von Humboldt wrote of Tenerife that:

> '[Apart from] the banks of the Orinoco, the mountain ranges of Peru and the lovely Mexican valleys, I…have never seen a picture as variegated, harmonious and attractive as that offered in the Orotava Valley by the striking contrast between the greenery of vegetation and masses of rock.'

Darwin spent the Spring and early Summer of 1831 trying to organise a trip to Tenerife, along with his university teacher and mentor, the botanist JS Henslow (1796-1861) and other Cambridge friends. Darwin even learnt some Spanish (in contrast to many modern visitors from Britain!). The trip to Tenerife fell through, but Henslow helped Darwin get the job of naturalist on the *Beagle*… and the rest is history. However, Darwin never set foot on Tenerife and had to content himself with watching the sunrise from the deck of the *Beagle*. He recorded in his journal:

> 'The next morning [January 7th 1832] we saw the sun rise… and suddenly illuminate the Peak of Tenerife, whilst the lower parts were veiled in fleecy clouds.'



The 'Peak of Tenerife' - El Teide emerging from the sea of clouds

That hill - the Casino Taoro is behind the trees at the top

Despite the holiday feeling of the meeting, the shadow of events elsewhere was not absent. Almost all the Spanish speakers at the opening ceremony made a point of expressing their sorrow and even anger over the coming war in Iraq. Many of the Spanish participants – and a fair few of the English ones – had customized their meeting badges to feature prominently the words 'No War'. When Bernat Soria showed a slide with the same message in his plenary lecture it drew a spontaneous round of applause.

Apart from the slog up the hill, and the paucity of local luncheries, the Casino Taoro proved a fine choice of venue, with several little surprises. The view down over the gardens to the town was spectacular. And how many meetings have you been to where you could leave a session to be immediately confronted by an enraged peacock in full display? Signs everywhere warned of other wild (or at least free-roaming) animals. Most of the visible ones were waterbirds and seemed contentedly asleep.

One notable feature of the meeting was the amount of whole animal or *in vivo* physiology on display, particularly in the poster sessions. The most spectacular example was the two posters dealing with measuring the ECGs of free-swimming dolphins, but there was plenty more. It almost goes without saying that the overwhelming majority of this *in vivo* work came from Spanish, rather than British, laboratories.

A confession

By this stage, you have probably noticed that this article has totally failed to live up to its 'Uncut' title, which hinted at shocking stories of drunken misbehaviour, salacious tittle-tattle, paparazzi-style shots of Physiological Society worthies staggering out of dodgy nightclubs with mystery blondes at 4 am, etc. etc. Well, I did have lots of that sort of material, but after receiving payment of a suitable amount in cash I have been persuaded that no useful purpose would be served by printing that sort of filth. And that story about the graduate student who accidentally locked herself out on her balcony clad only in a t-shirt is pure urban legend.

Exploring Tenerife

Most Physiological Society members present at the meeting seemed to have managed to escape their UK responsibilities for a full week. This left them with plenty of time to explore Tenerife, although one or two got no further than the nearby banana plantation and the *Loro Parque* wildlife park (more *in vivo* physiology?)

Looking down the island from the north-east - El Teide is to the right

BOX 2

Altitude, oxygen and hangovers

The cable car station at the top of Tenerife's Mount Teide is at 3,555 m above sea level – getting on towards 12,000 feet up. Every physiologist knows that as you go to higher altitudes the air gets thinner, and therefore that your lungs are taking in less oxygen. But how much does your haemoglobin O_2 saturation actually drop? I found any rapid movement a bit of a struggle up there, and my medically-qualified travelling companion helpfully commented that I was looking 'a bit blue around the gills'. Should I have been worrying?

The writer strikes a mock heroic pose

PS: I reckon I would have been justified in telling my friend to *!@# off, as, to quote Ganong's *Review of Medical Physiology*, 20th Edn: 'In unacclimatized subjects mental symptoms such as irritation appear at about 3700 m'.

Some numbers. The barometric pressure falls roughly exponentially as altitude increases, as does the ambient oxygen tension, or pO_2. At 12,000 feet or so, the pO_2 in water-saturated inspired air entering your airways is about 95–100 mm Hg. The actual pO_2 in the alveolar air can be approximated by the equation:

Alveolar pO_2 = Inspired pO_2 – (Alveolar pCO_2/Respiratory Exchange Ratio)

A normal alveolar pCO_2 is around 40 mm Hg but, like most people at 12,000 feet, I was hyperventilating a bit, so figure on a reduced pCO_2, say around 32 mm Hg. Taking the respiratory exchange ratio as 0.8 this gives an alveolar pO_2 of 60 mm Hg or so. This compares to a value of about 100 mm Hg at sea level. Luckily, the haemoglobin dissociation curve means that even at 12,000 feet and with 40% less oxygen in my alveoli my haemoglobin would still have been roughly 90% saturated with O_2 (compared with 97–98% saturation at sea level). So only a mild and tolerable degree of 'hypobaric hypoxia', and my friend was just trying to make me nervous – how kind.

Hyperventilating is one of the main physiological compensation mechanisms for the reduced pO_2 at altitude – but the hyperventilation response takes days to develop fully. Initially the increase in ventilation is only small, because it is limited by the respiratory alkalosis that it causes. This alkalosis will tend to decrease respiration and thus oppose, and limit, the respiration-increasing effect of the hypoxia.

Maintaining hydration at altitude

Which prompts a thought: a person suffering from a swingeing hangover probably has some degree of metabolic acidosis. This will tend to decrease the alkalosis accompanying hyperventilation, and should therefore allow 'better' (more) hyperventilation at the top of the cable car. So if you're going to be on top of a mountain, it helps to be there with a hangover*..! So perhaps the people from the meeting who went up Mount Teide the morning after the dinner knew more than me about respiratory and altitude physiology.

*PS Don't try this at home, to coin a phrase. In fact the adverse effects of hangover-associated dehydration will outweigh the benefits of any acidosis, meaning that that it is definitely better NOT to be hungover at altitude. In addition, if the effects of the alcohol have not worn off, you may simply walk off the edge of the mountain! So better to do what the real climbers do: stay sober on the mountain, but drink heroically at sea level.

For an introduction to respiratory physiology at altitude see J.B. West's classic *Respiratory Physiology - The Essentials* (Williams & Wilkins, 6th English Edition, 2000)

Shoulder-high icefields on El Teide

Avian exercise physiology - Loro Parque style

Tenerife is an island of dramatic contrasts, all packed into just over 200 sq km. Puerto de la Cruz is on the island's north coast, a lush subtropical ribbon of green. Gardens cover pretty much every square foot that is not a tourist hotel, and palm trees, fruit trees, banana plants and orchids are everywhere. Many of the plants growing in abundance – and often to huge sizes – in the gardens are instantly recognisable as ones that you have spent years struggling to raise as pot plants back in the UK.

But Tenerife is more than just Puerto de la Cruz. The true variety of separate eco-zones on the island becomes apparent as you drive inland – and up – from the north coast towards El Teide, the mountain that dominates the north-west of Tenerife. You ascend rapidly from the coast through temperate forest, then through conifer forest, and then to an arid plateau. It was probably this striking range of habitats that attracted Charles Darwin's attention (see box 1). Finally, there is the ascent (by foot for the truly foolhardy, or by cable car for the less ambitious, including me) to near the peak of El Teide, which is Spain's highest mountain at nearly 4000 metres above sea level. Up on El Teide the air is noticeably thin, not to mention cold (see box 2). Slithering along paths between the ice fields provides a definite challenge to lungs and coordination, especially to anyone daft enough to make the ascent clad in the shorts and t-shirt which are pretty much de riguer for Puerto de la Cruz.

Incidentally, quite a number of UK physiologists rather perversely chose to ascend El Teide the day AFTER the final conference dinner. I have heard hyperbaric oxygen touted as a hangover cure, but never *hypo*baric. Perhaps, in the spirit of true experimentalists, they were anxious to test their physical and moral fortitude to the limit. What's that line? 'Whatever does not kill you.. makes you stronger'..

Hasta la vista

So it only remains to say thanks to the Spanish Society – and especially the local organisers – for organising the meeting. It all went off without a hitch – give or take the non-appearance of the abstract books (stuck in Madrid), and the top-secret cloak-and-dagger hotel allocation system (which left many delegates in completely different hotels to the ones they had been told they would be in). But no-one really cared, and the meeting was fun, and everyone enjoyed themselves. And agreed that they would like to have another joint meeting soon.

Austin Elliott

Not a regular sight at Society meetings

Mind the wildlife!

Comments

From Affiliate Members who received Physiological Society grants to go to Tenerife

I presented data to 40-50 people, after which there were a seemingly endless series of questions from groups in Belfast, Glasgow and Spain. The questions were challenging but constructive and gave me ideas for further work.
Karen Noble

The lectures were of great interest, especially the lecture by Prof David Eisner. I thought he was an excellent speaker, and managed to make a difficult subject easy to understand.
Saqib Shabir

I found the meeting interesting and informative and the location was an added bonus.
Karen Jones

My presentation was well received, the questioning being of a clinical and scientific nature reflecting the skill set of the audience. One of the other groups which presented were using the same drug as me but having far fewer problems – I now aim to try their process here.
Susan Pierce

The atmosphere was pleasant and the drink more than drinkable.
Andy Matthew

Tenerife - the postgrads' view

Having had no prior warning that Puerto de la Cruz, Tenerife was a holiday retreat for rich English and German pensioners, it came as rather a surprise to be the youngest by at least 50 years at breakfast in our hotel on the first morning. Friendly as they were, being 22 and 25 we didn't have a great deal in common with them, and a trip round the island to see where and how woollen blankets are made didn't really appeal! We did take a day out before the conference started to Loro Parque, the most visited zoo in Spain – the highlight of which was the *Penguinarium*, with hundreds of penguins that apparently, due to artificial snow, didn't realise they'd been moved from the Antarctic! By far the most spectacular trip though was some treacherous driving up Mount Teide, the highest peak in Spain at 3,715m above sea level. A cable car took us up the final 1,200m, allowing stunning views of the entire coastline of Tenerife and some of the other peaks in the Canary Archipelago.

However, the real reason for the trip was to attend the International Joint Meeting of the Spanish Society of Physiological Sciences and the Physiological Society at the Taoro Congress Centre and Casino. It began well with a welcome reception on the Thursday evening on the terrace of the Congress Centre, with free-flowing champagne cocktail, which helped create the impression on returning to our hotel, that playing Bingo with the other guests was a good idea...it was a very long night!

Friday saw the start of the scientific programme. With over 200 very impressive posters to view, it was a good idea to have them all on display throughout the entire conference. One of us was presenting a poster and got some very positive feedback although we felt it would have been more useful to have the authors by their posters for longer than the one allotted hour. It also seemed a bit excessive to have three and a half hours between this hour and the poster approval sessions at the very end of the day. David Eisner ended the first day with an interesting Plenary Lecture entitled *Calcium in the heart: in and out of control*, rather aptly scheduled for Valentines Day!

The other one of us was presenting an oral communication on the Saturday afternoon. We were impressed with the technical running of the oral session, and in fact all of the sessions and symposia we attended. Saturday evening saw a number of Phys Soc members being introduced to the locally produced banana liqueur; with the general consensus of a big thumbs down, we're afraid!

We chose to go to the Renal Symposium on Saturday morning and to the Synaptic Plasticity Symposium on the Sunday morning, both of which were very informative. The latter was scheduled for a room rather too large for the audience, but it was none the less very interesting. The *Meet the Expert* sessions on Sunday lunchtime sounded intriguing and something yet to be included in a UK meeting. Unfortunately the session we'd planned to go to on mouse genetics was cancelled, but this encouraged us to go to the data interpretation one, the first stats lecture we can honestly say we attended voluntarily! The general outcome of the session appeared to be that stating whether a result is significant or not is useless; P-values should be stated instead, allowing readers to draw their own conclusions. An interesting point, but will it be taken seriously by the scientific world as a whole? We think incorporating *Meet the Expert* sessions into UK Phys Soc meetings would be a good idea, but maybe not to schedule them simultaneously so you have the opportunity to meet more than one expert!

The meeting closed with the Dinner on Sunday night in the Casino. This left us with two free days before our flight back to the UK, ample time to explore some more of the North side of the island and soak up the sun!

Overall we enjoyed the meeting, not only because of the location (although this did help) but the organisation and content were also very impressive. All that's left to say is look out Dublin, and lets hope you can make it even bigger and better than Tenerife 2003!

Left to right: Jenny Griffiths (Birmingham), Thelma Lovick (Birmingham) and Sarah Knight (Cork).

Jenny Griffiths
Department of Physiology
University of Birmingham

Sarah Knight
Department of Phyisology
University College Cork

Tenerife – the supervisor's view

The prospect of a few days recreational physiology in a sunnier clime than the UK in mid-February was undoubtedly an added bonus for Members who attended the joint meeting of the Spanish Society of Physiological Sciences and the Physiological Society held in Tenerife. The arrival in Puerto de la Cruz of a contingent of working physiologists from mainland Spain and the UK was clearly enough to upset the demographics of the local population of predominantly elderly German and British residents whiling away the winter months in the warmth. For those of us of supervisory age and used to making up the extreme right hand tail of the age distribution within university populations in the UK, the chance to be included on the left hand side of the normal distribution, albeit for just a few days, was somehow exhilarating.

The meeting itself was held in the lush surroundings of the Taoro Congress Centre and Taoro Casino with peacocks parading amongst the palm trees and strelitzia and bouganvillia in bloom. There was a wide range of symposia topics on offer and some excellent plenary lectures were given, interspersed between regular communication sessions. At these, the Society's ruling on acceptance of communications was clearly a novel experience for our hosts who, nevertheless, took the ritual in good part. Some 200 posters were displayed in a grandiose chandelier-hung room in the Casino, sporting marble floor, ornate plasterwork and heavy draped curtains. Indeed, in these somewhat incongruous and dimly-lit surroundings, a torch would have been a handy accessory in some of the darker corners of the room.

As with so many meetings, the weather played its part. Attendance was aided greatly by the frequent heavy showers which punctuated the first day. But thereafter the sun shone. What is the value of these joint meetings? They certainly provide the opportunity to sample the physiological activity of another country and they act as a forum for meeting potential collaborators with the possibility of attracting elusive EU funding. They also provide a platform for younger members of the scientific community from both countries to see and be seen by their peers and potential employers and/or future collaborators. Indeed, this is one aspect of joint meetings that we probably don't make enough of. An informal jobs fair over a glass or two of wine or perhaps a series of informal social gatherings loosely based around Special Interest Groups might be worthwhile adjuncts to be considered for our next joint meeting.

Thelma Lovick
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University of Birmingham

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Angel Nadal (above) and *Journal of Physiology* Senior Distribution Assistant, Ann Watson, below

Above: Editorial Board members and guests enjoy the dinner at the Hotel Semiramis

A pot-pourri of ion channels

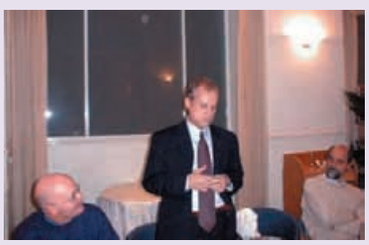
Victor Derkach reports on the Symposium held on 17 December, 2002 at the UCL Physiological Society meeting in honour of Alexander Selyanko (1952-2001)

Top: Alan North (left) and Vladimir Skok

Above, left to right: David Brown, Platon Kostyuk, Susan Brown, Alexander Selyanko Jr, Alex Verkhratsky (foreground)

Below, from left: Peter Smith, Victor Derkach, Alexander Filipov

Bottom, from left: Ljudmila Selyanko, Piotr Bregestovsky, Platon Kostyuk



The Darwin Lecture Theatre at University College London was overcrowded from the beginning, indicating the considerable interest of the British and international neuroscience community in the meeting. The idea of the meeting had been worked out by David Brown of UCL and Piotr Bregestovski of the Pasteur Institute in Paris, and supported by the Physiological Society. It was an international gathering of scientists in honour of an exceptional investigator, dear colleague and close friend Alexander Selyanko, who contributed substantially to modern neuroscience (see the obituary in the spring issue 2002 of *Physiology News*: http://www.physoc.org). It was a tribute to Alex's memory, and the Department of Pharmacology contributed outstandingly to this very special event. Alexander spent perhaps the most productive years of his career on the 'B' floor of the Department in David Brown's lab. The meeting was a very logical and fitting closure for Alexander's family, and for scientists from many countries whose life and research were affected in different ways by interactions with Alexander. It was a very emotional expression of people's feelings toward their extraordinary colleague and friend, and a celebration of his life with high quality presentations. Indeed, the symposium exposed only the tip of the iceberg, as so many investigators around the world expressed their sorrow in their testimonials toward this premature loss. (http://www.ucl.ac.uk/Pharmacology/asmemorial/as.html)

What was very special and highly admirable about this Symposium was that it wonderfully combined high quality scientific talks with a very moving atmosphere, involving numerous photos and recollections of Alexander. David Brown in his opening remarks gave an emotional start to the event. He introduced the audience to previously unpublished work of Alexander on M-channels and emphasized once again what a marvellous scientist Alex was. About half of his productive research career Alexander devoted to so-called M-channels, the potassium channel genes broadly expressed throughout the central and peripheral nervous systems and prominently contributing to the regulation of neuronal excitability.

However, Alexander's recognition as a first-rate scientist came from his pioneering studies on neuronal nicotinic synaptic transmission and receptors when in the laboratory of Vladimir Skok, back in the Bogomoletz Institute of Physiology in Kiev. His first teacher and mentor, Professor Skok carried on the event with memories of Alexander and with new data continuing the lab quest in the challenging field of nicotinic receptors. The subunit composition of neuronal nicotinic receptors remains the hottest issue there, and the latest developments from the lab indicate that nicotinic receptors of different subunit composition may uniquely control properties of fast excitatory synaptic transmission mediated by acetylcholine in different ganglia of the autonomic nervous system.

Piotr Bregestovski and Victor Derkach were understandably emotional about Alexander in their talks. Both knew Alex very well, over many years. Dr Bregestovski delivered a superb story on the special type of glycine-gated chloride-selective ion channels specifically expressed in the spinal cord and in the midbrain where they regulate motor and sensory pathways. It turns out that the inhibitory synaptic

transmission mediated by these receptors is under a tight control by intracellular Ca^{2+}. The results raise an intriguing possibility that this family of receptors may share similar Ca^{2+}-dependent signaling pathways that also regulate the activity of other neurotransmitter receptors. Victor Derkach introduced a new and alternative approach for measuring fundamental channel properties – single-channel current, open probability and the number of functional channels in a population – by utilizing their simultaneously closed states through silence analysis. Application of this technique to the GluR1 AMPA receptor provided independent evidence for receptor regulation by calcium-calmodulin dependent protein kinase CaMKII, the kinase broadly implicated in the formation of learning and memory by converting brief Ca^{2+} influxes in central glutamatergic synapses into a persistent increase of their strength.

Trevor Smart reported versatile and insightful studies on structure-functional relationships at ionotropic $GABA_A$ receptors, the receptors controlling the majority of brain functions by providing inhibitory synaptic input to many brain areas. No wonder these receptors are a tight focus of many labs and the pharmaceutical industry. His findings clearly indicated that structural pockets created by inter-subunit interactions are critical determinants for the action of modulatory substances like Zn^{2+} for example. One of the wisdoms of these studies is that knowledge of the 3-D conformational arrangements of the subunits is essential for our further understanding of the properties of $GABA_A$ receptors and the search for more potent and specific modulatory drugs. The conclusions nicely echoed studies of other neurotransmitter receptors and indicated further directions for cracking open the receptor's secrets.

Alan North gave a first-rate talk. He introduced a very original and clever approach to the intricate problem of subunit composition and stoichiometry of ATP-gated P2X receptors. Professor North convincingly demonstrated how the bridging of adjoining subunits in the receptor by utilizing disulfide bonds can be insightful for receptor subunit make-up. The data strongly argued for a trimeric assembly of P2X receptors with a particular subunit stoichiometry for heteromeric receptors. P2X receptors thus make a unique case among members of the super-family of ligand-gated ion channels. The demonstrated approach will likely benefit neighbouring fields as well, in studies elucidating the subunit composition of other kinds of ligand- and voltage-gated ion channels..

Left to right: Alasdair Gibb, Annette Dolphin, Alistair Mathie and David McKinnon

Not surprisingly the other half of the symposium was dedicated to potassium channels, perhaps the most diverse ionic conductances in the nervous system, and critically involved in the regulation of cell excitability. Neil Marrion opened this array of excellent presentations with an elegant study on the BK-type K^+ channel. The long-standing puzzle there was the molecular mechanism requiring intracellular Ca^{2+} for channel activity. The study shed light on an appealing possibility that the Ca^{2+}/calmodulin-dependent phosphatase calcineurin is involved in direct protein-protein interactions with the channel, resulting in the modulation of channel properties in a Ca^{2+}-dependent manner. Alistair Mathie described some interesting research on the subunit composition of two-pore domain potassium channels, the complex system of background K^+ channels controlling neuronal excitability and consisting of at least 14 different members. By testing heterodimers made of different TASK-type subunits and comparison with native K^+ background conductance, the study highlighted the subunit composition of endogeneous two-pore domain potassium channels expressed in neurons. Brian Robertson gave a delightful talk on a really diverse picture of channels involved in the regulation of neuronal activity in cerebellum. He showed how the precise orchestration of channel activity shapes a particular pattern of cell excitation.

David McKinnon received perhaps most of the attention in the second

Mark Shapiro (left), Joanna Winks, Patrick Delmas and Fe Abogadie

half of the meeting, as his lab had already tremendously contributed to the field of potassium channels by cloning and studying the genes of the M-channel family. In this superb presentation Dr McKinnon showed a very uneven expression of different members of the KChIP family of K^+ channel across different functional areas in the ventricle of canine and human heart. The findings revealed an intrinsic link between area-specific differences in the generation of action potentials and the expression gradient of these ion channels. Thereby, the study provided fundamental insights into the genetic basis of ionic conductances controlling myocardial function.

Mark Shapiro in his dazzling talk offered molecular insights into Ca^{2+}-dependent regulation of M-channels. This multidisciplinary study indicated that the formation of Ca^{2+}-calmodulin complexes and their interactions with the channel is probably the driving force behind the regulatory mechanism. Peter Smith showed a meticulous investigation into the signaling pathway in neurons involved in the M-current suppression mediated by extracellular ATP acting at metabotropic P2Y receptors. The data convincingly testified to the involvement of phospholipase C and indicated the requirement for phosphoinositide 4-kinase activity for the recovery from suppression. These findings are in nice accord with studies of other groups and in particular with a recent report from Bertil's Hille lab on the mechanism of bi-directional modulation of recombinant M-channels.

It was quite symbolic when Gayle Passmore concluded the event with one of the most impressive pieces of research of the meeting, a study where Alexander made his final contribution to the collective work from David's Brown lab. The study nicely connected basic research with immediate clinical perspectives, having direct implications for pain management strategies. It explored the attractive idea of handling pain processing by targeting the excitability of DRG neurons, transmitting neurropathic pain, through modifying the activity of M-channels expressed in their plasma membrane. This multilevel study clearly demonstrated the efficient control over firing activity of nociceptors and pain-related behavior obtained by enhancing M-type K^+ channel activity. The findings implicate a new avenue for pain management, suggesting a novel and alternative approach to the problem of pain handling and related therapy.

Andy Constanti, Gayle Passmore, Brian Robertson and Trevor Smart

The symposium dinner was an event itself, exceptionally warm and friendly, with plenty of emotions. Mark Shapiro, Piotr Bregestovski, Victor Derkach, Alex Verkhratsky, Trevor Smart, Jon Robbins, Vladimir Skok, Alan North and Platon Kostyuk spoke on the symposium success and the role of individuals like Alexander in science and in our lives. It was a really moving moment of the dinner when Ljudmila Selyanko expressed the family's gratitude to all participating people. Everyone left emotionally touched.

The Symposium made a strong statement in honour of a genuine scientist and an exquisite celebration of his life. As my colleagues noted:

'I was very happy to be a part of the symposium'
Mark Shapiro, University of Texas, San Antonio, USA

'...the atmosphere was very warm and pleasant'
Piotr Bregestovski, Pasteur Institute, Paris, France

'The symposium was very good and ... David [Brown] did an excellent job'
Trevor Smart, University College London, UK

'We really had a very nice meeting in London'
Svetlana Fedulova, Bogomoletz Institute, Kiev, Ukraine

'I thoroughly enjoyed the day. I know Alex was loved and admired by a lot of us and will be dearly missed. I feel that I was honoured to have known him and to be part of celebrating his life'
Neil Marrion, University of Bristol, UK

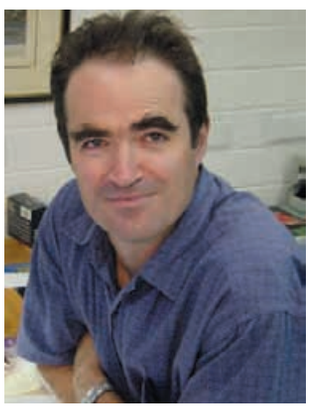
'I thought the symposium was very successful and a good tribute to Alex'
David McKinnon, SUNY, Stony Brook, New York, USA

Many thanks to the Physiological Society, people at the Department of Pharmacology and Professor David Brown for this extraordinarily noble and memorable event.

Victor Derkach
Vollum Institute, Portland, Oregon, USA

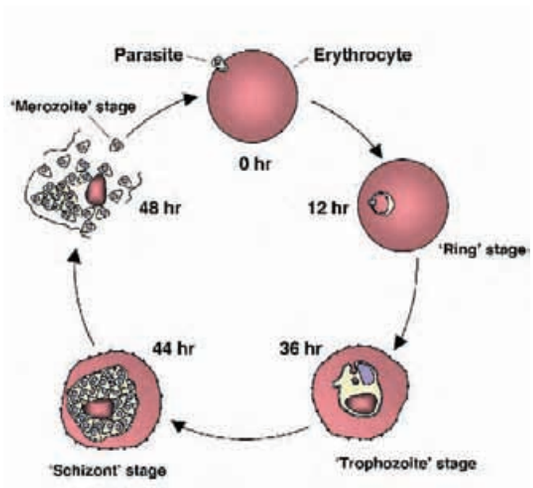
Ion channels in the 'malaria-infected' red blood cell

Kiaran Kirk explains how recent electrophysiological studies have provided new insights into the mechanisms by which the malaria parasite brings about a dramatic increase in the permeability of the red blood cell membrane to ions and nutrients



Kiaran Kirk

Some hours after the invasion of a red blood cell by the single-celled malaria parasite (Fig. 1) there are profound changes in the physiological properties of the red cell membrane. A host of small molecules have been shown to enter infected cells more rapidly than they do normal, uninfected erythrocytes and this has been attributed to the presence in the infected cell membrane of so-called 'new permeability pathways'. These pathways are believed to serve a number of physiological roles, including the influx into the infected cell of nutrients required by the parasite, and the efflux of potentially hazardous waste products derived from the parasite's active metabolism. The nature of these new pathways is not well understood, and their identity remains unknown. Over the last three years, however, electrophysiological studies from a number of different groups have provided new insights into the mechanisms underlying the altered membrane physiology of the parasitised red cell.



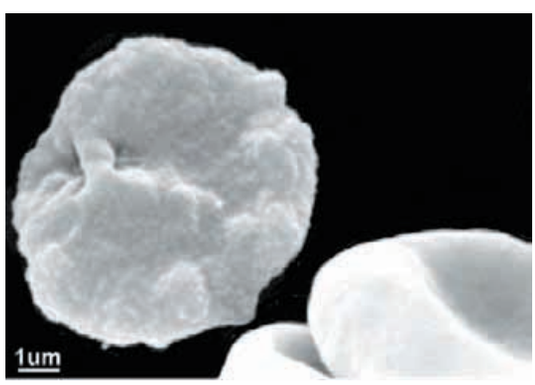


Figure 1. Schematic representation of the (~48 hour) red blood cell stage of the life cycle of the human malaria parasite, *Plasmodium falciparum*, and scanning electronmicrograph showing a mature 'trophozoite-stage' infected erythrocyte together with two uninfected erythrocytes. The scanning electronmicrograph was provided by Professor D.J.P. Ferguson, University of Oxford

Early studies of the altered permeability of erythrocytes infected with the malaria parasite entailed the use of either radiolabelled transport substrates or measurements of the rate of haemolysis of infected cells suspended in isosmotic solutions of the substrate of interest. From these types of experiments it was evident that the pathways induced by the parasite accommodate a very wide range of low molecular weight solutes, including amino acids, sugars, nucleosides, vitamins and both inorganic and organic ions. Quantitative comparisons of influx rates showed the pathways to have a marked preference for anions over cations. Transport was shown to be non-saturable, and to be inhibited (with similar potency for a range of different transport substrates) by a range of classical 'anion transport inhibitors', including compounds such as furosemide niflumic acid, glibenclamide and 5-nitro-2-(3-phenylpropylamino)-benzoic acid (or NPPB as it is better known). Together, the available transport data are consistent with much, if not all, of the increased flux of solutes into parasitised erythrocytes being via anion-selective (but nevertheless cation-permeable) channels of a single type.

Ion-selective channels are best studied using electrophysiological techniques. Human erythrocytes are not the easiest cells to study electrophysiologically; their small size, and their ability to squeeze through narrow openings (and to thereby disappear up the barrel of a glass microelectrode), make them difficult targets. Nevertheless, several groups have recently been successful in making electrophysiological recordings of both uninfected and malaria-infected human erythrocytes.

The first detailed characterisation of the electrophysiological characteristics of infected human erythrocyte came from Desai and colleagues, who reported that in cells infected with mature parasites the whole-cell current is 150-fold larger than that of uninfected erythrocytes (Desai *et al.* 2000). The increased current was attributed to the activity of a small conductance (< 10 pS) anion channel. The channel was inwardly rectifying (i.e. it passed current into the cell more readily than it did out of the cell), it was present at an estimated 1000 copies per cell, and it showed complex gating behaviour. The ion selectivity and pharmacological properties of the whole-cell currents showed close similarities to those reported previously on the basis of radiotracer flux and haemolysis experiments for the new permeability pathways induced by the parasite. Using a mathematical model to obtain quantitative permeability estimates from haemolysis experiments, the same group has shown recently that for several solutes there is good quantitative agreement between the permeabilities estimated on the basis of haemolysis experiments, radiotracer flux measurements and whole-cell current recordings (Wagner *et al.,* 2003), consistent with the channel underlying the inwardly-rectifying current being wholly responsible for the increased transport of at least some solutes into the infected cell.

Somewhat different results were obtained in a study by Huber *et al.* (2002a) who, in whole-cell recordings of infected human erythrocytes, identified *two* discrete anion conductances, differing from one another both in their inhibitor-sensitivity and in their voltage-dependence. One was outwardly rectifying and the other inwardly rectifying. The conductances were diminished on treatment of the parasitised cells with reducing agents, and the same manoeuvre was shown to slow the rate of haemolysis of parasitised cells suspended in an isosmotic solution of the polyol sorbitol. In the same study it was shown that similar anion conductances could be induced in uninfected erythrocytes by exposing them to oxidizing agents, and that oxidative stress also induced haemolysis of uninfected cells suspended in an isosmotic sorbitol solution. On the basis of these observations it was postulated that the new permeability pathways induced in infected cells are endogenous erythrocyte channels, activated in response to the oxidative stress to which the host cell is subjected by the intracellular parasite. Of the two anion conductances characterized it was actually the outwardly rectifying conductance that had a pharmacological profile closest to that of the parasite-induced permeability characterised previously. A preliminary report of a differential effect of different polyols on the outwardly rectifying conductance in infected cells (Huber *et al.* 2002b) is also consistent with the hypothesis that the channels underlying this conductance are permeable to small organic solutes of the sort known to enter the infected cell via the parasite-induced pathways.

The same group has reported the presence in uninfected human erythrocytes of an oxidation-induced cation conductance (Duranton *et al.* 2002) and have presented preliminary evidence that this conductance is activated in *P. falciparum*-infected cells (Tanneur *et al.* 2002). The conductance shows the same cation selectivity as has been reported for the transport of monovalent inorganic cations via parasite-induced pathways (i.e. $Cs^+ > K^+ > Na^+ > Li^+$; Staines *et al.* 2001), as well as showing an anion-dependence reminiscent of the anion-dependence of the uptake of both organic and inorganic cations into parasitised cells (e.g. Staines *et al.* 2001).

In another recent paper (Egée *et al.* 2002) a third group has obtained patch-clamp recordings of both uninfected and infected erythrocytes and have presented evidence for the activity in infected cells of an endogenous anion-selective channel, with a low linear conductance (~15 pS) and having properties similar, though not identical, to those

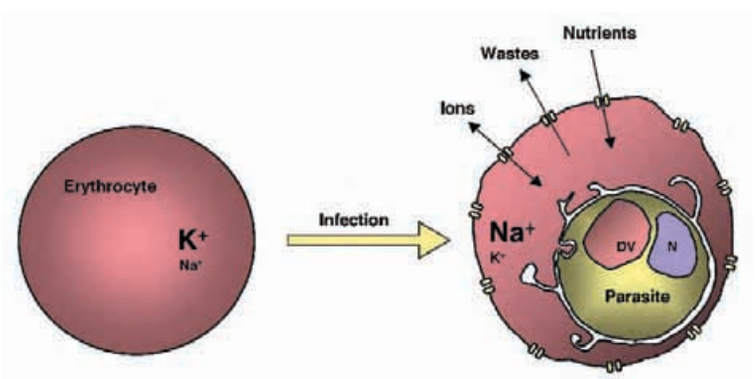


Figure 2. Schematic illustration of the physiological changes induced by the malaria parasite in its host red blood cell. The mechanism by which the intracellular parasite activates and/or inserts channels in the host cell membrane, and the identity of the channels themselves, are still to be resolved

of the parasite-induced channel originally described by Desai *et al.* (2000). Channels with the same properties could be activated in uninfected human erythrocytes either by the combination of protein kinase A and ATP, or by membrane stretch, raising the possibility that either one of these mechanisms might be involved in the activation of the channels in infected cells. In a small proportion (<5%) of excised inside-out patch-clamp experiments on uninfected cells a second anion channel, showing outward rectification, was observed. But whereas Huber *et al.* (2002a) observed an outwardly rectifying current in a majority of infected erythrocytes and have postulated that the enhanced permeability of infected cells to small organic solutes is attributable to the channels underlying this current, Egée *et al.* report that the outwardly rectifying channel was "never observed in infected cell patches". They, like Desai *et al.* (2000), attributed the increased conductance of the parasitised erythrocyte membrane to a single channel type.

In summary, it is clear from the spate of recent electrophysiological studies of erythrocytes infected with the malaria parasite that the membrane of the parasitized erythrocyte has a much higher electrical conductance than that of uninfected erythrocytes. The identity and number of channel-types underlying this increased conductance is less clear. There is some evidence that the channel activity observed in infected erythrocytes is attributable to the activation of endogenous, normally quiescent, erythrocyte channels and a number of different mechanisms of channel activation have been proposed (oxidative stress, membrane stretch, protein phosphorylation). The channel originally characterized by Desai *et al.* (2000), and showing a close (though not exact) resemblance to that described by Egée *et al.* (2002) does share many characteristics with the pathways responsible for the increased permeability uptake by parasitized erythrocytes of a wide range of low molecular weight solutes. This is consistent with, though not proof of, this channel underlying the increased permeability of the infected cell. However, the relationship between this channel and the multiple conductances reported by Huber and colleagues to be active in the membrane of parasitized erythrocytes (Huber *et al.* 2002a; Tanneur *et al.* 2002) is yet to be clarified.

Whatever the electrophysiological characteristics and molecular identity of the pathways responsible for the increased transport rates in the parasitized red blood cell, there is growing evidence of the significance of these pathways for the intracellular parasite and its host cell (Fig. 2). At least one essential nutrient required by the parasite (the water soluble vitamin pantothenic acid) has been shown to be reliant on these pathways to gain entry into the cell (Saliba *et al.* 1998). Recent studies using mathematical models developed by Lew and colleagues have revealed that the leakage of Na^+ and K^+ (down their respective gradients) via the parasite-induced pathways, is responsible for the conversion of the erythrocyte cytosol from a high K^+/low Na^+ medium to a high Na^+/low K^+ environment for the intracellular parasite (Staines *et al.* 2001; Lew *et al.* 2003). Observations such as these highlight potentially important roles for the parasite-induced pathways in the infected cell and underscore ongoing interest in the possibility that these pathways might be suitable targets for new and much-needed antimalarial drugs.

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Staff update!

Casey Early

Casey joined the Society's London office in February 2003 to take over from David Sewell as the accountant. He is a qualified Chartered Accountant and had previously worked with the firms' auditors, haysmacintyre, for four years. Casey studied at Loughborough University and obtained a BSc in Maths with Economics, followed by an MSc in Financial Economics. Casey's interests include travelling, films and weight training.

Sai Pathmanathan

Sai joined the Society in January 2003 as the new Education Officer and is taking on schools' liaison and some of the external relations work. Sai completed her BSc (Hons) in Biological Sciences at Queen Mary and Westfield, University of London and had just finished a DPhil in Neurosciences at the Department of Biochemistry in Oxford before joining the Society. Sai's interests include music, arts and crafts and voluntary work with youth and homeless.

Large multiprotein complexes are involved in short-term regulation of the epithelial brush border Na+/H+ exchanger NHE3

Many transport proteins exist in large macromolecular complexes that contain scaffold proteins, signalling molecules, kinases and phosphatases. Here Mark Donowitz and colleagues describe how the Na/H antiporter NHE3 is regulated by the dynamic assembly of protein complexes

Our studies reflect the overlap of two themes. One of the most commonly used mechanisms for rapid regulation of transport protein function is regulated endo and exocytosis. In addition, signal transduction has been recognized to often involve large multiprotein complexes. We have described that short term regulation of the epithelial brush border Na/H exchanger NHE3 often occurs by regulated endo and exocytosis that requires NHE3 to be present in large multiprotein complexes which include the two-PDZ domain containing proteins E3KARP (NHE3 kinase A regulatory protein) or NHERF (Na/H exchange regulatory factor).

NHE3 and neutral NaCl absorption in the small intestine, in which NHE3 is linked to a brush border Cl/HCO_3 exchanger, are rapidly regulated as part of digestive physiology with eating related stimulation and inhibition mimicked by neurohumoral agents/growth factors. In addition, as part of the pathobiology of diarrheal diseases, neutral NaCl absorption and NHE3 are inhibited by intestinal secretagogues. Exploration of the mechanism of this regulation has largely advanced based on studies of intact ileal mucosa and cell culture models of engineered NHE3 expressed in epithelial cells such as Caco-2 and OK and NHE null fibroblasts. In both tissue and cell culture models, regulation of NHE3 was associated with rapid changes in the amount of plasma membrane NHE3 either by stimulation of endocytosis or exocytosis, with variable additional contribution of changes in NHE3 turnover number. For instance, in ileal Na absorptive cells, stimulation of NHE3 by $\alpha 2$ adrenergic agonists or growth factors (EGF) was associated with an increase in the percent of NHE3 in the brush border, while inhibition of NHE3 by the cholinergic agonist carbachol was associated with a decrease in plasma membrane NHE3.

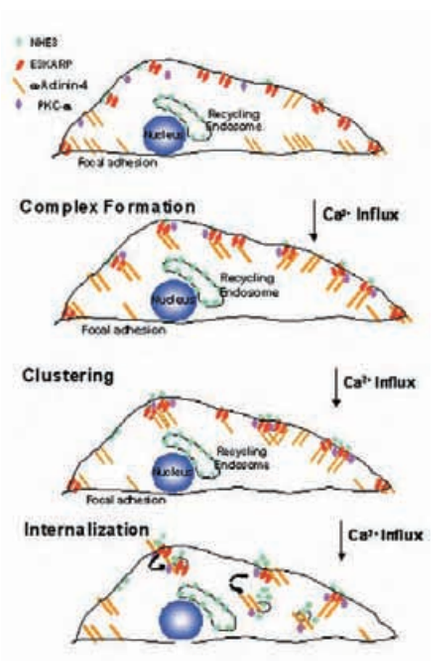

Figure 1. Putative Steps in Ca^{2+} Regulation of NHE3 Involving a Plasma Membrane E3KARP-Based Complex.

That NHE3 regulation involves multiprotein complexes has been demonstrated in ileal Na absorptive cells, the Caco-2 colon cancer cell line, the OK proximal tubule cell line from opossum, and PS120 fibroblasts. In all of these cells, NHE3 exists in complexes up to 900,000 kDa, and in ileal brush border NHE3 complexes increased in size with Ca^{2+} elevation (carbachol). The explanation for the large size of NHE3 complexes and the changes appears to be that NHE3 exists in a multiprotein complex under basal conditions and these change by adding or subtracting signaling or regulatory molecules as part of the NHE3 trafficking that occurs under basal conditions and that which occurs as part of rapid NHE3 regulation.

Surprisingly, when NHE3 regulation was studied in NHE null fibroblasts, most second messenger regulation failed to occur. This suggested to us that some regulatory component was missing from these cells. A yeast two-hybrid/proteomics approach was used to identify one of the interacting proteins and continues as the strategy to identify proteins involved in NHE3 regulation. One such regulatory protein was identified as interacting with the NHE3 C-terminus by yeast two-hybrid screening. The protein identified was E3KARP, which was related to another cloned protein, NHERF. The importance of NHE3 binding to E3KARP was first identified for cAMP regulation of NHE3. When E3AKRP or NHERF were expressed in PS120 cells, they reconstituted cAMP inhibition of NHE3. NHERF and E3KARP are scaffold proteins which contain two PDZ domains and a C-terminal ERM binding domain. Studies largely by Yun, Lamprecht, Weinman, Shenilokar and our group have demonstrated that second messenger regulation of NHE3 requires NHE3 to be present in large multiprotein complexes in which NHE3 binds E3KARP and/or NHERF and these PDZ domain proteins also scaffold at least some of the other proteins in the multiprotein complexes. Best studied are cAMP and Ca^{2+} regulation of NHE3. For cAMP regulation of NHE3, ezrin binding to E3KARP is necessary with ezrin acting as an AKAP (protein kinase A anchoring protein)

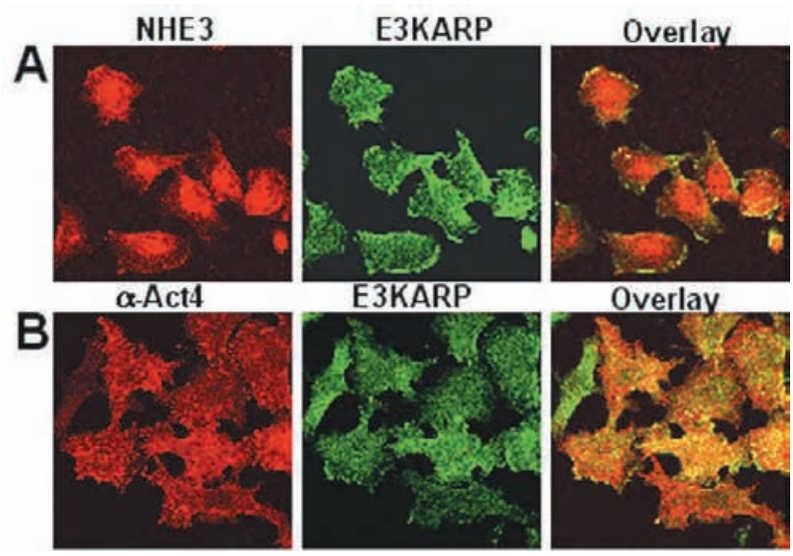

Figure 2. Confocal Microscopic Studies of PS120/E3KARP/NHE3 Studied Before Ionomycin Treatment.- Surface NHE3 is Diffuse: Shown are 0.3 µm xy sections through the middle of fixed PS120/E3KARP/NHE3 cells: A) NHE3 (left) and E3KARP (middle) panels are merged in right panel to show overlap; B) α-actinin-4 (left) and E3KARP (middle) panels are merged in right panel.

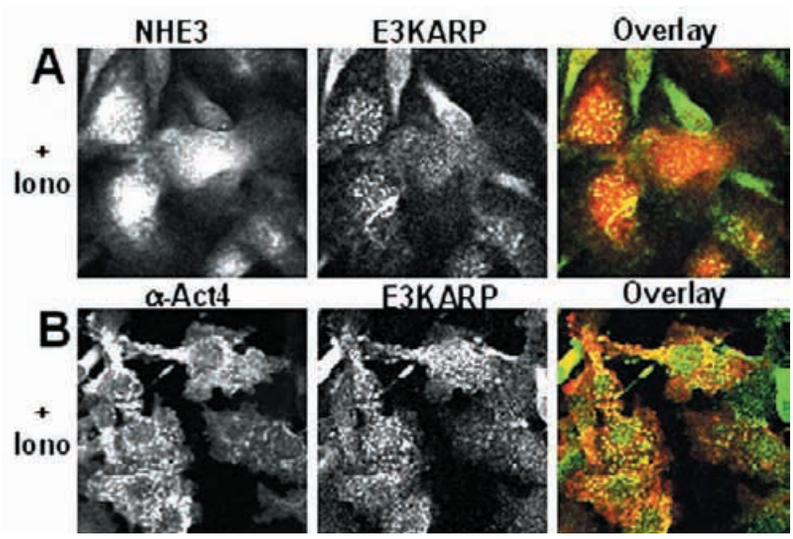

Figure 3. Confocal Microscopy of PS120/E3KARP/NHE3 Cells as in Fig. 2 were Studied 10 min After Exposure to 2 µM Ionomycin – Surface NHE3 is Clustered: Shown are 0.3 µm xy sections through the middle of fixed cells: A) NHE3 (left), and E3KARP (center) are merged in right panel; B) α-actinin-4 (left), and E3KARP (center) are merged in the right panel.

for PKAII. One function of this multiprotein complex is to allow PKAII to phosphorylate NHE3.

Components of these multiprotein complexes continue to be identified, again using proteomic approaches. For Ca^{2+} regulation of NHE3, in addition to E3KARP, α-actinin-4 and protein kinase Cα join the complex when Ca^{2+} is elevated **(Figs. 1-3).** Actinin-4 is necessary for formation of the NHE3 complex and for NHE3 internalization, while PKCα is necessary for the complex internalization. While some basal association of PKCα with E3KARP exists, this is increased with Ca^{2+} elevation. While both NHERF and E3KARP reconstitute cAMP regulation, only E3KARP can reconstitute Ca^{2+} regulation.

The mechanism of specificity of E3KARP in NHE3 regulation has been identified in several cases to be due to its binding of proteins involved in NHE3 regulation and for bringing them into the NHE3 complex. For instance, for Ca^{2+} regulation of NHE3, this results from E3KARP binding to α-actinin-4.

What is the role in NHE3 regulation of these multiprotein complexes? For cAMP and Ca^{2+} inhibition of NHE3, the complexes are involved in decreasing the surface amount of NHE3. The mechanism of changes in surface NHE3 involve changes in trafficking. For instance, cAMP stimulates endocytosis and inhibits exocytosis. In addition, cAMP decreases the NHE3 half-life. Thus PDZ domain protein related NHE3 complexes regulate NHE3 trafficking, with demonstrated changes in both endo and exocytosis.

Current understanding has painted a general picture of PDZ domain proteins being involved in regulation of NHE3 by taking part in formation of large NHE3-containing complexes which change as part of some signal transduction regulation of NHE3 and involve mechanisms that alter rates of NHE3 trafficking, as well as affecting NHE3 turnover number. However, this area is just being defined with many questions outstanding. These include: 1) What are the full compliment of proteins in the NHE3 complexes? 2) What is the nature of the changes in these complexes which occur with signal transduction? 3) What is the role of each component of these complexes in NHE3 regulation? 4) What aspects of NHE3 handling are affected by each complex component and by the signaling pathways activated (changes in endocytosis, exocytosis, half-life, distribution to lysosomes or proteosomes vs recycling); 5) Which of the complex components, if any, traffick with NHE3?

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Public understanding of science: mind the gap

The best way to engage in constructive debate, especially on controversial topics, is to try to narrow the gap between theory and practice. John Lee explains the importance of letting the public see what you are doing

John Lee

As every parent knows, what we say and what we do are not always the same thing. In professional life, judging from the many 'Guideline' and 'Best Practice' documents that I get to read, they are usually not the same thing. The documents tend to be written for a fantasy world where activities are discrete and the only thing in your diary for half a day is to give your full and undivided attention to the specific task which the writer was asked to address. In actual fact, of course, everything is quite a lot messier. What we tend to do, as responsible professionals working in the real world, is try to find a way through the day which gets our jobs done as well as they reasonably can be, while not necessarily dotting every 'i' or crossing every 't' as we go. The same obviously applies to the difference between the way we do science and the way we write it down in scientific publications. Shock, horror. Did I write that? But actually it is important to be explicitly aware of this gap between theory and practice, between the world we actually work in and the one which inevitably seems to be conjured up (even by otherwise sensible, practical people) when we try to write it down.

One reason why it is so important, is that this theory/practice gap can fundamentally interfere with the way we represent what we do to the wider world. The trouble is that professionals in all walks of life have fallen into the habit of pretending to themselves and their colleagues that the idealised version is the way things 'really' are and, what is worse, they tend to represent only this version to the general public. Of course, there are any number of ways of justifying this stance and most of the time the gap is indeed small and fairly insignificant. But the problem is that there is great potential here for drift. What started years ago as a relatively informal grant-reviewing process for a fairly small number of scientists turns into a huge mega-industry processing vast sums of money, in which great pressures are generated to inflate the significance of results, as well as the likely outcomes of the next project application. What started as a well-meaning attempt to see whether a disease can be detected early turns into a vast politically-driven screening programme, where dubious benefits and significant downsides are swept away by 'standard' working practices, impenetrable statistics and affirmatory language.

This is probably inevitable. Those of us who understand that almost every activity carries with it a 'Mind the gap' sign shrug our shoulders and carry on, doing our best and playing the game to a greater or lesser extent depending on our personal agendas. Those who are less aware of the invisible signs can be seen scurrying around with worried frowns as they try to locate and deal with all those 'i's and 't's, or, alternatively, if they are a more dominant individual, can be seen banging tables and fulminating over why this or that hasn't been attended to by someone else. Most of the time we only have to deal with colleagues who have been similarly professionalised and this system allows us to earn our daily bread (the most important point) and even works after a fashion. But what about when we have to tell the wider world what we're doing?

This is when the gaps can really start to widen. Generally-speaking, most professionals espouse the idea that wider public understanding of whatever it is they are doing would be a Good Idea. But there is a large caveat. The professional usually presents their topic without 'Mind the gap' signs. There are the obvious justifications for this – 'Present a clear story', 'Don't confuse people with details' and so on. But in fact a hidden, powerful and somewhat less creditable reason is that 'greater public understanding' is usually coupled, in the professional's mind, with a silent 'And therefore more positive attitude to what I do.' So there are strong incentives to paint a rosy picture, even when the benefits of a particular activity are fairly obvious.

But what about when a professional activity is perceived as controversial? What if there's a risk that even when the wider public are better informed about it, they like it even less, perhaps even want to stop or greatly curtail it? In this situation most professionals are no different from other people – they react to preserve their way of life. They are even more likely to present an over-optimistic picture, even less likely to acknowledge possible problems. They

stretch the gap as far as they dare, hoping that the debate will go away, leaving them once again in peace and misunderstood isolation.

Yet this is not really the right way to go about constructive debate. What if your over-rosy picture is found out? Then you risk being labelled as a propagandist and suffering a backlash against even a reasonable position. Even if you get the debate to go away or rumble on more quietly, you are likely to be in a more difficult situation than before - more entrenched, less likely to engage in further discussion, feeling abused and demoralised, and being perceived by the wider world as disengaged and secretive.

On the contrary, my view is that the best way to engage in constructive debate, especially on controversial topics is to try to narrow the gap. To let the public see what you are doing. To present the realistic possibilities and the difficulties as honestly as possible. To try to answer questions without hyperbole. To try and avoid the paternalistic 'of course I know best, I've spent my whole life working on this thing' attitude and trust to the fact that clearly explained issues tell their own story. To accept that, in your enthusiasm, you may have previously over-egged your case and be willing to step back if necessary. To understand that consensus may have moved away from where you thought it was when you started your activity and be willing to consider changing tack. This can be particularly hard to do in basic science or medicine, where years and decades of work can be driven purely by their perceived potential, where that 'might' in the conclusions of endless papers can accidentally harden into the nature of a faith. Obviously, it is precisely to try and avoid this situation (and the moral quagmire into which it can lead) that the professional has a duty to be explicitly aware of and honest about the gap between reality and theory. After all, history is pretty clear on the fact that the vast majority of our brilliant ideas lead nowhere and have no practical applications, now or ever.

I had recent personal experience of a situation which generated widespread public interest and controversy, but which helped to confirm the views I have expressed above. As a histopathologist, I regularly perform autopsies, and I do believe that this procedure continues to have an important role in medical practice. An autopsy is not rocket science, but it does provide explanations for the bereaved, important feedback to medical practitioners (we all know what can happen to open loop systems), and statistics of varying utility concerning causes of death. In November 2002, Gunther von Hagens, originator of the (in my opinion) excellent Body Worlds exhibition which attracted 700,000 visitors in London, announced that he would be performing a public autopsy – the first for 172 years – on an embalmed body. I was invited to be present and to commentate.

Whether or not to agree to participate was a tricky decision for me. On the one hand, I fundamentally believe that people do have a right to see for themselves how things are done and to make up their own minds. On the other hand, there was a tremendous establishment, professional and media furore against the event. Some of this centred on whether or not such a demonstration would actually be legal. Suffice it to say here that I had the advantage of seeing the legal correspondence, from which it was pretty clear that this event was not proscribed by current English law. But most of the antipathy to this autopsy seemed to be a straight-forward taboo reaction. The authorities seemed to feel that they might somehow get into trouble for allowing it to proceed, medical commentators - in spite of rhetorically approving public education on this issue - felt it was insensitive, was not the right way to go about it, etc etc, and basically wanted it to go away, while the media (with a few notable and thoughtful exceptions) were generally appalling, prejudged the event and wrote mainly nonsense.

After a lot of thought, I decided to participate, because I felt that allowing people to see for themselves would uphold an important principle and would also lead to a more realistic appreciation of what an autopsy actually involves (narrowing the gap). I should say that I had also satisfied myself that the full consent of the subject of this autopsy had been obtained. This was obviously, in various ways, a risky event to take part in. But in spite of the apocalyptic predictions made by some people beforehand, the feedback I have received concerning the event has been overwhelmingly positive. Although a few people clearly found seeing the procedure shocking, most were genuinely interested and valued the opportunity to ask their own questions and draw their own conclusions. The open and honest demonstration which von Hagens organised has helped replace fear with knowledge, allowing many people to be able to visualise the nature of an autopsy, whereas before they could not.

More importantly, I believe that the public autopsy was an event which marks something of a watershed in treating the general public like adults. As far as I can tell, it has done little harm, but has paved the way for more open debate on controversial topics - I can think of hardly anything else that has been as hidden away for so long as autopsies. Whether or not the eventual outcome is for the numbers of autopsies to go up, down or stay the same - in other words irrespective of any specific professional consequences - there is now at least the possibility that what happens will be for reasons that people have had an opportunity to think about more realistically.

I think that narrowing the gap is important in all areas of medicine

and science, however controversial. It may feel risky. It may even lead to changes we don't necessarily agree with. But in the long run it must surely provide a more stable foundation on which to build. Also, I think a bit more straightforwardness would help to support better quality science and medicine, by removing some of the polluting layer of doublethink from the professional mind. In spite of the trends of the last decade or two, quality does not depend on the wrapping, but on what's inside. Practitioners of paternalistic realpolitik will doubtless find my stance on this issue naïve and foolish. But I think that the ever freer flow of information in our wired world is against them.

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The (almost) outback experience

Notes of a visiting Australasian Lecturer of the Physiological Society

The whole trip almost unravelled before it started. Nobody seemed to want a visit from a pommie lecturer. The Physiological Society had invited me to be the Australasian lecturer and carry out a tour of a few laboratories in Australia in 2001. It had been over two years since David Cook from Sydney had done the reciprocal lecture tour in the UK. Now it was my turn. When I wrote to one or two of my contacts in Australia they said bluntly that they would not be there. They would be in New Zealand for the IUPS Congress. Try again next year. And by the way, there will be a monster meeting of all medical and health societies in Melbourne so why not come and give a talk at that as well? Great, I said, are you on for a visit in 2002?

Jonathan Ashmore on a trip which was undoubtedly too short

So that is how I came to be touring Australia in November last year, just at the end of the antipodean academic year. Had I thought more about the consequence of setting off from a dank and cold London I would have realised that this would be just when most university inhabitants would be focussed on the examiners' meetings and dodging students complaining about their abysmal exam marks. With summer holidays beckoning, who wants to think too seriously about a lecturer wished on them from the other side of the world? Or even about the more arcane features of the ear? I did try for a catchy little title for the lecture, all about designing the cochlea to do a hard job using soft parts. Someone commented that it needed a lot more sex and violence to really bring the punters in.

Our first stop is Perth. This seems a logical start, not quite so many time zones away and with time to break the long flight in a very hot Singapore. The arrival at the airport is novel. We are met by the head of Department who reverses noisily and expensively into something in the parking lot. I never drive, he explains. I spend the first few days in Australia wondering whether a missing tooth filling spells the end of any enjoyment. A walk-in dentist solves that problem with impressive speed: 'See you later' says the receptionist as she relieves me of 60 dollars. I am tempted to say that I hope she will not, until I realise that this is the standard goodbye. As an introduction to the world of Australian physiologists, the University of Western Australia has a large and well-known hearing research laboratory which has made major contributions to understanding how the ear works. The auditory laboratories look well supplied. UWA prides itself on being one of the top research universities. The first hint of changes that all is not a complete breeze may have been there to see: physiology itself seems to be in a slightly less than upbeat mood and has suffered from not embracing human physiology early. The result is that the classes for human biology are bursting at the seams whereas traditional physiology suffers – it is considered too hard by students paying for their degrees. This is to be one of the recurrent themes of many of the departments I visit. It is particularly important in a university system which has already embraced student fees (Australian students were amongst the first to accept pay-back-later schemes): restructure, sell the degree or pay the price to your uncompromising vice chancellor. At UWA I give a talk about our work on two photon imaging, not on hair cells: we already know about that, they say.

After a weekend down at Margaret River, home to Western Australia's expanding wine industry and to so many boutique wineries that some of them clearly double more as sites for fashion shoots than as vineyards, we fly into Sydney. As the flight descends into the city, the cabin fills with a slightly pungent whiff of smoke from the bush fires burning around the city: nature is intruding at 10000m. But at the University of Sydney the end of term seems definitely to be uppermost in people's minds. Mollified by a good reception

and turn out for the lecture I try out the 'sex'n'violence' talk about hair cells. The talk, I hope, may improve with time.

Although built in the late 19th century as a sandstone medical school, the well equipped molecular biology and neuroscience laboratories at the University of Sydney are a testimony to strong, if selective, support for basic biomedicine. I think enviously that they make the UK university infrastructure look distinctly downtrodden. The campus looks oddly familiar for, although I have never seen it before, it looks like a solid civic university of the UK variety but without the battering of the weather. The well-known picture of Katz, Eccles and Kuffler walking to a lecture (and printed in *From Neuron to Brain*) was taken here in the great quad at the University of Sydney, as Max Bennett tells me. Later, across town, Simon Gandevia and Elspeth McLachlan show me around the Prince of Wales Medical Research Centre which thrives successfully as a self financing centre to study systems physiology. Sited next to the University of New South Wales, the centre is also expanding and, with the help of the Wellcome Trust, is about to install one of the first 3 T magnets for fMRI in Australia.

To Brisbane where the talk is part of a two-hander with Gary Housley, a former colleague now in Auckland who is passing through the University of Queensland en route for London. A sense of just parachuting into cities is beginning to grow. The talk is well attended by members of the Vision, Touch Hearing Research Centre (or VTHRC as my ability to handle acronyms grows). UQ is also restructuring. It now has a three tier system of faculties containing schools which have combined traditional departments. Physiology , pharmacology and anatomy find themselves combined. This has not just been a paper exercise, for although it has happened with astonishing speed over the past two years, it has also been matched by laboratory rebuilding. The people I meet are very positive about it all. Perhaps I do not meet the malcontents. David Adams now runs the School of Biomedical Sciences. I am also shown a brand new building – the Institute for Molecular Biomedicine – which is planned to house 800 people when it is full, a sort of equivalent of the Wolfson Institute at UCL, and intended to jump start a strong biotech industry in Queensland. We celebrate that evening on hearing that the merger between Imperial College and UCL has been called off: even as an ex-IC alumnus I have a sense of relief. I read this news first in the Singapore *Straits Times*, so it must be true. News spreads.

We have supper with Jim Pickles to the deafening sound of possums jumping about on the tin roof of his house. This reminds me that I have yet to see a kangaroo jumping – the ones we see are by the side of the road, have their legs sticking up in the air and are definitely not hopping. Later that weekend I visit a lost cousin, unseen for 25 years, and who now owns a farm two hours north of Brisbane. Although the farm is surviving it is clear that the drought in parts of Queensland and New South Wales is getting very serious. The news says that Australia's harvest is threatened and livestock values are expected to be the worst since 1982. There are stories of the price of sheep being down to below AUS$1 (=35p) a head now that they cannot be fed. Although living in cities may be comfortable nature is still very much in evidence.

Two days later we find ourselves in Melbourne. We are invited to stay, no objections entertained, in an elegant house near the river Yarra and where, in the garden, parrots crash around in the trees. The Talk has now matured fully and is probably at its best. I give it an airing at a seminar at the Bionic Ear Institute. Despite the name (which started as a laboratory joke but stuck) this is a semi-autonomous institute of the University of Melbourne. It is independent because it is also a collaboration between the University, the Royal Victorian Eye and Ear Hospital and Cochlear, the Australian spinout company which developed one of the most successful cochlear implants. Cochlear, started by Graham Clark in the late 1970s, now makes over 70 per cent of the world's cochlear implants. Is this marriage between industry and university a pattern which we shall all face for new Institutes? In this instance Bionic Ear seems to be thriving.

The second talk in Melbourne takes at place at the Big Meeting in Melbourne. The Australian Health and Medical Research Council has, for the first time, organised a single big conference to take in all the separate biomedical research societies and charities. The meeting has been wildly successful and attracted 2000 delegates from all over Australia. It has done this by emulating the FASEB meetings in the USA. APPS, the Australian Physiological and Pharmacological Society, which by itself might only muster 200-300 people, now forms part of a much larger meeting. The Australian Neuroscience Society, however, still stands outside this arrangement and meets in February. In Melbourne everyone is very enthusiastic about the meeting and its networking potential. There is the hope that it has reversed declining numbers attending APPS. The downside is that the meeting has to be professionally organised and the higher registration fees deter the younger students and postdocs. There are some exceptionally good communications on ion channels. To be broadminded, I also go to some sessions on tissue engineering.

I am introduced for the British Physiological Society Lecture by Peter Gage, the current president of

APPS. He reminds the audience of the history of the visiting lecturer scheme. The next visiting lecturer is up to APPS to nominate. I am left hoping that I may not quite have dealt a death-blow to the exchange visits and that we can expect a nominated lecturer from Australia next year. This view is reinforced, I am glad to hear, by conversations I have that night at the conference dinner. It is held at a very bechromed and flash Melbourne Crown Casino. No physiologists are spotted gambling and I hope this is due to their advanced knowledge of probability theory. There are circulating magicians at the dinner and speeches by politicians. Both demonstrate admirable sleight of hand (could this be a way to test residual critical capacity at Phys Soc dinners?).

The last stop on the tour is Hobart. Nobody is an electrophysiologist here. My host is an authority on the platypus and the echidna and so in Tasmania is placed ideally for his work. The department of physiology has just recruited a zebra fish molecular biologist so even the most southerly Australian physiology department is joining international developmental biology. The last talk of the visit, now well honed, merges gracefully into the beer hour. I am let loose to look after myself in Tassie for several days. This is not too difficult. The white beaches border blue seas and stretch as far as the eye can see and, barring a few wallabies, are virtually deserted. I spend the time walking along a stretch of the most astonishing and empty coastline.

This was a trip which was undoubtedly too short. Despite my best intentions to give talks in the outback, the tour has skirted around the huge spaces of the Australian interior. To the first time visitor to Australia the distances are daunting. My hosts were enthusiastic, open and hospitable. There were experiments in social engineering being carried out to explore the future of physiology, possible given the much smaller populations of scientists. The Physiological Society itself might learn from these. But I am left thinking already that I should engineer another trip. And next time I shall make sure that any visit does not coincide with the complete collapse of the touring English cricket team.

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On women in science

Bill Parry talks to Susan Greenfield about the SET Fair report on women in science, engineering and technology

Susan Greenfield - waiting for a reply from the Government

The Baroness Greenfield, director of the Royal Institution (RI) and professor of synaptic pharmacology at Oxford University, was the main author behind *SET Fair: A Report on Women in Science, Engineering and Technology*, which was published in November 2002. Patricia Hewitt MP, the Secretary of State for Trade and Industry, commissioned the report to investigate why women are not appropriately represented in all aspects of the scientific career path, in both private and public sectors. 'Increasing the number of women scientists and engineers is vital for future UK competitiveness and productivity', said Ms Hewitt, adding: 'Successful British companies increasingly depend on the strength of their scientific and technological expertise, and we are obviously missing out on a huge pool of talent.'

I spoke to Susan Greenfield at the RI in February to discuss aspects of the report. At the time of going to press, she was still waiting for a reply. She hopes that it will be imminent so that work on implementing the report's recommendations could commence.

Bill Parry: The report identifies many factors which contribute to the high attrition rate of women in SET jobs, including: a career system that is not conducive to managing family and career responsibilities; institutional sexism and the glass ceiling. Which of its recommendations, in your opinion, are the most urgent?

Susan Greenfield: The first one that I really care about is the issue of providing ring fence funds to a woman – or anyone who's had childcare – and whose career has therefore been jeopardised by having to have time off to look after children. I think this is really important, to have a level playing field.

I like very much the idea of a Working Science Centre (WSC). I see now the huge benefit of (the RI's) Science Media Centre, which is kind of the same thing, in that it brings together constituencies that haven't met each other before.

BP: Which factor do you feel is most responsible for just 9% of UK bioscience professors being women?

SG: I don't know if one can talk about a single factor in this case because it's the constellation of the vague and the cultural along with the biological, along with the socio-economic. I think you're looking at the net result from a constellation of factors.

BP: Do you think this is a problem that pervades society generally or particularly women in science?

SG: I think science is a particularly special case. Most other professions have a very clear career structure, including medicine, and most of them have built into that career structure the issue of maternity leave, as far as I understand it. Neither of those facts applies to research science. (If you're lucky enough to get tenure,) it'll be when you're nearing 35, which is edging in past the biological optimum in any event. To have people until they're 35 on fixed-term contracts, with no security at all, is very different (from other careers).

BP: What advice would you give under- and post-graduate women who are considering a career in science?

SG: They should be under no illusion that it's all plain sailing, that everything will be sorted out. I've often gone on record, and been misquoted, for saying that academic women, especially scientists, shouldn't have children, and I've never ever said that. I've said it's hard at the moment, you have to make some pretty horrible choices, you can't have it all ways, and that the government ought to do something. That's the real quote. I think at the moment it depends on the women and how much they really care. If it's just *an* option for you and if you want to have children, then you might think *very* seriously about those other options. Research science is hard enough anyway: you have

fixed, short-term contracts, long hours, and you have crummy money, let's be honest.

BP: According to a Swedish report, women weren't as assertive and confident as their male counterparts when it came to applying for grant funding and so are at a disadvantage in that regard. How can this be changed?

SG: This is the kind of thing that's been very hard in the report to actually legislate for. You can't change the male psyche or change the female psyche. I think the more women that do it, they more automatically that will help. And I think [our report] recommends lots of gender-friendly policies there. I'd like to see a much more extensive mentoring scheme for women.

BP: How do you see us best increasing the profile of women scientists, present and past? For instance, if I asked friends to name a handful of famous women scientists, most would be hard-pressed to do so.

SG: That's because women are bad often at promoting themselves, which is what I feel the Science Centre could contribute towards. Head hunters and search committees would, I hope, come to us and their names would get on the radar like that. I think expressly targeting women and trying to showcase them is much better done just by example. I think the best thing is that you are there, you are seen as an expert or a high profile person, and you happen to be female but no one points that out or bothers about it; you are just there as a woman. I think it's a much more subtle role model that's important.

BP: You don't have any children. Was that a decision made for career purposes?

SG: You don't wake up and say: "Right, today I've decided I'll never have children." Obviously it doesn't work like that. What happens, I suppose, is sometimes people actively want children, and I know some women get extremely broody. That never happened to me, partly because I have this horrible brother who's 13 years younger than me... There are other factors in my case. My husband, who already had a daughter, was upfront with me when we were getting serious with each other, saying he never wanted children, so fine. Not being broody, not wanting kids, him not wanting kids, my career taking off and me really enjoying it, meant that somehow I never really thought of it or saw it as an option. I've always been rather hard-headed and realised that I can't have everything. Perhaps had I met someone else, had I not had the career I had, had I not had a brother, I may well have had kids now. It wouldn't have been a worse life or a better life, it would have been a different life.

The number of women undertaking both under- and postgraduate degrees in the biosciences is increasing, as is the proportion of women entering the SET workplace. In order to maximise the individual and collective potential of this "huge pool of talent", we await Ms Hewitt's response and hope that it will match this momentum. That the matter is in the hands of these two able and powerful women will hopefully mean that steady progress will be forthcoming.

Bill Parry is a freelance writer and works at the Institute of Biology

When science meets the headlines

A guide for scientists and doctors, *When animal research hits the headlines,* has been published by the Science Media Centre. The SMC is an independent venture working to promote the voices, stories and views of the scientific community to the news media. A related half-day meeting at the Royal Institution is also planned. Further information is available from Mark Peplow at the SMC :

(0207 670 23976, mpeplow@ri.ac.uk).

Doing physiology in Romania

Gordon Reid explains how his department rose from nothing at all to a Centre of Excellence in six years, with the help of a few broken chairs

The Bucharest 'Centre of Excellence', supported by the Physiological Society under its Eastern European and Third World grants scheme, is centred around my group of three postdocs and myself. We work on transduction in primary somatosensory neurones, in particular the ion channels that detect cold and noxious heat. The cold- and menthol-activated ion channel in thermoreceptors was first described by us (Reid & Flonta, 2001) and continues to be a major focus of our work (Reid et al. 2002). Methods in use are patch clamping and Ca^{2+} imaging in cultured dorsal root ganglion neurones, and patch-clamp studies on the cloned thermosensitive ion channels TRPV1 (the capsaicin receptor, aka VR1) and TRPM8 (the cold and menthol receptor, aka CMR1). In addition, a number of students and workers from other institutes are working in a multi-user research centre in our department that makes these methods available to outside users.

The three original members of my group, Alex Babes, Florentina Pluteanu and Violeta Ristoiu, did the majority of their PhD work with me and have continued to work on related projects. All played an essential role in setting up our present lab and the multi-user centre, which is now run by Florentina. Both Alex and Florentina are supported by Physiological Society fellowships, sponsored by Peter McNaughton (Cambridge) and Sally Lawson (Bristol) respectively. The standard of equipment we have, and the facilities we have created, are equal to or better than those found in comparable Western labs. But it wasn't always this way, as you will see below.

Whenever I meet someone new at a scientific meeting I generally get asked the same two questions: how did I end up in Romania? and what's it like doing science here? The first question is simple to answer, but the answer to the second could easily fill a book. I'll try to give a flavour of what it's like in the short space of this article.

So how did I end up here? Six years ago, when I was a postdoc in Jürgen Schwarz's lab in Hamburg, he asked me if I'd like to spend a week in Bucharest setting up a patch clamp rig. He told me they'd got the basic parts - microscope, micromanipulator, amplifier, puller, and oscilloscope. I asked him what else I could expect to find there - other groups working in the department who could lend us odd bits of equipment, cables, tubing, and so on - and he said, to impress on me the hopelessness of the task, 'They've got nothing there. Nothing at all'. So I took all the bits and pieces with me that I could think of, and as an afterthought I put a flask of GH_3 cells in my pocket. Jürgen turned out to have been largely right, as I was to discover again and again in the succeeding months. We really were starting right from the beginning.

Gordon Reid, with the Faculty in the background across the river

For instance, we had to fix the manipulator very firmly onto the microscope (an essential for stable patch clamping!). So on my first day in Bucharest I asked 'Is there a workshop? Could they make a clamp for us?' - the reply was 'Maybe, but... you'd better come downstairs'. We went down to a dim, damp basement room containing some fish tanks, a gloomy mechanic smoking and reading a newspaper, and a huge, ancient upright drill. We explained the idea. The mechanic put down his cigarette, pointed to a broken radio and a pile of wood and metal junk in the corner, and told me sadly, 'These are the materials we have. What can I make with these?' Clearly another approach was going to be needed.

In the boiler room we found some broken chairs. We borrowed a saw and scrounged some screws, and put together a wooden clamp to hold the manipulator - it didn't look elegant, but it worked. Using a stone slab and some tennis balls as an anti-vibration system, we made Romania's first whole-cell recording, a potassium current in a GH_3 cell, and held the

recording just long enough for someone to make some pictures. I had an uneasy feeling that getting the patch clamp set-up to work was going to be the easy bit.

The fact that I'm still in Bucharest six years later is largely due to my wife, who I met during that first visit. But it's also because there was a lot still to be done. All over Eastern Europe, university departments had been dedicated to teaching for the whole of the Communist period, and research had been done in institutes of the Academies of Sciences. This system is being dumped as fast as possible, because experience showed that a split between research and teaching is not good for either. The International Bank for Reconstruction and Development (World Bank) gave a $15 million loan to build up university science in Romania, which was awarded as research grants starting in 1998.

My head of department, Maria-Luiza Flonta, and I got a total of about $200,000 from this source for our own research, and in addition our department was awarded $400,000 to set up the multi-user research centre I mentioned above. This has been the core funding that allowed serious research to begin here. The first equipment we bought was a Milli-Q water system and a Sartorius analytical balance - before that, we simply didn't have reliable clean water or a good balance in the department. This money also allowed us to start throwing away pipette tips after use instead of washing them! However, $200,000 of grant income over five years is a tiny amount by Western standards, and having funding and equipment is only part of the story. To do competitive research requires fast access to consumables and literature, and at the beginning we had neither.

Let's consider reagents - in the UK, next-day delivery is commonplace; in Bucharest, the delivery delay is one to three months! Imagine: you do an experiment that gives an intriguing and unexpected result; to follow it up, you need a reagent that you haven't got, so you place the order and wait, and three months later the substance arrives (and you can't go and ask a colleague in the department, because yours is the only patch clamp group in the country!). If we stuck to the conventional approach, we could give up the idea of doing world-class science here, and we would have to resign ourselves to reading about it in articles from our Western colleagues and competitors.

We had to find another way: we needed money deposited in another country that could be used to order what we needed for next-day delivery, and a fast transport route to

Left to right: Florentina Pluteanu and Alex Babes with Éva Lörinczi, a former member of the group

get it to us. Initially using my own money and leftover travel expenses, and later grants from the Physiological Society, we deposited money for this purpose outside Romania. To begin with we got substances delivered by post; this got us involved with Customs, and our Customs problems (and unorthodox solutions) will be familiar to readers all over Eastern Europe and in many other parts of the world.

Any parcel, however small, that comes from outside the country is not delivered to the recipient; instead, the recipient is invited to come to the Customs office, where the package is opened and inspected. Personal items are allowed through, although experience shows that sometimes the more desirable items, like miniatures of whisky, are unexpectedly classified as 'forbidden' and liable to 'confiscation'. Lab reagents are immediately pounced on and treated with the greatest suspicion; they are sent to another Customs office, and we have to start obtaining the necessary official papers to get them into the country. Some of these papers are standard but additional papers are usually requested, different ones each time, which causes delay and requires multiple trips to Customs for each item. These complications largely stem from the scope for bribery that exists: individual Customs officers can make an already cumbersome system unworkable, or they can make it run very smoothly if they want to, and they frequently use this power to extract bribes. Bribery is so well established that even a major courier company once asked us for money to pay a bribe to Customs! My policy is that we stay clean and don't pay bribes. Instead we avoid Customs where we can. I'll leave the methods to your imagination.

Our reliance on money held outside the country has been compounded by another problem that is virtually unknown in the West: even after being awarded a grant, we have occasionally found that money had disappeared from our account and been spent by another grant holder instead! We no longer have this problem, because our core funding (at present from the Volkswagen Foundation) is now all held and administered outside Romania.

The problem of access to literature is now almost completely solved, although it was serious at the beginning. The only scientific journals our University library subscribes to are Nature and Science, and originally we made heavy use of reprint requests, a very slow and erratic system. The advent of online publishing has changed this beyond

recognition. I immediately subscribed to the most important online journals that we could get for a reasonable price. This costs us about $2000 per year, but is money well spent as we have immediate access to over half of the new articles relevant to our work. The rest are supplied by a network of friends around the world from their libraries' online subscriptions. We have recently registered for HINARI (http://www.healthinternetwork.org) which will give us access to all the major scientific journals (2100 journals in total) for $1000 per year. With that, and our NATO-funded Internet access, our access to literature is as good as we could have anywhere in the West.

Future prospects for science in Romania could be bright, but I am still concerned - as I have been since arriving here six years ago - by the fact that we manage to keep our work going only by finding creative but irregular solutions to problems. We have constantly needed to bend the rules in the interests of our work, for instance paying a company for non-existent consumables (to be supplied later, free of charge), so that the money would be protected from our University administration and could not be spent by someone else. Sticking to the rules (especially concerning supplies of lab materials) would make our work impossible, and all the time it is at risk: a slight tightening of Customs controls, for instance, could close off our rapid supply of consumables completely.

There are other, less obvious problems.

Meritocracy vs mediocrity

Our universities and research councils are split between those who are producing good work and would succeed on merit anywhere in the world, and those who were appointed for reasons other than merit (often pre-1989) and are thus threatened by excellence in others. Unfortunately (in contrast to East Germany) these people were not removed after 1989. My head of department and a few very good colleagues are thus constantly having to fight in committees to promote quality. For example, our research assessment system is biased towards mediocrity: a publication in an international, ISI-listed journal gets 30 points, and one in an unlisted journal 20 points. Moves to make this fairer (e.g. a score based on journal impact factor) are staunchly resisted by those who have rarely, if ever, published in a journal that has an impact factor.

Too much teaching, not enough learning or training

Perhaps because universities have been primarily teaching institutions for so long, a typical student's timetable is about twice as full as a comparable student's in the UK. Any move to reduce teaching hours to a more sensible level raises fears of teaching posts being cut. We are still primarily paid to teach and not to do research: officially we're supposed to be doing research *one day per week*! The heavy teaching load holds back our research efforts and also makes it difficult for those students who want to come into the lab to learn, because they can't find the spare time. More subtly, there is heavy emphasis on memorizing at the expense of thinking and doing. Paradoxically, given the excessive teaching hours, little attention is paid to practical training. As an example, some of the students who came into the lab when I first arrived (students who had emerged from a Masters degree course in neurobiology) didn't know how to do basic things like make up a solution of a given molarity, or had no idea of how to use a pH meter accurately. It is not always easy to remedy this when students begin to work in the lab, because the low importance given to practical training during their early education can give them the impression that important tasks, needing rigour and care, are trivial or menial.

The brain drain

I have not yet mentioned the problem that is perhaps most serious of all, the 'brain drain' of young and talented researchers towards Western countries. This topic is much discussed, not least in articles by talented Romanian researchers who have left the country! They tend to propose solutions at the level of national science policy, and discuss how to attract young Romanian scientists to return home - but always, it seems, how to attract *other* young Romanian scientists to return. The question that comes to my mind when I read one of these thoughtful articles is usually 'so why don't *you* come back home to work here?' Sometimes, the dismal salaries are mentioned (we all, including myself, earn less than $200 per month). But I don't think this is the main reason why good scientists leave the country and stay away. More important is the widespread perception that it is impossible to do good science in Romania.

We, and a few other active and talented research groups, have shown that this perception is wrong. I am fortunate to have a group who have all made the decision to stay here in Romania, and to make good science happen *here*. Over the last six years, we have shown that world-class science *is* possible in Romania. It's not easy. In the West, good results can be produced in science with a moderate degree of commitment, but here an extraordinary level of dedication and hard work is needed. For those who have that commitment, and are absolutely determined to get something done, our experience shows that nothing is impossible.

Gordon Reid
Department of Animal Physiology and Biophysics
Faculty of Biology, University of Bucharest

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Primate neuroscience centre public inquiry

The neuroscience research centre inquiry was about planning matters, not science, says Mark Matfield, expert witness for the University of Cambridge

The public inquiry into the University of Cambridge's planning permission for the proposed primate neuroscience centre at 307 Huntingdon Road was held at the end of last year in the South Cambridgeshire District Council offices. I was the main advisor to the University and one of their expert witnesses. As such, I was surprised to read Keri Lee Page's report of the inquiry (*Physiology News*, 2003, 50, 27). She seemed to fall into the trap of thinking that the appeal was assessing the use of primates in neuroscience research, or the specific research that would be conducted at the proposed centre. She implied that the neuroscience research community and the University should have done a better job of defending their science, although some of her comments about animal research and the way she gave equal weight to the evidence of a full-time antivivisection campaigner and the Regius Professor of Medicine displayed a surprising lack of understanding of the issue.

University advisor at the inquiry, Mark Matfield

In reality, this was an inquiry about planning matters, not science. As Keri Page indeed pointed out in her article, the Planning Inspector had stated quite clearly many months before that he was not able to take into consideration any evidence about the science or the ethics of animal experimentation.

Participants

When Stuart Nixon, the Planning Inspector, opened the meeting, he made it clear that everyone would be allowed to have their say. As is standard practice, the two main parties – the University of Cambridge and the South Cambridgeshire District Council - were represented by barristers. There were also three 'Rule 6' parties: organisations granted the right to take part in the appeal with legal representation, to present evidence and to cross-examine other witnesses. The main Rule 6 party was a coalition of animal rights groups comprising Animal Aid, the National Anti Vivisection Society, People for the Ethical Treatment of Animals, Uncaged, Naturewatch and X-Cape. The other two were the British Union for the Abolition of Vivisection (BUAV) and Doctors and Lawyers for Responsible Medicine (DLRM).

The Inspector asked all the other organisations or individuals present to indicate if they would like to give evidence or make a statement. These ranged from antivivisection, green and religious groups to local interests. Many of these organisations and witnesses had already submitted written evidence to the appeal.

Opening statements

For the University, Robin Purchas QC pointed out that the proposed centre was not a new development in the green belt, but an enlargement of facilities on a site that the University had used for large animal research for over 30 years. Normally, green belt policy would not allow such an enlargement, but letters from the Minister for Science and the government's Chief Scientist, as well as a detailed submission from the Medical Research Council, established that the proposed centre was a matter of national importance, which overrides the green belt policy. South Cambridge District Council had accepted this point. Its only grounds for refusing planning

permission were that there would be protests outside the site which, because of the roads at that point, would create a 'serious danger to public safety'. The University disputed this and regarded it as a substantial over-exaggeration of the situation.

The District Council's barrister claimed that the proposed centre would attract a substantial level of protest, which would result in the roads being blocked and that these blockages would result in serious danger to the motoring public. She also questioned whether there were other sites that could be used for the centre.

District Council witnesses

Following the opening statements, the District Council called its first witness, Chief Inspector Steve Pearl of Cambridgeshire, the senior officer in charge of policing animal rights protests in the county. He described the tactics used by Stop Huntingdon Animal Cruelty (SHAC), with particular emphasis on those protests where roads had been blocked. He also pointed out that, notwithstanding the police observations about likely protest at the site, if planning permission were granted, the police would do all they could to ensure that law and order was maintained.

The District Council called three other witnesses who explained previous observations that the police had made regarding the planning application for the centre, the Council's reason for refusing planning permission, how protests at the 307 Huntingdon Road site might affect traffic, the potential danger to the public that could result, and examined other sites owned by the University that could be used.

University witnesses

The main academic witness for the University, Sir Keith Peters, Regius Professor of Medicine, explained why it was so important to UK neuroscience for this centre to be built now and at Cambridge, and why it needed to be in reasonable proximity to other neuroscience centres with which it would collaborate.
In an annexe to his evidence, Sir Keith provided a lengthy explanation of the importance of research on primates for both fundamental neuroscience and the development of improved treatments for human neurological conditions. The barristers for the antivivisection groups wanted to cross-examine Sir Keith on this, but he pointed out that the annexe had been written by Cambridge neuroscientists who were not appearing as witnesses. This appeared to upset the antivivisection groups who clearly wanted to argue the case against the use of primates in neuroscience research.

Other witnesses for the University presented evidence on the reasons for choosing the site and the disadvantages of other potential sites, and the lack of potential danger posed by any blocking of the A14 road by protests.

I gave evidence later for the University as an expert witness on animal rights' protests. I pointed out that there was little evidence to support the police's conclusion that the protest against 307 Huntingdon Road would be the same style and intensity as the demonstrations against Huntingdon Life Sciences. Even if the campaign were similar to the one against HLS, I argued that there was no basis for concluding that it would cause a 'serious danger to public safety'.

Turning to the evidence given by Greg Avery of SHAC (see 'third party evidence' below), I stated that I simply did not believe him. I explained that SHAC was totally focused on one target, Huntingdon Life Sciences (HLS), and could only have one target. However, it was easy to see that SHAC would claim that the Huntingdon Road site would be a major target as a tactic to influence the enquiry against giving planning permission.

In addition to my evidence about animal rights protest, I was asked to explain the way in which animal research was regulated in the UK and to respond to a number of the assertions made by the animal rights witnesses, and to explain why the standard animal rights claims (on LD50, thalidomide, drug side-effects, etc) were fallacies.

Third party evidence

The Inspector set aside one day for 'third parties' to give evidence. These included the majority of animal rights groups present. There were many heart-felt statements of opposition to the proposed primate laboratory and some diatribes against all and any animal research. When Stop Huntingdon Animal Cruelty gave evidence, Greg Avery said that, whatever evidence was presented at the inquiry, he believed that John Prescott would give planning permission for the centre. If that happened, he claimed that SHAC would campaign against it as well as against HLS. He threatened that SHAC would use all their tactics, including blocking the nearby major roads, to stop the centre being built.

For Doctors and Lawyers for Responsible Medicine, Professor Claude Reiss from Paris presented a somewhat rambling dismissal of all animal experimentation in both basic medical research and drug development. However, he lost all credibility when it was pointed out that he had set up a biotechnology company to develop new therapies for AIDS which, he agreed, would have to be tested on animals before they could be prescribed to patients. When the apparent inconsistency of this with his evidence was questioned, he simply shrugged and said that, by then, the drugs would have been passed over to a pharmaceutical company who could do all the animal testing.

When BUAV gave evidence, Director Michelle Thew showed BUAV's

video of its infiltration of a primate research laboratory at Cambridge and submitted the report of the infiltration. In essence her case was that this research was conducted so poorly at Cambridge that it could not be considered to be in the national interest. To challenge this, the University submitted the Home Office Inspectorate's report into BUAV's previous infiltration, of Harlan Hillcrest, which included numerous sections saying: 'BUAV alleged... However, our investigation found no evidence of ...'.

After the close of the appeal, the Home Office finally reported on their investigation into BUAV's allegations about the primate research at Cambridge. As we have come to expect, no evidence was found to support any of BUAV's main allegations.

The coalition of animal rights groups presented two witnesses of their own: a planning expert who added little to the Council's objections and Dr Ray Greek, an American anaesthetist who appears to make his living as a professional antivivisection pundit. However, the University barrister displayed a remarkable ability to digest and comprehend neuroscience research by referring Dr Greek to key publications in neuroscience and showing the crucial role of primate research.

Closing arguments

The inquiry reconvened on the 17–19 January 2003 for closing arguments and a site visit. The Inspector indicated that he would send his report of the proceedings, along with all the documents submitted, to the office of the Deputy Prime Minister who would make the final decision. Just when that will be announced is not known, but it seems unlikely that it will be in the immediate future.

Mark Matfield
Executive Director
Research Defence Society

Keri Page replies:

While I agree fully with the factual account of the Cambridge planning inquiry presented by Dr Matfield, I would like to comment on his interpretation of my earlier report. I am a PhD student at Cambridge University and sat in the public gallery at the inquiry with the specific idea of seeing how the whole process looked from that viewpoint.

The equal weight in my article given to evidence from anti-vivisection groups and from Sir Keith Peters was not intended to reflect the balance at the inquiry, or its overall purpose, but rather to draw attention to issues that the scientific community might find of interest. My apparent lack of understanding was a deliberate attempt to raise the profile of the debate amongst practicing scientists. Similarly, the open questions at the end were not intended to favour either side of the ongoing dispute but instead to play the role of Devil's advocate and encourage open discussion of the issues surrounding animal experimentation.

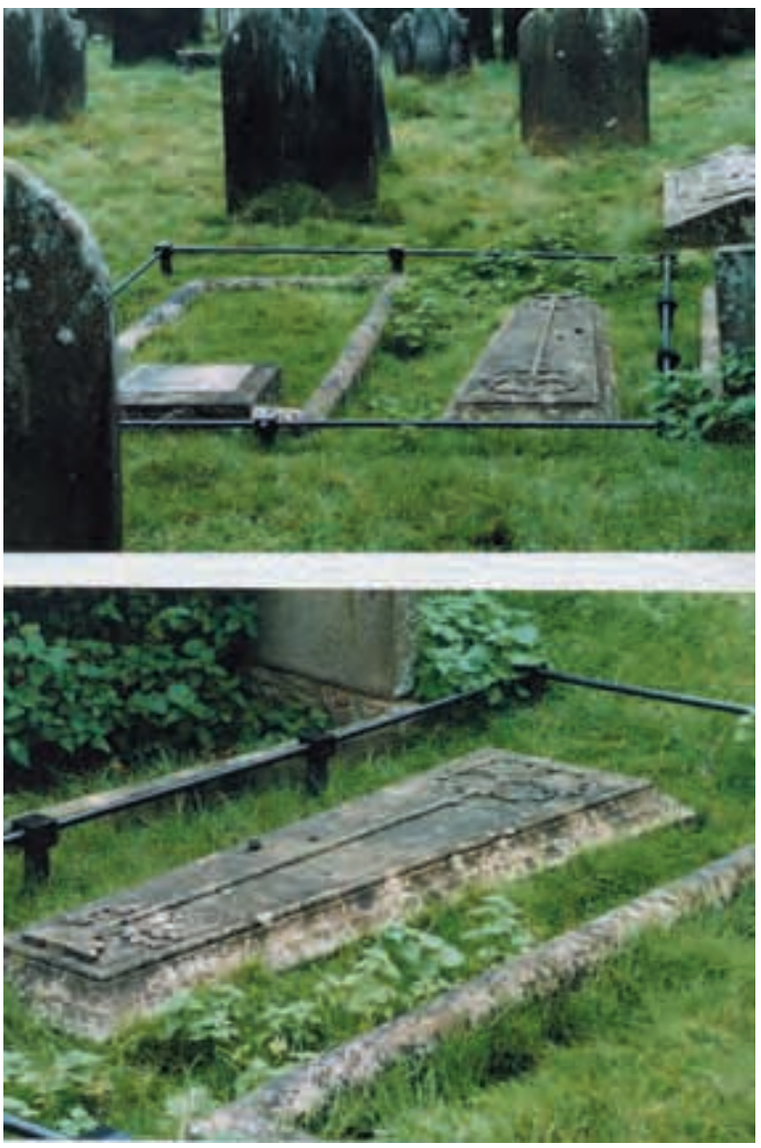
The inquiry Planning Inspector, Stuart Nixon, gave permission for animal welfare groups to present their case – in the name of questioning the assertion of national need. However, as Dr Matfield makes clear, the Inspector had previously stated that science- and ethics-based evidence would not be considered in his final decision. For this reason the University was, of course, not obliged in law to make such a case. Nevertheless, as a scientist, I found it uncomfortable to watch as Mr Wald (Animal Aid lawyer) questioned the usefulness of primate research and described neuroscience as scientific dabbling, while the University appeared to make no scientific case to defend itself. Welfare groups and Cambridge residents in the public gallery where I was sitting loudly accused the University of intellectual arrogance, and complaints of distrust were bandied around. My fear is that, despite the University making a solid case for the centre being built on greenbelt land, it must have looked to the Press and lay people in the gallery as though the University was not confident in defending its science.

It was clear from the start that the inquiry would be widely reported in the scientific and non-scientific press. It would therefore have been reassuring to see the University call upon its wealth of successful research and experience in order to build a watertight case for neuroscience, even if this was not strictly necessary. Ultimately it is important to encourage support for science from the general public as well as from national and local government.

Animal experimentation is a contentious subject for both scientists and non-scientists. In order to air this debate Physiology News welcomes constructive short pieces from anyone who wishes to contribute.
Ed

Sydney Ringer's grave – worthy of a proper memorial?

David Miller asks whether the Society could mark the grave of a very influential physiologist



Sydney Ringer's grave, prominent only by being bounded by a black metal rail

Sydney Ringer (1835–1910) and his work surely deserve to be more widely celebrated. There were meetings in the UK and Canada dedicated to his memory on the centenary of his publication on the composition of physiological saline capable of maintaining the beat of the (frog's) heart (Ringer, 1883). In truth, however, he remains essentially unknown despite being nominally acknowledged in many physiologists using 'Ringer's solution'. This fate of obscurity, suffered by too many influential scientists, does not serve physiology well.

Physiologists need hardly be reminded of the debt we owe Ringer. He started the evolution that has led to modern cell culture media and blood or tissue fluid 'replacement' salines. Without this no isolated cells or tissues could usefully be studied. His discoveries were the underpinning of saline infusion in clinical practice. The 'recipe' for 'physiological saline' surely ranks with blood transfusion itself as a major life-saver, essential in post-trauma interventions and as a pre-requisite to most modern surgery.

Ringer was present at the inaugural scientific meeting of the Society (UCL, December 1880), demonstrating 'the effects of lime and potash on the frog's heart'. He was a member from 1884. He chaired the dinner of March 1891 where a motion was passed ''That in the opinion of this Society it is important that, as recommended by the General Medical Council, a large part if not the whole of the additional year which is to be added to the medical curriculum should be devoted to Elementary Physics, Chemistry, and Biology'. *Plus ca change*?

Around the time of the frog-heart paper's centenary, I first had the opportunity to visit the beautiful village of Lastingham, near Pickering in North Yorkshire, where Ringer had a home for many years. He was from a Norfolk Quaker family. However, upon his marriage (to one Anne Darley, the daughter of the local Lord of the Manor) he evidently invested in a fine house in the north Yorkshire moors. This was a 'weekend' and family retreat from his busy, successful clinical practice and professorship in London (UCL). It was here he enjoyed his retirement. He died after a stroke in October, 1910 and now lies buried in the churchyard. As someone who has made a few litres of his solutions over the years, I wanted to 'pay my respects'. Lastingham's church (St Mary's) is a magical, ancient place with a unique 7th century Saxon crypt. Regrettably, there is no explicit record of Ringer or his scientific work in the church or in its guide book, save for mention of the donation he ('Dr Sidney [*sic*] Ringer') made towards the major restoration done (in the 1880s) to commemorate

his daughter Anne. (She died tragically at her own 7th birthday party, apparently after choking on a plum stone). After much searching in the churchyard, I located his grave. It is prominent only by its being bounded, together with his wife's grave, by a black metal rail. The gravestone markings are badly eroded, can barely be read and reward careful scrutiny merely with his name and dates. The grave itself looks like those around it, venerable only because of its evident age but anonymous and certainly undistinguished. When I visited again in October 2002, by coincidence on the very anniversary of his death, nothing had changed.

It would surely be appropriate for the Society to fund and donate suitably worded, permanent plaques so that visitors may know something of the work of Professor Sydney Ringer, FRS. Perhaps one could be lodged prominently in the church, with another near his grave, The visitors' book reveals that the church attracts people from around the world - probably including some others who hoped to find something marking the connection of Lastingham with Ringer's eminence and significance as a physician and physiologist. The Society could also encourage the tourist board and local historical societies to publicise the connection of Lastingham with a scientist whose work has affected the lives and well-being of so many more than presently know it.

David Miller
University of Glasgow

Reference

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'Physiologists need hardly be reminded of the debt we owe Ringer' - David Miller

Tilli Tansey, the Society's Archivist, responds:

I am of the strong belief that anything that can point a little to our illustrious past is good. There are several great names, many of them the founding fathers of the Society and pioneers in the subject, who are not recognized or commemorated at all, and certainly not by the Society. History can be used very effectively as PR and to get the subject across to the general public in many very palatable ways, and some of the suggestions of wider contacts seem very sensible. I have looked at a few Lastingham websites and, as the church is the village's main selling point, emphasizing the significance of one of the people buried there would be a very good idea.

Farewell to Pauline

Pauline Stevenson worked in the Cambridge Publications Office of the Society as a Production Editor for over nine years. She joined at a time of major change for both journals as desktop publishing had just been introduced. In April she left to take up a position in Nottingham with FRAME (Fund for the Replacement of Animals in Medical Experiments), principally to work on the journal ATLA (Alternatives To Laboratory Animals). FRAME is a charitable trust, founded in 1969, to promote the concept of alternatives to the use of live animals in medical research and toxicity testing.

The decision of the Society to change publisher from 2004 will inevitably lead to major changes in the Publications Office, both in terms of staffing levels and production. The uncertainty as to what the future holds for some production staff has prompted Pauline to move into another area of publishing. The Society and staff congratulate Pauline on her new position and wish her every success for the future. She will be greatly missed by everyone in the Cambridge office, not only for her extremely high editorial standards but also for her contribution to life in and out of the office.

The revolution of the bio-entrepreneurs: from bench to bedside

Keri Page enters another world at the CMI National Competitiveness Summit

Many practising scientists in academic institutions know how hard it is to get funding. Applying for grants is a long and uncertain road. More recently, however, some research councils have received additional government support to make available separate funding schemes designed to encourage scientists to realise commercial opportunities. These schemes often focus on government identified 'priority areas' in applied research. Research with practical applications or commercial potential is also of great interest to venture capitalists and to big industry, such as pharmaceutical companies. This kind of financial backing must surely make so-called applied research seem a safe bet to upcoming graduates, in terms of money-making potential. And if the cash incentive alone is not sufficient to sway wavering students into applied sciences, then the current rise in bio-business awareness and entrepreneurship training might help. Should these fashionable trends continue, many worry that we will see a wedge driven between blue-skies research and applied research. Will financial considerations contaminate the ethos of curiosity-driven science? Will young basic-research scientists be siphoned off by bio-enterprise? How might this affect breakthrough-science of the future and the role of the University?

The relationship between science and society is changing. Scientists are being encouraged to actively engage the public in their research. One possible result of this may be that the public now value scientific research by how immediately it can be beneficial, both personally and commercially. This is to be expected, since it is well-known that scientific and technological development is central to both wealth creation and economic growth. However, this attitude threatens to make blue-skies research very un-cool.

Funding a revolution

On 19 November 2002, I attended the *Cambridge-MIT Institute (CMI) National Competitiveness Summit*. I had entered another world: the realm of the bio-businessman. I was suddenly witnessing for the first time a new face of science. The summit was dedicated to assessing the impact of scientific advance and technological change upon UK businesses and future national prosperity. I quickly learned that the UK ranks highly compared to the rest of the world in terms of papers and citations, with the UK being responsible for a full 8% of the world's scientific research papers. Despite this excellent science base, however, it would seem that, compared to the USA and much of Europe, we have less in the way of patenting and spinout activity resulting from our scientific endeavours. The finger of blame pointed firmly at British scientists' innovation, entrepreneurship and business acumen.

Since the government first identified this problem, they have encouraged the integration of management, business and science/technology education through degree to post-doctoral level in a number of ways. Notably, they have outlined 'priority areas' for funding, many of which are applied sciences. In turn, research councils now offer an array of new initiatives to encourage grant applications focusing on key applied research areas. Many of the initiatives are designed to facilitate better relations between academia and industry. For example, the BBSRC runs 'Biotechnology YES' with the University of Nottingham, which introduces 150 postgraduate and postdoctoral students each year to the skills necessary for commercialising science and designing business plans. The BBSRC also offers an Industry Fellowship scheme, supporting researchers in both industry and academic institutions. This is taken a step further by the Small Business Research Initiative (SBRI), which offers financial aid for small high-tech firms that aim to develop new research capacities by forming links with universities and research council institutes. In partnership with the Gastby Foundation and the Department for Trade and Industry, research councils have come together to run a UK BioScience Business Plan Competition to increase awareness and 'help the formation of new bioscience business ventures'.

Another source of research funding, Cancer Research UK, own a specialist technology transfer company called Cancer Research Technology Ltd (CRT). CRT aims to develop new discoveries in cancer research by encouraging start-up companies and getting partnered products onto the market.

The bio-business revolution is also alive in the universities: in 1998 the government announced a £25 million Science Enterprise Challenge competition to establish eight (now 13) 'Science Enterprise Centres' (SECs), which now link more than 50 universities in the UK. Many universities also now have a specialised technology transfer company or department, where professionals are available to help bio-entrepreneurs consider the available commercialisation options.

In regions of the UK with 'clusters' of biotechnology industries and successful spinouts, the government also funds a variety of regional support networks and associations.

A case study: the University of Cambridge

According to CMI, the East of England now has the highest concentration of bio-business activity in Europe, and Cambridge represents

its most significant biotechnology 'cluster.' It is no coincidence, therefore, that the city's university is home to a thriving bio-business support network for undergraduates, post-graduates and post-docs. Members of this network include the *Cambridge-MIT Institute (CMI), Biology in Business (BIB)* and the University *Entrepreneurship Centre*, to name just a few. These associations bring together business managers, financial investors, scientists and entrepreneurs to encourage both awareness and training.

CMI, for example, is a government-funded collaboration between the University of Cambridge and the Massachusetts Institute of Technology (MIT). For undergraduates, there is an Exchange Scheme and a Research Opportunities Programme aimed at 'training a new breed of innovators and business leaders'. For graduates there is a new range of Masters degrees in areas such as Bio-Enterprise and Technology Policy, essentially designed to integrate business and science, while educating post-graduates in the skills required to take 'innovation from the lab to the market'. CMI offer bursaries for outstanding students. The Masters programmes work closely with the university SEC (the Entrepreneurship Centre). This centre offers courses, placements and workshops for undergraduates, as well as providing an entrepreneurship foundation module as part of the Materials Science and Physics honours degree. Overall this structure provides a support base for budding bio-businessmen and women of all ages

Future directions

If young scientists are bombarded throughout their careers with this heady mix of bioscience and business, it begs the question; 'how many will resist the attraction and remain slogging at the bench for a pittance?' How many people will conduct poorly paid basic research in favour of more lucrative biotechnological research with potential for commercialisation? Reassuringly, the promoters of this new breed of bio-business have considered the repercussions for basic research and the outcome is comforting. 'One of the key features of modern bioscience is that much of the entrepreneurial value from research lies in the basic science, not further along the outdated linear model that places applied research adjacent to commercial exploitation,' explains Monica Winstanley, Head of Public affairs at BBSRC. 'Our various funding mechanisms and training schemes are aimed at ensuring there are effective links between academic researchers and the business and commercial sectors.' It should also be noted, says Andrew McLaughlin of the BBSRC press office, that 'such schemes ... represent a small proportion of the BBRSC's research budget ... which continues to fund excellent curiosity-driven research through its competitive funding programme.'

Jochen Runde, director of CMI's MPhil programme believes that even if the financial reward is greater in business, enough students will still aspire to doing basic research. 'Most of the people on our programmes were never going to become life-scientists. We are drawing from a pool of people who have already made that decision; an unutilised resource.' Current students of CMI courses support this opinion. For example Shefaly Yogendra, an MPhil student on the CMI Technology Programme says, 'Individuals work with different motivations ... some prefer not to move into managerial roles.' Runde suggests that scientists and policy makers should instead be focussing on encouraging more young people to come to university to study science in the first place. In other words, we need to make basic research equally as 'sexy' as bio-business. Alternatively, 'there may be a case for creating incentives to attract private investment into pure science,' says Yogendra. Professor E. B. Keverne from the University of Cambridge takes an opposite view. He points out that basic research and applied research are 'not necessarily competing.' Basic science should 'address the questions industry isn't interested in,' says Keverne. Both Keverne and Runde stress that blue-skies research should 'continue to be funded by the state.' Nevertheless, Keverne notes that to be appealing, basic research would need to be funded at a competitive level and a hierarchy of attractive career opportunities would need to be established to draw in young blood. The BBSRC is already 'working with universities and research institutes to improve career paths in science', says McLaughlin. But making careers in basic research more attractive will undoubtedly cost the universities money too. Where will this extra money come from? It may be that 'money will find its way back into universities if good contacts are maintained,' says Runde. The BBSRC also hopes to see 'reciprocal benefits arising from academic-commercial associations,' says Winstanley.

Basic research in universities may benefit from this bio-business craze in other ways too. Entrepreneurship and business management are transferable skills. Training in bio-business should encourage creativity, problem solving, opportunity-seeking capacities and networking skills. All these desirable attributes should feed back into the science education system as new partnerships are forged in the future.

Dr W. Nuttall, Course Director of CMI's Technology Policy programme stresses that, even amidst all the uncertainty and debate surrounding bio-business and science policy, 'the important thing is good science.'

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Abstracts – to be or not to be?

Among my hoard of Phys Soc Newsletters are some dating from the 1980s. One of the topics in the Letters section was whether Abstracts were worth publishing. The consensus then was that publication was important, but the question has never really gone away. Mutterings have re-emerged with the move to solely on-line publication.

What are Abstracts for? At the lowest level of usefulness an Abstract may serve as a meal ticket when it comes to justifying funds to go to a Meeting. At the highest level, an Abstract can provide an initial record of exciting new findings and establish priority (publication in abstract form doesn't necessarily preclude later presentation of a fuller account). One only need look at the Proceedings published in *The Journal of Physiology* during the 1930s to see who first discovered what about acetylcholine and cholinergic nerve fibres. It was in a communication presented to the Society in 1933 that Henry Dale suggested the terms 'cholinergic' and 'adrenergic'. Later suggestions for autonomic nervous system terminology merit a mention: the Minutes of the 1954 Mill Hill Meeting record that in discussing the use by R. C. Garry and J. S. Gillespie of 'orthosympathetic' and 'parasympathetic', B. Katz offered 'sympathetic' and 'unsympathetic' (see Bynum, 1976).

In the twenty-first century there is far less scope for physiologists to present a brand-new discovery at every Society Meeting (even with the marked reduction in their frequency) but this shouldn't of itself detract from another function of Abstracts: as neatly summarized in 1986 by Hugh Elder, this is '*to provide a forum for discussion and to inform other members of one's current activities*'. I say 'of itself' because I do question whether today's Abstracts fully serve this function. Do they still provide a forum for discussion? I get the impression that

Ann Silver

even in designated sessions discussions are often little more than questions to the speaker rather than the cut and thrust of informed debate. And 'informed' is the operative word. When Abstracts were precirculated it was easier to do the sort of homework that might enliven discussion – they could be read beforehand during a gap in an experiment or possibly in the train on the way to the Meeting. Having to scroll through Abstracts on line and print them off is seen as something of a chore even by dedicated web enthusiasts. Once at the Meeting, people generally have too little time to study the Abstract Book with an eye to critical discussion. Further, having heard interesting results, the audience may vote for publication of an Abstract they've not actually read. The published version won't be much use to a later reader if it's unclear, incomplete or ambiguous (I could go on).

Despite these problems I'd be sorry if Abstracts didn't survive beyond the Meeting. I doubt that ephemeral presentations would contribute as much to the atmosphere of the Meetings and the vitality of the Society. A Phys Soc Communication may well represent the first entry on a student's publication list and lay the foundations for continued involvement with the Society. Perhaps the question we should be asking is not whether it's worth publishing Abstracts but whether Abstracts are worth publishing. In other words, are too many Abstracts accepted for publication when, because of various deficiencies they can add little to the body of knowledge (a favourite phrase of David Whitteridge's)? J.N. Langley complained 104 years ago, that poor publications cause '*a serious injury to the man of science*'. After scrutinizing about 550 Abstracts for the UCL and Tenerife Meetings I can tell you that some of these didn't do much good to a woman of science either. I suspect there were two causes for this: lack of time and lack of training. First, time – authors who are enmeshed in administrative red tape, while juggling research and teaching, are genuinely short of time but there are others who fail to *make* time. Before the advent of parallel sessions, the number of Communications that could be presented at a Meeting was strictly limited so they were accepted for inclusion in the programme in order of receipt. In practice this meant that one aimed to get an Abstract to the Meetings Secretary at the *earliest* date for receipt. (Overseas authors sometimes sent off copies on successive days hoping one would make it on the right date!) Now, with a more expandable programme, and on-line submission, the sense of urgency has gone. Busy people feel able to leave completion of their Abstracts literally to the last minute – and it shows. Those of you who've been to my courses on thesis writing will have heard me quoting what Pascal wrote in 1657: *I've made this letter longer than usual because I lack the time to make it shorter.* And that's the particular problem with producing a Proceedings Abstract: it does have to be short. The ability to say clearly all that needs to be said in only 3000 characters and spaces (approximately 450 words) is a useful skill. Older authors probably acquired it in grammar lessons when long passages had to be précised 'in

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How to be concise but comprehensible

First, have a plan: this was the question, this is what we did, this is what we found, this is what we concluded. If you're to put a good case for your conclusions you'll need to present clear data from *recognisably* well-conducted experiments. You can do this only if you don't waste words and spaces on waffle – avoid all redundancy. Unpractised authors tend to squander words in the first line or so. Here's an example:

The current experiments were performed to ascertain whether or not the increase in the growth of the vibrissae, brought about by the peptide whiskerin, was of the same magnitude in cats as in dogs.

This has devoured 197 characters and spaces; 110 of these could be saved for use elsewhere by writing:

We tested whether the peptide whiskerin caused similar whisker growth in cats and dogs.

For this apparently straightforward investigation, the methods would probably be quite brief; for other experiments full details may be essential. Decide what *must* be included, then use the minimum number of words compatible with clarity. Shorthand forms are acceptable but non-standard abbreviations should *generally* be defined. Spelling out a complex chemical in full may, however, use up valuable characters without necessarily informing the reader. It's often better to indicate function rather than structure: Here is an example of profligacy:

Solution A was sodium free and had a pH of 7.1 and it contained 1.2 mM 2,3-dihydroxy-6-nitro-7-sulphamoylbenzo[f]quinoxaline (NBQX).

Bang go 130 characters, 59 for the drug alone. More economical, and probably more immediately informative, would be:

Solution A (Na^+-free; pH 7.1) contained 1.2 mM NBQX, a kainate receptor blocker.

When appropriate (and obviously this isn't always the case), use the methods paragraph to free the results from distracting repetition of units, *n* values, statistical tests etc. For example you may be able to end the methods with:

Uptake (means ± S.E.M.) is expressed in μg min^{-1} $(100\ ml\ blood)^{-1}$; n=6–8; significance taken at P<0.05 (Student's paired t test).

Experimental data uncluttered by these details are easy to assimilate. For example:

In Series 1, uptake (control vs. treated rats) was: Group A, 5.10 ± 0.02 vs. 3.11 ± 0.01 (P <0.05); Group B, 5.22 ± 0.03 vs. 5.11 ± 0.01 (P >0.05); Group C, 6.02 ± 1.1 vs. 9.11 ± 1.3 (P <0.01).

Make clear immediately, as here, where your values come from and what's being compared with what. Too often readers get bogged down in a morass of values (including the *n* and *P* values) before reaching the magic words '*in Groups A, B and C respectively; controls vs test.*'

If you lack sufficient characters for a considered conclusion, wholesale deletions are not the answer (unless you are within a few minutes of the submission deadline). Substitute short words for long ones (e.g. '*do*', '*use*', '*start*', '*buy*' and '*to*' for '*perform*', '*utilize*', '*commence*', '*purchase*' and '*in order to*'); get rid of '*and*' where a semicolon would do; prune redundant verbs as in '*Rats were kept in cages and were fed on chow*', and recast similarly wasteful sentences.

What about figures and tables? Abstracts may include two figures or two tables or one of each. Giving your data in figures can be economical since they don't reduce the character allowance. Unfortunately, some figures can be a disaster: what looks fine on the computer screen may be useless when printed, with symbols becoming indistinguishable and axis labels unreadable. The legends should be informative but concise (they are included in the word count); remember to refer to the figures at the appropriate point in the text. Tables are less economical than figures, incurring a reduction of approximately 30 words for every three lines; some data are, however, more comprehensible in a well-designed table than in a great undigested lump in the text. Again it comes down to allowing time to consider and implement the format that will show your results most cogently.

Finally, accuracy. One's own typos are notoriously hard to spot, particularly on screen. Having submitted your Abstract, don't just ignore it: re-read hard copy to see if it needs correcting at the Meeting. The spell checker won't have alerted you to '*10*' for '*100*', '*ml*' for '*μl*', '*decreased*' for '*increased*' and '*pure bread animals*'. Check your References: are all cited References listed, all listed References cited and all names and dates identical in text and bibliography?

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not more than 100 words'. Those who escaped this usually boring exercise have to learn brevity for themselves.

So how does one communicate as much as possible without exceeding the character limit? The accompanying box contains a few hints. Some reflect problems encountered in Abstract scrutineering but most were drummed into me by my PhD Supervisor about 50 years ago.

This article is no model of brevity: even without the boxed words it's twice the length of an Abstract. Perhaps, though, it may help to reduce the faults that blight too many of the current Abstracts. While it's the responsibility of the Meeting to reject scientifically unacceptable Communications, it's the authors' job to ensure that if the work is accepted for publication, the Abstract is of a publishable standard.

Ann Silver

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Scientific meetings of the Physiological Society: a case for change?

Scientific meetings are one of the most important activities of the Society and, at £ 250,000, meetings receive the largest annual budget of any of the Society's charitable activities. Most members have definite views about how best to spend this money and how scientific meetings should be organised – in fact, there are probably as many ways of organising meetings as there are members. By its very nature scientific research is a dynamic process driven by new findings and new technologies. The same has to be true for scientific meetings: the forum at which we disseminate our research findings and exchange ideas must evolve. A significant faction of our members believe it is time to alter the current format of meetings so as to serve better the needs of the membership in the 21st century.

The Council and the Meetings Sub-Committee have discussed this issue and have endorsed a proposal for a revised format of meetings. Both bodies recognise that input from members is vital in determining how future meetings are organised. To achieve a format that will satisfy the majority of the membership there will be extensive consultation before any motions for change are put to the AGM in September 2003. The aim of this article is to present some of the arguments for and against change and the adoption of a new format. After reading this, please take up the invitation to join in the debate.

Desirable aspects of the current arrangements of scientific meetings

- Meetings provide a good training ground for tomorrow's physiologists. There is little doubt that the standard of presentations at Physiological Society meetings exceeds that at many other scientific meetings.
- Meetings are held sufficiently frequently to allow rapid dissemination of research findings.
- Meetings increase interaction with colleagues and friends
- The current format allows for demonstrations of experimental techniques, in addition to a choice of oral, poster and demonstrated communications of research findings.

Less desirable aspects of the current arrangements of scientific meetings

- Although overall attendance at meetings is not declining (over 1,000 registered at University College London in December 2002), attendance at individual sessions is often patchy. Most members will have attended under-subscribed sessions, including those at which invited international speakers are presenting. This often unpredictable situation is embarrassing for hosts and guests alike. Even worse, it sends out the wrong signals about the state of physiology in the UK.
- Communications that particularly interest you may be spread over 3 days. Many members cannot justify such prolonged attendance at every Society Meeting.
- As Universities introduce conference offices it is becoming increasingly expensive to host Society meetings. For an average 3 day UK meeting the Society pays approximately £20,000 to the host institution, in addition to any costs associated with travel grants, symposia and invited speakers.
- It is becoming increasingly difficult to identify departments that are willing to host meetings. Physiologists are no longer concentrated in Departments of Physiology, and traditional departments find themselves increasingly under-resourced.
- We do not advertise our meetings except on The Society's web site. As a consequence, the vast majority of participants apart from invited speakers are from the UK and Ireland. This has led to accusations

that our meetings are parochial and do not reflect the international calibre of the research that is presented.

•The frequency of our meetings brings a risk of clashes with the increasing number of specialist meetings organised by other Societies e.g. Neuroscience, Biophysics, American Heart and FASEB. Often these are at exciting locations and, with cheaper air fares, they are increasingly attractive – to Affiliate as well as to Ordinary Members.

Proposal for future arrangements of Scientific Meetings

Our proposal builds on the success of the Special Interest Groups, Designated Meetings and Joint Meetings held with UK or overseas Societies. The members of the Meetings Sub-Committee and Council believe that the suggested changes formally acknowledge what is already happening. By accepting the changes we would be able to develop scientific and financial strategies to promote our research achievements more effectively in both national and international arenas. The proposal does not involve a reduction in the number of scientific meetings per year, rather a change in the remit and focus of individual meetings.

Recommendations

Each year there would be up to two Main meetings (3–4 days in the Summer and/or Winter) and three or four Designated meetings (each of 1–2 days). The abstracts from all meetings would be published electronically.

1. The Main meeting(s) would be at approximately the same time every year, the dates being compatible, where possible, with attendance at other major European and International meetings. Each Main meeting would comprise Symposia, Plenary/Prize Lectures, Designated Sessions, and Oral and Poster Communications but not Demonstrations. Special Interest Groups would be involved in setting the programme.

2. The Designated meetings would be organised through Special Interest Groups or by individual members. They could be held in the UK or overseas in conjunction with other societies including clinical societies. These meetings would include invited speakers, Oral and Poster Communications and Demonstrations.

3. The Society's meetings should be advertised more widely, both here and overseas. This could be done through International Societies or by placing announcements giving information about on-line registration, abstract submission etc. in certain popular journals e.g. *NIPS, TINS, TIPS* etc.

Potential advantages of the revised format

1. Designated meetings would increase potential for joint meetings with other Societies.

2. Larger Main Meetings and Designated Meetings would ensure better attendance at individual sessions.

3. Special Interest Groups would be consulted for topics for Symposia. This would ensure that Symposia reflect new scientific developments and not just the interests of the host department.

4. Demonstrations given at the Designated meetings are likely to attract an informed audience.

5. Increasing the number of joint meetings could break down barriers between basic and clinical sciences and between the activities of different Societies. This would be timely, given the establishment of the Biosciences Federation in December 2002.

6. The revised format would be more attractive to overseas participants. A knock-on consequence of this could be to increase our international membership.

7. The revised format would increase the participation of Society members in the organisation of meetings and the success of the Designated meetings will be largely dependent upon the activity of the membership who wish to host meetings. Special Interest Groups would be able to call on the help and expertise of the Meetings Office and would have the financial wherewithal, to host internationally recognised scientifically focused, meetings within UK departments and, in so doing would raise awareness of institutional research activity in a wide audience.

What you should do now

It is important that we get the format of meetings right and satisfy the needs of the majority of our membership. To this end we encourage you to join in the debate via The Society's web page (www.physoc.org). Not only will you be able to join in the discussion with other members, you can also request information from the Meetings Office about past meetings; such as numbers and topics of Symposia, number of registrants at particular meetings etc. Armed with this information, our aim is to enable you to make informed suggestions about the 'Future Format of The Society's Scientific Meetings'. In response to your suggestions, it is envisaged that the proposals posted on the web site will evolve as we approach the AGM in Manchester in September. Shortly before the AGM we will circulate a questionnaire in order to get an indication of the consensus view before any debate and vote at the AGM.

Remember, the remit of Council and the Meetings Sub-Committee is to serve the membership. It's your Society and the format of meetings must be your decision.

Members of the Meetings Sub-Committee:
Chris Benham, Colin Blakemore, David Brown, Geraldine Clough, Mark Dunne, Michael Gray, Richard Helyer, Malcolm Hunter, Prem Kumar, Bridget Lumb, Giovanni Mann, Daniela Riccardi, Jeremy Ward, Stan White

The new Biosciences Federation: a major step forward for biology

On 2 December 2002, the Biosciences Federation was founded as an umbrella organisation having the following key aims:

- To promote liaison, dialogue and interactions within the diverse community of bioscientists on common issues that relate to research and teaching;
- To provide opinion and information to assist the formulation of public policy;
- To promote wide and open debate, involving the wider public where appropriate, about the practical and ethical issues surrounding developments in the biosciences and their applications.

The Federation is to be launched formally in the House of Commons towards the end of September.

The Institute of Physics and the Royal Society of Chemistry have long served as examples of the importance of a single representative body to support a scientific discipline. Biology has not had such a powerful body. The Institute of Biology (IOB) has partly fulfilled this role, but has only about 16,000 members out of a possible 100,000 or so active (research) biologists in the UK. The UK Life Sciences Committee (UKLSC), of which the Physiological Society was an active member, was established some six years ago to promote the interests of scientists at the molecular and cellular end of the biosciences. It was a dynamic body, building up to a membership of 18 learned societies representing about 35,000 bioscientists. However, more was needed. During the past three years leading members of the bioscience community have been working behind the scenes to establish a new organisation that can truly claim to be a single, united voice for life scientists. Those societies already signed up to the Biosciences Federation represent 60,000 life scientists and cover the range from physiology and neuroscience, biochemistry and microbiology to ecology. Crucially, the IOB has agreed to join the Federation and will bring valuable expertise particularly in areas such as links with schools, continuing professional development, and in the accreditation of qualifications. The Physiological Society was a founding member of the Federation and we are pleased that our president, Colin Blakemore, has agreed also to be the Federation's first President.

The Council of the Biosciences Federation agreed two Standing Committees – on Education (chaired by Keith Elliott, Manchester) and Animal Science (chaired by Nancy Rothwell, Manchester), and more are planned. These will probably be on the environment and sustainability, bioethics, and public affairs. Both the IOB and the UKLSC can justifiably claim to have made an impact on government science policy and will now combine their efforts under the Federation. At the time of writing submissions have already been made to inquiries by the Commons Science and Technology Committee into the value the UK obtains from participating in European science, and into bioterrorism, and one is being prepared on the Higher Education White Paper. Ways to help the Federation become proactive rather than reactive are being investigated.

The first event to be organised by the Federation will be an education colloquium in October run jointly with the LTSN intended to help teachers of first year undergraduates, careers advisors and school teachers understand the changes that are taking place to the school science curricula and their implications. More details of this colloquium will be circulated to Members shortly.

This is an exciting development for biology, but there is much still to do. The Federation plans to keep members up to date with activities via an email newsletter, which will be circulated to Heads of Departments and put on the Physiological Society website. Any comments or queries from Members should in the first instance be directed to Maggie Leggett (mleggett@physoc.org).

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Aiming in the right direction

Finding the resources to succeed

A significant and growing range of high-quality online resources is available to users in further and higher education. But how do we make the most of this growing and sometimes confusing range of resources? How do students and staff come to know about the resources that can make a significant difference to their learning, teaching and research?

These were among the challenges that a pilot initiative, the Resource Guide for the Social Sciences, aimed to address some four years ago. This was funded by the Joint Information Systems Committee (JISC), a committee of HEFCE. Initially a one-year pilot, the project sought to trial a subject-based approach to raising awareness about the range of resources available to the social sciences. A Resource Guide Adviser was appointed who worked in consultation with the social science community to develop a framework of promotional and awareness-raising activities. These were delivered to staff and students at a range of UK universities.

The activities included the production of both paper and electronic materials and the development of

'hands on' exploratory workshops. The success of the pilot project resulted in extended funding for the social sciences and the framework being piloted in the arts and humanities. The Resource Guides proved popular with staff and students, gaining a reputation for providing a user-friendly approach to navigating the labyrinth of resources on offer by providing a manageable and digestible overview of available resources.

With an ever-increasing number of resources on offer, guidance through them has become even more crucial. Because of this and the outcomes of an independent evaluation of the work of the Resource Guide Advisers, the initiative has been expanded to cover all subject areas within higher education. Five new Resource Guide Advisers have been appointed and are hosted by the Resource Discovery Network (http://www.rdn.ac.uk/) subject hubs. Their job is to collaborate with JISC services, partner organisations, publishers and other bodies to produce Resource Guides in seven subject areas. They will also promote the key resources to their subject communities. Outreach and engagement with these communities will be central to the work of the advisers, as it was for the pilot Resource Guides. Collaboration with other providers of resources, such as the Learning and Teaching Support Network (LTSN) and the Research Councils, will be vital too.

Joanne Badge is the Resource Guide Adviser for Health and Life Sciences and is based with the subject hub, BIOME at Nottingham University. BIOME is a freely available Internet service that aims to provide access to a range of high quality internet resources in the health and life sciences. Aimed at students, lecturers, researchers and practitioners, BIOME consists of six subject gateways that can be cross-searched at the BIOME level. The Resource Guide will promote the services of BIOME along with other resources relevant to the subject community.

Technical advances and the continued growth in the range of available resources mean that now, more than ever, institutions and users need to be able to access information, advice and support in the use of these resources. The Resource Guide initiative provides an important means of making a sometimes confusing information landscape manageable and comprehensible for our users. Not only will staff and students now have a single point of reference for resources within their subject areas, but they will also have expert advisers who will help make sense of this environment for them, and to point them in the right direction.

To find out more about Resource Guides, see:
http://www.jisc.ac.uk/resourceguides/
or order your printed guides from
jo.badge@nottingham.ac.uk

Joanne Badge

Taken in part from an article first published in JISC Inform (2002), issue 2, Autumn 2002, pp 20-21 by Karen Ford and Philip Pothen, JISC Executive

The European Resource Centre for Alternatives to Animals in HE (EURCA)

Animal use in undergraduate teaching across Europe is small (<1%) relative to the total used for research – most are small rodents or amphibians and pharmacology and physiology are the major users. However, it still represents a significant number of animals – 3,696 animals (0.14%) used for educational purposes out of a total of 2,567,713 (Home Office, 2001). This figure is also a gross underestimate as animals which are killed just prior to use, to provide isolated tissue preparations which form the mainstay of pharmacology practical teaching, would not be counted in the UK figures.

The decline in animal use for teaching over the last 15 years has been mirrored by a significant increase in the development of technology-based alternatives (computer programs, video, mannequins and models) and it is these which have made the greatest contribution to the decline. However, making alternatives available does not necessarily translate into teachers adopting them into their practice. Further reductions in animal use will only happen if teachers are persuaded that primary learning objectives can still be achieved by substituting alternatives for animal labs or by using alternatives to better prepare students in advance of an animal lab.

The EURCA project, established in 2001, was the realisation of a number of recommendations arising from an ECVAM-sponsored workshop in 1998 (van der Valk, et al. 1999) and aims to address the following perceived needs of teachers in HE:

Raising awareness and providing useful information

Although a number of alternative databases exist (e.g. NORINA, InterNiche) the information they provide is product-centred and probably of insufficient detail to enable teachers to decide whether a particular alternative is likely to be of real use to them. Assuming a teacher can identify a number of potential alternatives from these databases the next stage is to obtain copies so that they may evaluate them. This is time consuming and many teachers, given the numerous calls on their time, don't get beyond this stage.

The EURCA website (http://www.eurca.org) contains a number of features (news and events areas; links to sponsors, collaborators and other useful websites; links to articles about the use of animals in education; a list of advisors who have agreed to provide support to teachers wishing to use alternatives). There is also a resources database which focuses on providing much more

than product descriptions for a selected range (currently around 50) of high-quality alternatives. For example, the database:

- contains independent peer reviews of alternatives obtained through an active review commissioning programme
- provides pedagogical information (what educational level, what learning objectives it addresses, how long it would occupy students, can it be modified to meet local needs)
- provides, where they are available, exemplar support materials (e.g. workbooks, study guides, self-assessment activities) to help teachers to integrate an alternative into their courses
- publishes evaluation studies
- seeks comments from users through a discussion board.

In addition, EURCA has established a 'physical' resource centre (a collection of alternatives) which is central to a number of outreach activities, e.g. taking the Resource Centre to relevant scientific meetings (approximately six international meetings each year), and responding to requests for site visits. There is also a quarterly newsletter sent out to anyone who has registered via the website.

Local networks

EURCA recognises that a significant amount of dissemination needs to take place locally facilitated by respected teachers who can actively persuade colleagues of the benefits of using alternatives. To this end we are trying to identify EURCA contacts in each European country who will act as advocates, attend small national meetings and promote EURCA activities in their own countries.

Any members who think they may be interested in becoming a national contact person should get in touch with us as soon as possible.

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Other Society News

Neurophysiology

The 4th edition of Neurophysiology by R.H.S. Carpenter has recently been published by Arnold, London (£24.99), ISBN 0340808721

Trevor Lamb

Professor Trevor Lamb, FRS has recently moved from the Physiological Laboratory in Cambridge to join the John Curtin School of Medical Research of the Australian National University in Canberra as Federation Fellow. Trevor's research will examine the events that occur when light reaches the retina and activates the

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photoreceptors. The chain of events involves conversion of light into an electrical signal, triggering a series of molecular events within the cell. A second series of molecular events are involved in the shut-off, or adaptation, of the retinal cells after exposure to light. He hopes to describe these molecular events, and provide a mathematical description of the entire process. His work is directed to improved treatment of retinal disease. A fuller understanding of the nature of photoreceptor to light also has potential benefit for the development of electronic products which could code images from optical sensors. Examples of this type of electronic equivalent of the biological receptor could include auto colour control and data compression in video sensors.

Mark Dunne

Professor Mark J. Dunne, former Meetings Secretary, has recently moved from Sheffield to take up the post of Professor of Physiological Sciences in the Division of Physiology and Pharmacology at the University of Manchester, recently 5*-rated.

Poster presentation at the House of Commons

As part of National Science Week, I was lucky enough to be selected to present my work at the House of Commons on 17 March 2003 at an annual showcase for the UKs top young scientists, engineers and technologists. I'm in the second year of my PhD investigating the contribution of metabotropic glutamate receptors to the generation and modulation of locomotion, using *Xenopus* tadpoles as a model system. This is the fifth year of this initiative, which seeks to give young researchers the chance to present their contribution to British research to members of both Houses of Parliament. There was a wide diversity of posters presented – from the speed of trains on Britain's railways to the underlying causes of schizophrenia. I'm lucky to have had this opportunity not only to interact with my peers but also with MPs and to explain my work to both specific and non-specific audiences. I am grateful to the Physiological Society for providing funding for me to attend this worthwhile experience.

Rebecca Chapman

Poster title: The contribution of metabotropic glutamate receptors to the modulation of swimming in *Xenopus laevis* tadpoles

Symposium–ly the best

I left my last piece with the thought that one can't just blame symposium speakers for the drone-some-ness of too many Symposia.

What about the Symposium organisers?

After all, they don't HAVE to invite people who are notoriously tedious - or just plain bad – speakers.

Or do they?

What really are the criteria for who gets invited to be a symposium speaker?

I have been giving this some thought.

One often suspects a major criterion is that the speakers should have given exactly the same talk at a lot of other symposia, judging by the fact that one typically sees the same names over and over (and over) again. My personal record for the number of times in one year I have heard the same person give the same talk is three, but I suspect you could at least double this with a bit of work and a frequent flyer plan.

I sometimes wonder: do these people just permanently orbit the globe in a plane, touching down periodically to trot out the talk? Doubtless honed, on the laptop in some departure lounge, of course.

One could almost think of this as the academic equivalent of some ageing rock band doing their latest 60-date world tour. Except without the personal trainers, holistic masseurs, and contract clauses specifying four cases of Evian water for bathing in.

So if you are organising your first research symposium, you just invite the same people that spoke at the last one on a similar topic that you went to. Right?

Wrong. Organising a symposium is a key career opportunity, and the list of invitees needs careful thought. You are in a position to offer people something – an all expenses paid freebie. So the question is, what can you – indeed, should you - get in return?

With this in mind, I have compiled the following patented MCain^{TM} quick guide as to who you should invite. My modest hope is that this will be of some use to those of you pondering the list of potential speakers for your symposium.

The speakers should include the following:

First, yourself. No time for any false modesty when there are 'Esteem Indicators' to be collected for RAE 2008.

Next, one or two internationally eminent leaders in your field who you would like to meet and schmooze. Their presence will help attract an audience but also, more importantly, will make people think you are well in with the big hitters.

Next, two or three people who work in distant/exotic locations that you would like to visit (Australia, New Zealand, Japan, Hawaii etc.). If they are known to be organising a symposium in their own backyard, or even on a tropical island, within the next three years then so much the better.

Plus:

One or more people who previously invited you to their symposium in Acapulco/ Thailand/Tasmania/wherever. What goes around, comes around, as they say.

Three UK-based professors who are the people most likely to be reviewing your next grant application. (Failing that, people who sit on MRC/BBSRC/ Wellcome funding panels are also shrewd choices).

One or more people whose lab(s) made the knockout mouse that might add a bit of that timely embracing-the-genomic-revolution factor to the said next grant application.

At least one person who might be organising an EU framework programme bid that they might invite you to join.

And finally:

Three or four of your old drinking buddies who will provide some genial company and can be relied on to write nice letters praising your symposium (and prominently featuring your name) to your Head of Department/Dean/Vice-Chancellor.

(NB Don't worry if the number of really important people you need to invite – see above – doesn't leave enough speaking slots for your mates in this final category; they can always be squeezed in by inviting them to be session chairmen or 'discussants'.)

And there you have it. At the cost of a bit of time and effort, you will hopefully raise your profile in the field, give your next few grants a helping hand and position yourself for some nice long-distance conference freebies.

However, I should end with a word of caution. Having done all the above, don't make the mistake – common among younger academics – of co-organising your symposium with a more senior and better-established colleague, for instance a professor. Because unlike certain other things I could mention, reciprocal freebies flow exclusively uphill.

Happy organising.

Mark Cain

Eberhard Buhl

1959 – 2003

Born in Germany in 1959, Eberhard Buhl graduated in medicine from the Johann Wolfgang Goethe University in Frankfurt in 1984. In 1987 he was awarded the higher degree of Doctor of Medicine summa cum allude by the same University. Following appointments as postdoctoral fellow in the Department of Neuroanatomy at the Max Planck Institute for Brain Research (1984–1987), and as Staff Scientist in the Institute's Department of Neurophysiology (1987−1988), he took up an appointment as research officer in the Vision, Touch and Hearing Research Centre at the University of Queensland, Australia. In June 1990 he became an MRC Scientist in the MRC Anatomical Neuropharmacology Unit in the University of Oxford and, in 1996, was appointed as tenured MRC Senior Scientist and Group Leader. Eberhard Buhl took up the chair of Neurobiology in the School of Biomedical Sciences at Leeds University in October 1999.

By the time of his arrival in Leeds Professor Buhl had already achieved international renown as an experimental neuroscientist, devoted to advancing the understanding of brain function through his research interests in areas such as cortical networks, signalling processes in neuronal circuits and cortical rhythmogenesis. He was an exceptionally skilled neuroanatomist and latterly electrophysiologist. He used these techniques in a highly complementary fashion to pioneer the study of structure in relation to function in the brain. He published many papers using this combined approach in high-profile journals, setting the 'gold standard' for such work around the world. In what is now a classic series of experiments Professor Buhl demonstrated the mechanism behind specific, rhythmic brain activity of cognitive relevance. This seminal work precipitated an entirely new field in neuroscience – that of *in vitro* brain rhythms – and it is impossible to overestimate the impact this work has had and will continue to have for many decades to come.

During his time in Leeds Professor Buhl's research continued to make very substantial and significant progress, attracting major research grants totalling over £2 million, from UK sources such as the MRC and the Wellcome Tust, and also overseas from German medical research charities and the National Institutes of Health in the USA. He set up a number of key research collaborations with industrial partners. In 2001 he was made an editor of *The Journal of Physiology* and, in the following year, was appointed to membership of the Neuroscience Board of the MRC.

Professor Buhl's appetite and passion for scientific research did not prevent his taking a full part in other academic and managerial activities. From his earliest days he maintained an active interest in teaching and at Leeds taught neuroscience to both science and medical students. Indicative of the esteem he had with his peers, Professor Buhl was appointed as Head of the School of Biomedical Sciences in January 2002. He also chaired, graciously and effectively, the School's Executive Committee, Estates Committee and Neuroscience Group.

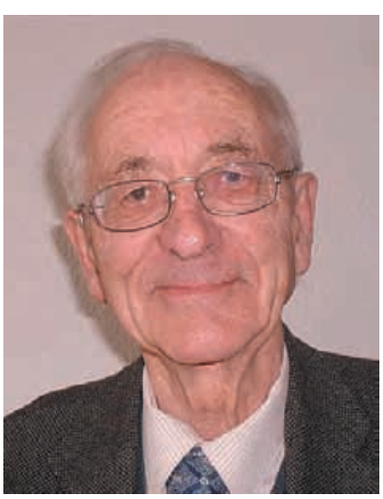
Miles A. Whittington
School of Biomedical Sciences
University of Leeds

Bernard Katz

1911 – 2003
Elected Member 1940
Elected Honorary Member 1979

E. Geoffrey Walsh

Elected 1952, Died 26 March 2003



Full obituaries of Sir Bernard Katz and Dr E. Geoffrey Walsh will be published in the next issue of *Physiology News*

Conceptual advances in brain research

A new book series with the above title was launched around the beginning of this millennium under the editorship of Robert Miller of the Otago Centre for Theoretical Studies in Psychiatry and Neuroscience, New Zealand; Gunther Palm, who is Head of the Unit of Neural Information Processing at the University of Ulm, Germany and Gordon Shaw of the Center for Neurobiology, University of California at Irvine. Five books have already been published and others are in preparation. Each book differs in style from others in the series: some are collections of well-edited manuscripts, whilst others in the series resemble monographs. The series is published by Harwood Academic Publishers, London and New York. Below, I set out brief reviews of volumes 3, 4 and 5

Volume 3 – Time and the Brain

Edited by Robert Miller (2000), ISBN: 90-5823-060-0, 417 pp, £73.00

This is an interesting book in which the temporal aspects of brain electrical activity are explored by an internationally respected group of authors. The early chapters concentrate on the temporal structure of pulse trains recorded from single cells, whilst later chapters consider temporal structure in the EEG and correlations with behaviour and psychology. Under normal circumstances investigators would not have the opportunity to consider the wide variety of approaches and expertise described in this book. It is well produced and makes fascinating reading.

Volume 4 – Sex Differences and Lateralization in the Animal Brain

By the late V.L. Bianki and E.B Filippova (2000), ISBN: 90-5823-088-0, 209 pp, £120.00

This book was first published in Russian in 1997 and summarizes the sexual specificity of functional lateralisation of mammalian, including human, brains. Some of the text is very dense, but makes for rewarding reading and is based on many years of study at the Laboratory of Behavioural Physiology at the St. Petersburg State University. The book is divided into five chapters:

- *Sexual dimorphism of interhemispheric asymmetry in humans*
- *Behavioural indices*
- *Electrophysiological characteristics*
- *Hormonal factors*
- *A neurobiological model of sexual dimorphism in the brain.*

It is very fitting that this work is now available in English and I would hope that other volumes of interesting neuroscience, translated from Russian, will be published in the future.

Volume 5 – Cortical Areas: Unity and Diversity

Edited by A. Schultz and R. Miller (2002), ISBN: 0-415-27723-X, 520 pp, £95.00

As with volume 3, this is a collection of papers by a renowned group of 25 international scholars. It revisits the issues surrounding the unity of cortical morphology, localisation of function, cortical connectivity and the large-scale patterning of cortical function. The 18 chapters are divided into five major areas of study:

- *The empirical status of cortical maps*
- *Cortical areas: correlation with connectivity*
- *Constancy and variation across species*
- *Functional equivalence between areas*
- *Morphological substrates of segregation and integration.*

Most of the chapters read well and are consistently edited to a high standard, providing a feeling of continuity through the book. This is no easy task and the editors are to be praised for their efforts.

Bill Winlow

Textbook of physiology

Gabriel C. Ezeilo

Oxford University Press, New Delhi, 2002
ISBN: 0 19 565505 2. 558 pp, hardback price 955 Rupees (approx £13.00).

It is very difficult to be original in writing yet another textbook of physiology and this book is in many ways very similar to others in the field. However, it is well-illustrated, although only in black and white, covers all areas adequately, and is clearly written. I would have no hesitation in placing it on a recommended book-list for students. It is well worth the money, if it can be obtained in the UK at the cover price shown on the copy sent to me!

Bill Winlow

FORTHCOMING PHYSIOLOGICAL SOCIETY MEETINGS

2003
Dublin 8 – 10 July
Manchester 10 – 12 September
Cambridge 17 – 19 December

2004
Glasgow 29 – 31 March
Babraham Institute, Cambridge – May
Cardiff 6 – 7 July
Cork – September
King's College London 16 – 18 December

2005
Bristol – July

YOUNG PHYSIOLOGISTS' SYMPOSIA 2003

University of Coventry
26 – 27 June 2003

Whole body human physiology

Main contact:
Douglas Thake (d.thake@coventry.ac.uk)
or Maggie Leggett (mleggett@physoc.org)

Trinity College Dublin
7 July 2003

Main contact:
Aileen Lynch & Yvonne Nolan
(youngphysiol2003@hotmail.com)

SECOND WORLD CONGRESS ON FETAL ORIGINS OF ADULT DISEASE

Brighton Centre, UK
7 – 10 June 2003

www.foad2003.org

NEUROHUMORAL CONTROL OF CARDIOVASCULAR FUNCTION – FROM GENES TO PHYSIOLOGY

Bristol, UK
28 June 2003

Lecture Theatre 1, The Kingsdown Conference Centre, University of Bristol, Southwell Street, Bristol.

Further details from:

http://murphy4.med.bris.ac.uk/symposium

3rd CONGRESS OF THE FEDERATION OF EUROPEAN PHYSIOLOGICAL SOCIETIES

Nice, France
28 June – 3 July 2003

Further details from:
FEPS2003, CNRS UMR 6548, University of Nice-Sophia Antipolis, Faculte des Sciences, 06108 Nice Cedex 2, France.
Tel: 33 4 92 07 68 51
Fax: 33 4 92 07 68 50
Email: FEPS2003@unice.fr

www.unice.fr/FEPS2003

DIGESTIVE HORMONES, APPETITE AND ENERGY BALANCE

Hammersmith Hospital, UK
30 June – 1 July 2003

Organized by Imperial College Metabolic and Endocrine Unit at The Wolfson Conference Centre, Hammersmith Hospital, London, UK. For more details and registration information:

Email: r.boning@imperial.ac.uk

www.obesity.med.imperial.ac.uk

INTERNATIONAL SOCIETY FOR AUTONOMIC NEUROSCIENCE (ISAN)

Calgary, Alberta, Canada
4 – 8 July 2003

Special features of the meeting will include a relatively inexpensive registration fee (about Canadian $550) and reduced registration fees for postdoctoral fellows and students. The fee will cover the cost of the meeting, banquet and some meals. Economical accommodation is also available. There will be opportunities for junior faculty members to present major lectures in addition to posters.

www.fp.ucalgary.ca/isan2003

Satellite Symposia at this meeting

ENTERIC NEUROSCIENCE
Banff, Alberta, Canada
9 – 13 July 2003

Email: hsharkey@ucalgary.ca

www.med.ucalgary.ca/webs/ENS

AUTONOMIC DYSFUNCTION AFTER SPINAL CORD INJURY: MECHANISMS, PREVENTION AND TREATMENT
Banff, Alberta, Canada
10 – 11 July 2003

Email: bpettypiece@rri.ca or lcweaver@rri.ca

www.isanweb.org/meetings/satellite2003a.html

SIXTH IBRO WORLD CONGRESS OF NEUROSCIENCE

Prague, Czech Republic
10 – 15 July 2003

2003 BIOCHEMICAL SOCIETY HARDEN CONFERENCES

56th Harden Conference - *Biological Electron and Proton Transfer*
26 – 30 August 2003
University of Plymouth, UK

Organizing Committee
Peter Heathcote (QMW, UK)
Peter Rich (UCL, UK)
Tony Moore (Sussex, UK)
John Moody (Plymouth, UK)

Scientific Programme includes sessions on:
Electron, proton and hydrogen atom transfer: theoretical aspects
Electron transfer in specific proteins
Proton transfer in specific proteins
Structural aspects of electron and proton transfer
Coupled electron and proton transfer in cytochrome oxidase
Coupled electron and proton transfer in photosynthetic systems
Dynamic aspects of protein structure

Registration Deadline: 27 May 2003

Scientists wishing to participate are asked to contact The Meetings Office for an application pack at the address below.

The Meetings Office, Biochemical Society, 59 Portland Place, London W1B 1QW
Tel: 020 7580 3481
Fax: 020 7637 7626
Email: meetings@biochemistry.org

Poster Presentation
Posters are welcomed and must be submitted online at:
www.biochemistry.org/meetings by 27 May 2003.
Applicants intending to present a poster will be given priority.

Poster Abstract Deadline: 27 May 2003

Delegate Registration fees:
Before 27 May 2003
£375 (full member) and £250 (student).
After 27 May 2003
The fees rise to £425 (full member) and £300 (student).

Fees include registration, 4 nights B&B in an en suite room, lunches, dinner, Drinks Reception and the Conference Dinner. There will be a limited number of bursaries for young scientists.

57th Harden Conference - Proteinase Structure and Function
9 – 13 September
Oriel College, Oxford, UK

Organising Committee
John Deadman (Thrombosis Research Institute, London, UK)
Robin Leatherbarrow (Imperial College London, UK)
Brian Austen (St. Georges Hospital Medical School, London, UK)
Chris Southan (Oxford Glycosciences, UK)

Speakers include:
Mark Lively (Western Salem, NC, USA), David Fairlie (Australia), Tim Clausen (Max-Planck-Institute for Biochemistry, Martinsried, Germany), Christian Sommerhoff (Munich, Germany), Vince Ellis (East Anglia, UK), Gillian Murphy (Cambridge, UK), Anthony Turner (Leeds, UK), Kelvin Cain (Leicester, UK), Jennifer Rivett (Bristol, UK), Eleftherios Diamandis (Toronto, Canada), Raphael Kopan (St Louis, MO, USA), Sonia Emanuele (Palermo, Italy), Chris Southan (Oxford Glycosciences, UK), Ian Smith (Cryptome Research, Baker Medical Institute, Melbourne, Australia), Brian Walker (Belfast, UK), Richard Jackson (Leeds, UK), Chris Schofield (Oxford, UK), Jennifer Harris (Genomics Institute of the Novartis Research Foundation, San Diego, CA, USA), Bruno Martoglio (Swiss Federal Institute of Technology, Zurich, Switzerland), Ravi Acharya (Bath, UK) Molecular structure of human angiotensin converting enzyme (ACE)

Registration Deadline: 11 July 2003

Scientists wishing to participate are asked to contact The Meetings Office for an application pack at the address below.

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Tel: 020 7580 3481
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Poster Presentation
Posters are welcomed and must be submitted online at:
www.biochemistry.org/meetings by 11 July 2003.
Applicants intending to present a poster will be given priority.

Poster Abstract Deadline: 11 July 2003

Delegate Registration fees
Before 11 July 2003
£450 (standard), £500 (en suite) and £350 (student standard).
After 11 July 2003
The fees rise to £500 (standard), £550 (en suite) and £390 (student standard)

Fees include registration, 4 nights B&B, lunches, dinner, Drinks Reception and the Conference Dinner. There will be a limited number of bursaries for young scientists.

Full details and programme are available on the Meeting web site:

www.biochemistry.org/meetings

or from the Meetings Office, Biochemical Society, 59 Portland Place, London W1B 1QW
Tel: +44 (0)20 7580 5530
Fax: +44 (0)20 7323 1136

THE CONGRESS OF THE LATIN-AMERICAN ASSOCIATION OF PHYSIOLOGICAL SOCIETIES (ALACF) AND THE BRAZILIAN PHYSIOLOGICAL SOCIETY (SBFIS)

Ribeirao Preto, State of Sao Paulo, Brazil
1 – 4 September 2003

THE BIOLOGY OF CHLORIDE

Woods Hole, USA
3 – 7 September 2003

57th annual meeting and symposium of the Society of General Physiologists.

Further details from:

www.emory.edu/CELLBIO/SGP/sgp.htm

IUPS 2005 – 35th CONGRESS OF THE INTERNATIONAL UNION OF PHYSIOLOGICAL SCIENCES

San Diego, CA, USA
31 March – 5 April 2005

IUPS 2005 is being organised by the six member societies of the US National Committee of the IUPS, the American Physiological Society, the Society for Neuroscience, the Microcirculatory Society, the Society of General Physiologists, the Biomedical Engineering Society and the Society for Integrative and Comparative Biology, under the auspices of the US National Academy of Sciences.

www.IUPS2005.org

Noticeboard

Notices for the Autumn 2003 edition of Physiology News should reach the Publications office by 14 May, 20023

Please note that whilst members are welcome to advertise relevant events in *Physiology News* and on the Society's website, advertisments via email will be restricted to events sponsored by the Society.