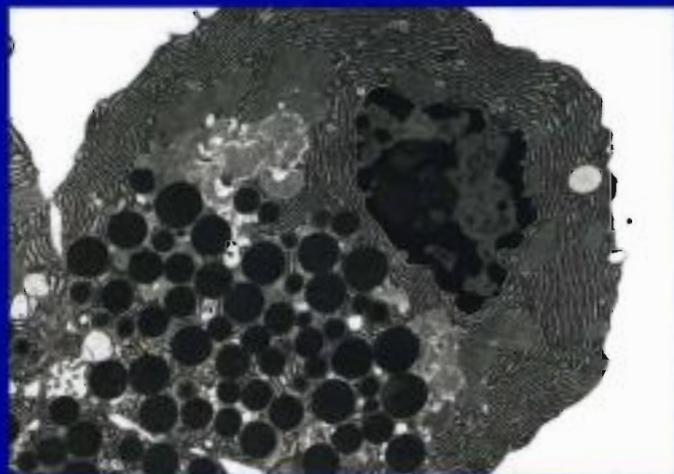


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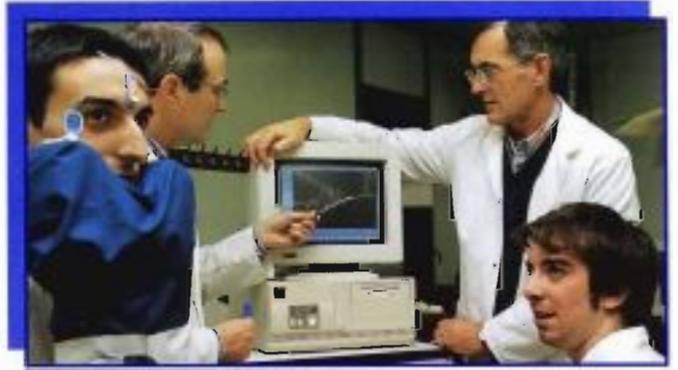


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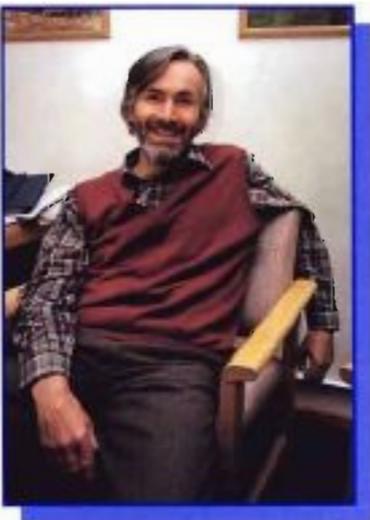
Fred Cody with third year project students: (L-R) Greg Davies, Ian Corbett, Kate Law, Brendan McCabe (in Multiuser Lab).



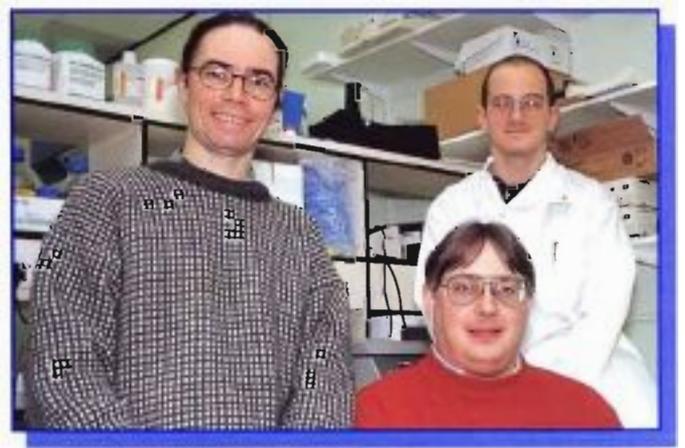
Jon Banks and Tony Wareham with third year project students Florent Revel and Sam Jackson.



(L-R) Rob Fenton, Stuart McLarnan, Chris Cottingham, Craig Smith, Daren Holden, Daniela Riccardi, Cally Ferguson, Tarek Maawad. (In newly refurbished Molecular Physiology Lab).



Maynard Case



(L-R) David Lydall, Richard Prince, Nick Ashton (seated).

Photography courtesy of Martin Rosenberg

Front cover: Transmission electron micrograph of a pancreatic acinar cell, showing intracellular organelles (nucleus, dark-coloured enzyme — containing secretory granules, lighter-coloured mitochondria). The cell cytosol appears “striped” because it is filled by the cisternae of the endoplasmic reticulum (see article by Austin Elliot in *Science News & Views*). Photograph courtesy of Austin Elliot.

Manchester Meeting

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Action Points

- ☛ **Affiliate Travel Grant Scheme:** The next two deadlines for receipt of applications are 31 May and 31 July 1999.
- ☛ **Vacation Studentship Scheme:** The deadline for receipt of applications is 30 April 1999.
- ☛ **MSc. Bursaries:** The deadline for receipt of applications is 31 May 1999.
- ☛ **Change of Addresses:** Please can Members inform the Administration Office of any changes of address, telephone or fax numbers.
- ☛ **Email Addresses:** The Society is making increasing use of email addresses. Please can Members inform the Administration Office of new email addresses, or changes to existing ones. Changes can be emailed to admin@physoc.org
- ☛ **Newcastle Meeting:** Abstracts should be submitted to the Meetings Secretary between 19 April and 29 April 1999.
- ☛ **Magazine:** Letters and articles for inclusion in the next issue should reach the Editor by 16 March 1999. Advertisements and Notices should reach the Administration Office by 12 April 1999 whilst items for the Special Interest Group Forum should reach the Meetings Secretary's Office by 8 April 1999. Items for Committee News should reach the Committee Secretary's Office by 12 April 1999.
- ☛ **Membership Proposals:** Candidates for election as New Members at the 1999 Annual General Meeting should ensure that their proposal papers reach the Administration Office by end of April 1999.
- ☛ **Membership Subscriptions:** Annual Membership Subscriptions for 1999 were due on 1 January 1999. Members failing to pay their subscriptions will be liable to sanctions.

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Guidelines for Contributors

These guidelines are intended to assist authors in writing their contributions and to reduce the subsequent editing process. The Magazine Editorial Group is trying to ensure that all articles are written in a journalistic style so that they will have an immediate interest value for a wide readership and will be readable and comprehensible to non-experts. In particular, scientific articles should give a good overview of a field rather than focus on the author's own research.

Format of articles

The main message or question posed should be introduced in the first paragraph. The background for the topic should then be established, leading up to the final dénouement or conclusion.

Length of articles

This will be determined by the subject matter and agreed between the contributor and the commissioning editor. Articles will vary in length from 200 words to a maximum of 800 words.

Submission of articles

Authors should submit text in the form of a disk accompanied by a print-out wherever possible. Use of disks reduces the risk of introduction of errors during re-typing. It is helpful to give brief details of the computer, operating system and software package(s) used (DOS formatted WordPerfect 5.1 files preferred, but not essential).

Deadlines for submission

Contact the Editors office or the Administration office for submission dates. Late submissions will not be accepted or publication will be deferred to a later issue.

Illustrations

Authors are encouraged to submit diagrams, drawings, photographs or other artwork to illustrate their articles or, if they cannot provide these themselves, to suggest what artwork might be appropriate. Photographs may be colour or black & white, prints or transparencies.

Author photographs

The Magazine normally includes photographs of the authors of articles. These may be colour or black & white; prints are preferable if cropping is required.

References

Authors are requested to keep the number of references to a minimum (preferably no more than two or three).

Suggestions for articles

These should be made (in writing, by phone, or in person at Scientific Meetings) either to the Editor, to the Editorial Assistant or to the relevant member of the Magazine Editorial Group (see left).

Magazine Editorial Group

Bill Winlow*News from Abroad, Letters*

Chris Peers.....*Science News & Views*

Austin Elliot.....*Science News & Views*

John Dempster.....*Teaching & Technology*

Tilli Tansey.....*Traces of the Past*

Annick Moon.....*Young Physiologists*

John Chad.....*Special Features*

Frances Ashcroft.....*Policies & Politics*

Physiology in Manchester

Physiology research and teaching in Manchester is largely focussed within the School of Biological Sciences, located in the Stopford Building. The School was established in 1986, and reconfigured as a single-department School in 1994. It spans all fields of biology: molecules, cells, systems, animals, plants and environmental studies. All barriers to collaboration have been removed, providing a highly interactive environment which allows the School to conduct high quality research and maintain an extensive range of undergraduate and graduate programmes. Our unified structure and single-site location enable us to provide access to expensive state-of-the-art equipment for both research and teaching. In 1996, the success of the School was recognised with the award of the Queen's Anniversary Prize for Excellence in Further and Higher Education.

The School is organised as a Research and Graduate School (RGS) and Undergraduate School (UGS). The RGS consists of five Research Divisions while the UGS comprises four Teaching Boards. Within this framework, each member of staff is a member of one Research Division and one or more Teaching Boards. Physiologists are largely located within two Research Divisions: Physiology, Pharmacology & Toxicology and Neuroscience. They contribute especially to undergraduate science programmes in physiology, pharmacology, pharmacology/physiology, neuroscience, neuroscience/psychology and biomedical sciences; to masters programmes in neuroscience and molecular pharmacology; to an integrated 2-year problem-based course for medical and dental students, and to other professional courses such as pharmacy and nursing.

The Society Meeting in Manchester is a designated meeting which focuses on epithelial and membrane transport. It is "sponsored" by four special interest groups: Epithelia and Membrane Transport, GI Tract, Placental & Perinatal Physiology, and

Renal Physiology. These overlapping areas represent some of the strengths of physiology both within the School of Biological Sciences and elsewhere in the University of Manchester.

Much research is focussed on analysing the location, structure, function and regulation of membrane transport proteins (receptors, channels, transporters and pumps) in a variety of tissues, using diverse cellular and molecular techniques. Major current projects include: body fluid homeostasis and renal transport mechanisms and their regulation (Nick Ashton, Richard Balment, Hugh Garland, Roger Green); water and electrolyte secretion by exocrine glands (Martin Steward, Maynard Case) and by choroid plexus (Peter Brown); placental transport mechanisms (Colin Sibley); molecular physiology of urea transporters (Alison Howorth, Craig Smith) and extracellular Ca^{2+} receptors (Daniela Riccardi); intracellular Ca^{2+} signalling (Austin Elliott); stimulus-secretion coupling in islet beta cells (Len Best, Peter Brown); K^+ channels in vascular endothelium and smooth muscle (Ged Brady, Gill Edwards, Michael Hollingsworth, Arthur Weston); structure-function studies on ligand-gated ion channels (Richard Prince).

Neuroscience, although not a feature of the current meeting, is also strong in Manchester. Major areas of research include: neurodegeneration (Rosemary Gibson, Sarah Loddick, Sylvie Toulmond, Nancy Rothwell); interactions between the immune system and the brain (Giamal Luheshi, Nancy Rothwell); role of the basal ganglia in normal and abnormal movement (Jon Brotchie, Alan Crossman); control of human voluntary movement (Fred Cody); receptor desensitisation in mammalian CNS (David Bristow); disruption of brain function by infectious or inflammatory diseases (Mike Dascombe); pro-convulsant and anticonvulsant activity of opioids and other drugs (Barbara Pleuvry); analysis of neural networks underlying patterned

behaviour (Cathy McCrohan); developmental aspects of neurobiology and excitable membrane properties (Tony Wareham); properties of the human circadian timing system (David Minors).

Molecular pharmacology is also a major strength, with a particular focus on the signal transduction pathways involved in the induction or suppression of programmed cell death/apoptosis, especially that induced by anti-cancer drugs (Christine Chresta, Caroline Dive, John Hickman) and that involved in neurodegeneration (Cathy Waters); control of haematopoietic differentiation (Ged Brady); DNA damage and repair and cell cycle control (Keith Caldecott, David Lydall).

Exciting new developments are in place in Manchester. These include the Manchester Bioscience Incubator and the Wellcome Clinical Research Centre. The Incubator Building opened in January 1999. It is a £15m state-of-the-art extension to

the Stopford Building and includes a first-class transgenic facility. It represents a place where entrepreneurial units and bioscience start-up companies can grow and develop to independence. With the increasing need for integrative biology, especially in relation to transgenic models, scientists with physiological training and skills will play a major role in this new development.

Construction of the Wellcome Clinical Research Centre will soon begin on land opposite the Incubator Building. The initial themes within this Centre will be: psychobiology of psychiatric disorders; tissue injury; gene therapy of cardiovascular diseases; gut-brain axis; osteoporosis; and cranio-facial diseases. Again, the need to integrate functional genomics into human and patient studies represents a further opportunity for those with a physiological background to make a major contribution to this Centre. So, in Manchester, the future is bright: the future is physiology.

*Maynard Case
University of Manchester*



*Stopford Building, University of Manchester
Photograph courtesy of Roger Green*

BLOOD-BRAIN BARRIER

The Blood-Brain Barrier Special Interest Group held a very successful Session at the SmithKline Beecham Meeting in Harlow in November with nine Communications, fourteen Poster Communications and a Symposium, topped-off with the Davson Lecture.

The Communications and Posters covered a wide range of BBB-related topics and it was especially gratifying to see nine contributions to the Communications and Posters coming from European laboratories outside the UK.

Particular thanks go to the speakers in the Symposium "Blood-Brain Barrier: Mechanisms Regulating Integrity and Transport", and also to John Greenwood for his excellent presentation on lymphocyte migration across the blood-brain barrier, he was followed by Quentin Smith from Texas Tech University who offered valuable new insights into the structure-activity relationships of the large neutral amino acid carrier into the brain. In the second part of the Symposium Hans-Joachim Galla from Münster presented important new work on BBB tight junction structure and formation and the influence of hormonal signals on this process and Paul Fraser wound-up with a consideration of the mechanisms of blood-brain barrier disruption and influences on permeability.

The day was concluded with the second Davson Lecture given by Dr Liesbeth de Lange from the University of Leiden on the "Application of intracerebral microdialysis studies to aspects of blood-brain barrier function".

We were particularly grateful to SmithKline Beecham Pharmaceuticals for hosting the Meeting and for generously contributing to the costs of the Symposium.

The SIG has a number of plans for future Meetings. There will be a BBB Session at the Newcastle Meeting in July (abstract deadline Thursday 29 April 1999) where there will also be an Epithelial & Membrane Transport Session and a further Session at the Imperial College Meeting in April 2000. There should be some good possibilities at Imperial for interesting and beneficial interactions with the Microvascular & Endothelial Group at that Meeting. There will also be a Davson Lecture associated with this Meeting.

In December 2000 it is planned to have a major activity, with a BBB Special Interest Group Session, a Symposium and a Davson Lecture, to mark the first Society Meeting within the new Division of Physiology of King's College London and part of the Guy's, King's and St Thomas's School of Biomedical Science, following the merger with UMDS. This Meeting will be at the Guy's Campus, the new home of your Convenor from August 1999, unless the SIG purges me in the meantime!

If you would like to be informed by e-mail of the BBB-Special Interest Groups' and other related activities, please e-mail your details to me at david.begley@kcl.ac.uk. New ideas for activities and Meetings are especially welcomed.

David Begley

COMPARATIVE & INVERTEBRATE NEUROSCIENCE

In order to better serve the interests of Comparative Physiology, our next special interest group meeting will now be held Birmingham in December, rather than in Glasgow in September. Symposium and communications sessions will be held at the same meeting by the Comparative Physiology SIG, allowing members to move between the groups. Dr. Jon Barnes, who was originally to be local organizer for the Glasgow meeting, has kindly agreed to organize a symposium in the area of comparative sensory physiology at a future meeting of the SIG.

My term of office as SIG coordinator will shortly end and an election for my successor is therefore required. Would you please send nominations to me at:

School of Biomedical Sciences,
University of Leeds,
Leeds LS2 9NQ;
E-mail w.winlow@leeds.ac.uk
by **Monday 17th May**.

Please ensure that anyone you nominate is willing to stand, before contacting me! I will then organize an election as appropriate.

Finally, anyone interested in attending **the 9th Symposium on Neurobiology of Invertebrates** to be held at Tihany, Hungary from 1-5th July should contact either Professor Robert Walker at Southampton or myself as soon as possible. The meeting is organised by the International Society for Invertebrate Neuroscience and promises to be well attended. I can vouch for both the excellence of previous symposia and the wonderful location on the shores of Lake Balaton.

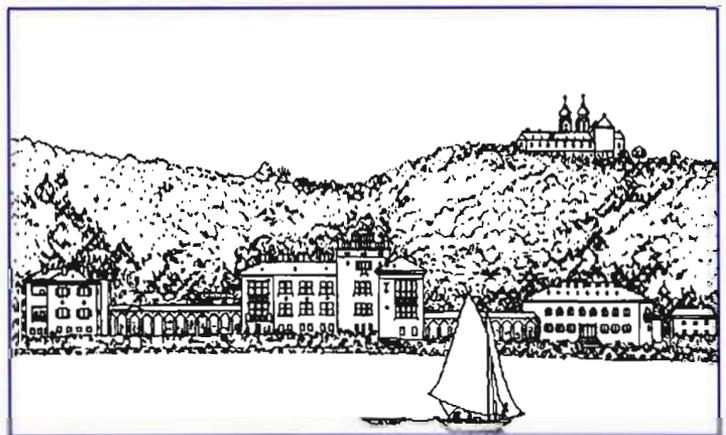
Bill Winlow

RENAL PHYSIOLOGY

The Group is Scheduled to reconvene at the Manchester Designated Meeting where we have a Session for the Renal Physiology Special Interest Group. My hope is that many in the Group will be presenting their current findings and observations. The SIG has also provided funding for the "Acid/Base Transporters in Epithelial Cells" Symposium and I would encourage you all to come as the programme looks to be a very powerful and challenging one.

Looking further ahead, please bear in mind that the Group has a further Designated Session in December 1999 of Birmingham and again, I would urge you to actively support the SIG with contributions to ensure its success. I am planning to have a Designated Lecture at this Meeting and if you have any suggestions or topics which you would like covered, please let me know. The second important event in December 1999 will be the change in Convenor, when I shall hand over to Stan White who will lead the group for two more years. Your presence at the auspicious event would be most appreciated.

Edward Johns



SMOOTH MUSCLE

As the new Convenor of the Smooth Muscle Special Interest Group I am attempting to gather an up-to-date e-mail list of all Phys Soc Members (Ordinary and Affiliate) who are interested in smooth muscle. I would like to thank the many members of the Group who have already responded to my request for the names and e-mail addresses of those who haven't listed their e-mail addresses in the Grey Book. I would also like to urge others who may know current e-mail addresses of Group members to sent them to me (n.mchale@qub.ac.uk).

We are currently planning a Techniques Workshop in Belfast in July 1999 immediately after the Annual General Meeting in Newcastle. The theme will be "Techniques for Measuring Sub-sarcolemmal Calcium". We are also planning a Designated Session at the Newcastle Meeting. Further details of both events will be circulated (by e-mail) early next year. In the meantime I would like to hear your suggestions for themes and locations of future Designated Sessions and for a Symposium in the year 2000. I look forward to seeing you in Newcastle if not before.

Noel McHale

RESPIRATORY PHYSIOLOGY

The new Convenor for the Respiratory Physiology Group is:

Dr Douglas Corfield
Dept of Medicine
Charing Cross & Westminster Medical School
Fulham Palace Road
LONDON, W6 8RF

Tel: (0181) 846 7185
Fax: (0181) 846 7170
Email: d.corfield@cxwms.ac.uk

Our thanks go to Prem Kumar, previous Convenor, for maintaining the Group over the last few years.

Meetings Secretary's Office

IMPACT FACTORS AND THEIR ROLE IN THE LIFE OF A SCIENTIST

Mankind, it seems, makes a poorer performance of government than of almost any other human activity. In this sphere, wisdom, which may be defined as the exercise of judgement acting on experience, common sense and available information, is less operative and more frustrated than it should be.

*Barbara Tuchman,
"The March of Folly"*

Dear Editor,

What governs contemporary science? The answer is simple - the impact factor. The Journal Citation Rankings are watched by scientists as closely as soccer tables by football fans. One can hardly imagine a pub-talk after a meeting which does not involve vehement lamentations about the impact factors (IFs) and their role in determining the fate of a scientist. The overall opinion is quite negative, though usually it does not go beyond simple complaints. The constructive suggestions are rare. What does the impact factor represent in fact? Is it indeed a measure of scientific excellence, and, even more importantly, is it a measure of the scientific capabilities of a researcher? Can one say that a particular paper published in *FASEB Journal*, which has an impact factor of 14.629* is exactly 4.63 times better than another one appearing in *Journal of Physiology, London* (IF 3.160)? Or that a paper in *Advances in Microbiological Physiology* (IF 8.333) exceeds 3,32 times one in *Pflugers Archiv* (IF 2.580)? Accordingly, does a scientist who published one paper in *Nature* (IF 27.368) deserve 3,8 times higher respect than the one who published two papers in *Neuroscience* (IF 3,594)? Several research institutes (at least in Germany) provide their scientific employees with the ranking list where they are arranged according to their cumulative impact factor (CIF) over the current year. This CIF is calculated by summing the IFs

for all the papers published by that particular researcher during a year. Even more pathetic stories come from my friends in US - there, the earning of valuable points depends also on the position within the author list - the first and the last authors get 100% of the IF, whereas the other authors get only a percentage, according to their position in the list, with the middle one getting the least. The use of these CIF-based leagues table obviously makes life easier - one knows immediately what percentage of due respect should be paid to collaborators, and the administrators of science know who's who. But the question which arises is what we are all doing with this - acquiring new knowledge or fighting for a position in a league table?

The whole IF issue came into being from the US, as other things did (i.e., McDonald's or Hollywood thrillers), which altogether changed considerably and constantly the cultural landscape of the Old World. It seems that the IF has changed the way that scientists think about what they are doing similar to the way in which the Big Mac had changed the way people enjoy their food. It also made the life of the scientific bureaucracy easier - it is easy to assess the achievements of a particular scientist and it is easy to do a Research Assessment Exercise - just compare the numbers.

On the other hand, it is absolutely clear that the scientists do need some sort of independent feedback on the quality of their output. The question is then whether this IF or CIF is an adequate tool for such feedback? Conceptually thinking, this is not at all the case, for the simple reason that the IF defines the standing of a journal, it exists before one publishes the paper and is thus independent of the quality of a particular submission. Certainly, the high-ranking journals do have more exposure and therefore provide a better potential for a paper to be recognised, but this doesn't imply that IF can be accepted as a measure of the scientific quality of an individual contribution. In fact, the IF is more of a measure of the ability of editorial board to select high quality papers, provide a right balance between original papers and relevant reviews, the latter bringing, if timed rightly, a significant number of citations and of being aware of the current scientific fashions.

Is there an alternative, which could provide a better and less biased feedback on the quality and worthiness of a scientific contribution? In my view, one such alternative is the use of a straight citation index of a particular paper and/or a cumulative citation index of a particular scientist. Indeed,

when we look at papers of real scientific impact we can immediately see the validity of such a citation index. Brilliant examples are the papers describing new methods (e.g. Hamill et al. description of patch-clamp technique which gathered 7039 citations in 1991-1998, - compare this with the 2.58 IF of *Pflugers Archiv* when the paper was published) or new concepts (e.g., Putney's paper defining the "capacitative calcium entry" - 721 citations in 1991-1998; when *Cell Calcium*, where the paper was published, has an IF of 2,26). Obviously, this might be not the only solution, but I strongly feel that the scientific community must think harder over the current situation and should do whatever necessary effort to prevent transforming science into a business activity, aiming at the acquisition of valuable points. I would like to hope that by writing this letter I may initiate a wider discussion between the members of the Society on this important issue.

Alex Verkhatsky

Source

Journal Citation Reports - 1997 Science Edition

Note: my personal cumulative IF for 1998 is 47,53 (6 papers)

Come back Saffron, all is forgiven!

Over the last five years Saffron Whitehead put a lot of time, effort and skill into editing this magazine. In the last issue she thanked all who had helped her during that time. On behalf of the Society, it is now my turn to thank her for all she achieved and for the professionalism with which she approached the job. In the last few months both my editorial assistant Craigie Chapas and I, have wondered exactly how she managed it, as we attempted to put this issue together. We thank Saffron very much for providing us with such a good template to work from.

Inevitably, there have been glitches and problems associated with moving magazine production to our central London Office. We hope we can come through the next five years as well as Saffron did and we are not likely to forget her enormous contribution to both the *magazine* and the Society during her period as Editor.

Thank you Saffron.

Bill Winlow
Editor

Charter for Animals – Latest News

Many members of Physiological Society will be well aware of the legislation under which animal experimentation in the country is conducted (The Animals (Scientific Procedures) Act 1986). Before the 1997 election the Labour Party published a Charter for Animals, which included a number of ideas for reviewing and tightening this legislation. So far only some of these have been implemented – for example there has not yet been a Royal Commission. However, there have been non-legislative changes – the banning of the ascites production method for monoclonal antibodies; changes to the composition of the Animal Procedures Committee (APC); the “voluntary” ban on the testing of cosmetics, and the introduction from April 1999 of local ethical review processes. As I write, the end of cosmetic ingredient testing in the UK has just been announced, and we are expecting further changes, for example to the composition of the APC.

The BPS and the Laboratory Animal Science Association started to discuss their concerns about the direction of Government policy in this area early in 1998. We soon realised that there were strong common interests which were shared by other societies, so we broadened our discussions to include The Physiological Society, British Society for Immunology, Society for Endocrinology, British Laboratory Animals Veterinary Association and the Nutrition Society. For want of a more imaginative name, we have called ourselves the Inter-Society Animal Use Group (AUG). In November 1998, the UK Life Sciences Committee agreed to take the Group under its *aegis*, which will enhance our credibility when speaking to decision makers.

The Group is concerned that the Government may not realise the implications for science and industry, of making animal research more difficult. Many politicians seem to believe that molecular biology and genome research have made animal work redundant. They need to be educated about the realities. Alternatives are always used where possible, and all responsible institutions practise the three R's, but cell and tissue cultures and computer simulations cannot yet predict the behaviour of whole organisms. The AUG is making contact with relevant Government Ministers (to date Lord Sainsbury, Minister for Science in the Department of Trade and Industry, and George Howarth MP, Minister responsible for animal legislation in the Home Office). We are also trying to build coalitions with other groups which have an interest in the continuing progress of biomedical science, such as The Royal Society, Medical Royal Colleges, patient groups etc.

One of the AUG's concerns is the amount of time being taken to obtain or amend Home Office licences, both project and personal. We are well aware of the considerable pressure on Inspectors, and do not wish to be critical of them, but we are concerned that delays might be a convenient, non-legislative way of bringing the numbers down. The previous Home Office Minister, Lord Williams of Mostyn, expressed the hope that the number of animals used in scientific experiments would be halved before the next election. The AUG has been trying to obtain information from universities and industry to try to support the anecdotal evidence that research is being seriously hampered by these delays. Unfortunately, to date the evidence we have

been able to gather does not support this contention, mainly because institutions do not have the necessary data. The introduction of local ethical committees will require institutions to keep more detailed records, so we shall continue to try to collect this information and, if it bears out our concerns, will discuss it with the Home Office.

Educating the public about the continuing need for animal experiments is a massive task. The AUG has some plans to get involved in this, using for a like the BA meeting, but they are at an early stage. There is also a need for more information for schools, and our new link with the UKLSC will give us the opportunity to work with the latter's Education and Careers Group in this area, as well as with the Biomedical Research Education Trust (BRET).

We also think it is very important to educate our members – hence the briefing meeting which we held at the joint BPS/Physiological Society meeting in Southampton. We hope to continue to hold similar meetings, where scientists can share their experiences as well as keeping up to date on the latest changes in legislation, and on techniques and alternatives too.

Outside the AUG, the BPS has been trying to ensure that the skills base for *in vivo* work is maintained. Following an indication from the pharmaceutical industry that it was having difficulty in finding recruits with the appropriate knowledge and attitudes for *in vivo* work, we surveyed 32 universities where pharmacology was taught. Only 14% of them had neither reduced nor eliminated *in vivo* work for undergraduates over the past 5-10 years. The main reasons for this were expense and the difficulty of getting licences. The BPS therefore established a fund with the support of seven

major pharmaceutical companies to offer grants to universities to run *in vivo* pharmacology courses for undergraduates. The first grants were paid this year, and we hope to keep the scheme running for at least three years, so that we can assess whether it has made any difference.

We have also opened a dialogue with the Home Office about licences for education and training, because we have been warned that they will become increasingly difficult to obtain. The Home Office has challenged us to demonstrate that *in vivo* work is the only, or a significantly better, way to inculcate the knowledge required in students. We have asked the industry for help in this, and if any reader has any ideas on how this might be demonstrated please contact us – it will affect physiology as well as pharmacology.

Some readers may wonder why we are not leaving all this to the Research Defence Society (RDS). Most of the members of the AUG are corporate members of the RDS, and we keep in close touch. However, the RDS is a single issue pressure group, and is therefore seen by some people as representing a biased view. The learned societies are more likely to be seen as speaking in the interests of “pure” science. This issue is not going to go away. The anti-vivisectionists will continue to lobby – the subject is one of the biggest in most MP's postbags. We therefore cannot “leave it” to any-one else – it affects us all.

Tom Blackburn
British Pharmacological Society

FIRST PHYSIOLOGY WORKSHOP IN SCOTLAND *Dundee hosts a successful event.*

On 17th & 18th September 1998, the Physiology Division of the Department of Anatomy & Physiology hosted a two-day physiological workshop for senior pupils of Scottish schools organised by Dr Sandy Harper and Mrs Vivienne McGuire. Whereas universities in England & Wales have hosted several workshops, this was the first of its kind to be held in Scotland. 49 students and 4 biology teachers attended from as far afield as Lochaber in Highland Region to Dumfries down in the Borders, approximately 200 and 150 miles from Dundee respectively.

Following arrival and registration, the students were introduced to the scope of physiology by the Head of Department, Dr Martyn Ward. The students were divided into groups (named after famous Scottish Physiologists - Haldane, MacLeod, Garry & Black) and were involved in a number of hands-on practicals such as Measuring Performance: Exercise Physiology, Making the Heart Beat, Measuring Lung Volumes and Touch, Temperature and Vision. Since these practicals are largely computerised, the students were introduced to the use of computers in Physiology both for computer-aided learning (CAL) and for running practical classes. The Department has been at the forefront in introducing computers into the teaching of practical human physiology, largely due to the energies of Dr Nick Part. In addition, lecture/discussion groups on the use of animals in research and career options open to Physiology graduates were presented.

Following the first day sessions in the lab, the students adjourned to the University's Conference Centre where they received talks on current major challenges in Physiology. Dr Hari Hundal (Physiology, Dundee) presented "Diabetes and Insulin Action: a Research Perspective" in which he describes the multidisciplinary application of molecular biology and cell signalling to furthering our understanding of the pathogenesis of diabetes and the prospects for drug design and gene therapy for the control of Type I and Type II diabetes.



*Professor Ron Maughan
University of Aberdeen*

After dinner, Professor Ron Maughan, Biomedical Sciences, University of Aberdeen gave us an entertaining and thought-provoking presentation entitled "Attaining and Maintaining Peak Performance". The scope of Ron's talk was wide-ranging - from his ascent to Physiology following a brief sojourn studying

English Literature & Forestry to the correlation between foot size at age 4-5 years and performance of the East German Olympic swimming team! Overnight accommodation was provided at the conference centre for out-of-town students.

The second day focussed again on hands-on practicals and demonstrations including, measuring reflex times in man. As part of the workshop the students were asked to prepare a poster describing how the body responds to a period of moderate exercise. The judging process to find the winner was very



"Posh Spice" has height measured

difficult as the standard of presentation and content was very high in all 4 groups. However, first place was awarded to the Black team who each received book tokens as their prize.

The workshop was a great success as judged both by the exit feedback from the students and staff involved. The students really enjoyed the hands-on practicals and making new friends (as judged

Taste of university life

JUDITH Flett from Dumfries Academy was selected to attend a two-day physiology workshop at Dundee University, sponsored by the Physiology Society.

After the two day course I attended at Dundee University on physiology, I can really say it was a great experience and a valuable opportunity. I got a great insight into physiology as a subject to study as a degree and was told about opportunities which can be taken up after this degree.

These include careers in medical and industrial research, for example work in fundamental and applied research in the pharmaceutical industry. You can also be given a good background for careers such as teaching and the civil service.

Dumfries & Galloway Standard
October 1998

Alternatively, other careers can be followed after further study — eg medicine, dietetics, nursing, management, sales and marketing and accountancy.

The course was well planned and both the practical and theory sections were very interesting. We were able to do our own ECGs — electrocardiograms — and test some pulmonary functions.

I highly recommend the course to anybody interested in any of the medical or biological sciences.

Other than finding out about the course in particular, general information about the university was obtained and staying in the West Park halls gave me an insight into actually living in Dundee.

A further advantage of taking part was that I won a £110 book token in a competition to design a poster showing the effects of exercise on the body.

Newspaper article, featuring one of the participants, Judith Flett from Dumfries Academy

by the exchange of addresses at the end of the workshop). The staff have been pleasantly surprised by the many thank-you letters from the schools involved and the unsolicited newspaper publicity arising from the workshop. We look forward to hosting another workshop in the future.

Students were given an information pack and a small gift as a memento of their visit with us and we feel that a very positive impression of

university life and the subject of Physiology was taken back to schools by the participants.

We would like to thank Professor Ron Maughan and his “team”, Dr John Lieper and Dr Susan Sheriffs for their valuable help in the exercise physiology aspects of the workshop.

Dr Sandy Harper



"Black" team with their winning poster



Poster preparation is going well

A look behind closed doors



Back Row (L-R) *Josie Taylor, Amy Thomas, Ian Carey, Chris Stephen, Kate Riordan, Anthony Eason, Michael Gannon, Daniel Sutton, Andrew McCleary.*

Front Row (L-R) *Andrew Watson, Rebecca Brewster, Gemma Chidgey, Irfan Badakshi, Torquil Chidwick, Ciaran Ruane, Andrew Carbett.*

We arrived at Birmingham Medical School on the 15th July 1998, expecting our trip to the Physiology Department to be a relaxing day off, following the recent stress of A-Level exams. Instead, we left the Medical School at Birmingham University fairly exhausted, but with a general consensus that the world of physiology was pretty fascinating. We had some idea that physiology was the study of the way in which living organisms worked, but we knew little else. We began the day with coffee and an informal welcome and introduction by Dr. Prem Kumar.

Having finished our refreshments, we quickly split into two groups. Our group went to see the electron microscope where Paul Stanley explained to us the basic differences between the two types of electron microscopy, scanning and transmission. The microscope we saw performed both types of microscopy and on the day

we were there it was set up for scanning. Paul explained the essential preparatory methods, the way in which the microscope works and we looked at a housefly. We came to realise that advances in technology have been essential in the advancement of physiology and that the two go hand in hand.

We also had a closer look at photographs of phospholipid cell membranes and different organelles, such as mitochondria. During the next seminar session we were shown a Physiological Society video and discussed the basic principles of physiology and scientific experimentation with Dr. P. Kumar. We then had a short workshop on 'designing an experiment'. Dr Kumar asked us to formulate an hypothesis and design an experiment to test it using only the materials and equipment available in the teaching laboratory in which we were seated. After the more humorous suggestions such as 'lock the

lab door and see how long it takes us all to die of asphyxiation' we came up with a rather more tame idea 'whether females are shorter than males'. Before experimenting we discussed this and eventually came to the conclusion that our A-Level Biology class did not represent a large enough sample, and was biased to age group. From this workshop we learnt many important lessons about conducting scientific investigations, including the value of suitable controls which will certainly help us with our future practical work at A-Level.

Before lunch, which is always a difficult time to keep the attention of any student, we discussed vivisection with Dr. Chris Lote. The discussion was enlightening and thought provoking. We considered the arguments for and against animal research and by the time we left the workshop, we had a much better idea of the implications of vivisection for society.

There was little time for lunch because we had the invaluable opportunity of talking to the much sought after Chief Admissions Tutor in a small group about entry into Medical School.

After lunch came Dr Anthony Evans' opportunity to seek revenge on us, his biology class, by getting us to undertake a series of gruelling exercise-based experiments. Reluctant 'volunteers' had their metabolic rate measured during exercise,

while the rest of the group measured their own lung capacities using spirometry. We also measured our electrocardiogram by attaching electrodes to our wrists and ankles, the electrical activity detected was printed out for us to keep. Luckily no heart abnormalities were detected within the group although in one case a flat line was recorded!

It was a rare opportunity for us to see what a University was like, without the 'hard sell' focus of an Open Day. It is probable that more people would apply to University if they had this same experience of 'student life'; being taught by lecturers who are experts in their field, the opportunity to use highly specialised equipment and the friendly, relaxed atmosphere which we all experienced.

Before we knew it the day was over and we left feeling that a career in physiology was a distinct possibility. We must mention the kindness of Professor John Coote, the Head of Department for allowing the use of his facilities, and all the staff especially Dr Kumar and Anneli Conway (PhD Student) who gave up their time so generously to allow us an insight into the world of physiology.

*Andrew Watson and Kate Riordan
St Thomas Aquinas Catholic
School Sixth Form
Kings Norton, Birmingham*

MEASUREMENTS OF FREE CALCIUM CONCENTRATIONS WITHIN THE ER – IT'S AN INSIDE JOB

Austin Elliott reports that measuring free calcium in the cytosol is old news. Calcium measurements inside intracellular organelles are “in vogue”.

Single-cell fluorescence-based measurements of cytosolic free calcium ($[Ca^{2+}]_i$) have now become commonplace, accounting, for instance, for roughly 15% of the papers in two recent Volumes of the Journal of Physiology. So it is easy to forget that the “single cell $[Ca^{2+}]$ revolution” began less than fifteen years ago with the landmark invention of Fura-2 and Indo-1 by Roger Tsien and his co-workers (Grynkiewicz et al., 1985). Fura-2 and Indo-1 improved on the earlier dye Quin-2 by fluorescing brightly enough for signals to be recorded from small single cells. Until the dyes arrived, measurements of $[Ca^{2+}]_i$ were confined to a few labs using the photoprotein aequorin, and generally to multicellular preparations of tissues with relatively large cells (e.g. striated muscle). The fluorescent dyes, together with methods for loading them into cells without microinjection, have permitted single cell measurements of cytosolic $[Ca^{2+}]$ in almost any mammalian cell.

If measurements of cytosolic calcium are now routine (not quite true, but almost, provided one is happy to measure spatially-averaged $[Ca^{2+}]_i$ with time resolution of a second or so) where are the new frontiers of calcium measurement? One is at the technological edge of confocal microscopy, where two-photon microscopy is now allowing experimenters to peer hundreds of microns deep into intact tissues (Denk & Svoboda, 1997). Another is trying to measure free $[Ca^{2+}]$, not in the cytosol, but rather *within* intracellular organelles, for example, the releasable intracellular Ca^{2+} store – or stores – generally considered to be located in the endoplasmic reticulum (ER).

Why measure intra-ER free $[Ca^{2+}]$?

The most obvious answer for the physiologist is that the free $[Ca^{2+}]$ inside the ER ($[Ca^{2+}]_{er}$) is the major driving force for intracellular Ca^{2+} release. It is also possible that $[Ca^{2+}]_{er}$ actually regulates the ER Ca^{2+} release channels, and perhaps also the ER Ca^{2+} uptake pumps (for review see Krause & Michalak, 1997).

A more subtle question is whether the ER is a continuous or discontinuous network throughout the cell. For instance, does localised release of Ca^{2+} , which produces spatially discrete changes in cytosolic $[Ca^{2+}]$ in many cells, also produce localised depletion of the stores? On a similar theme, it has recently been argued that intracellular Ca^{2+} stores can act as “ Ca^{2+} tunnels” through the cytosol, so that Ca^{2+} ions can be taken up by the stores in one part of a cell and subsequently be released in another cellular region without having to diffuse through the cytosol (Mogami et al., 1997). There are many other unsolved questions, including one as basic as how low $[Ca^{2+}]_{er}$ has to fall to activate so-called depletion-activated (or “capacitative”) Ca^{2+} entry. Finally, the ER Ca^{2+} pool plays an important role in the folding and post-translational processing of secreted and cell surface proteins.

Methods for measuring intra-ER free $[Ca^{2+}]$ in living cells

There are basically two approaches available for measuring $[Ca^{2+}]_{er}$. One is to use small molecular weight fluorescent dyes, similar to Fura-2 and Indo-1. Magfura-2 has been widely used since it has a K_D for Ca^{2+} (c. 50 μM) appropriate to the expected $[Ca^{2+}]_{er}$. This approach is attractive since the necessary equipment is the same as for measuring cytosolic $[Ca^{2+}]$, and the dye signals are bright enough to measure $[Ca^{2+}]_{er}$ in single cells or even in subcellular regions (see e.g. Golovina & Blaustein, 1997). However, there are major problems in restricting dye loading to *only* the organelle you want and not everywhere else in the cell, i.e. other organelles and particularly the cytoplasm. In fact, the strategy typically adopted is to load the dye everywhere and then wash it out of the cytoplasm, e.g. by permeabilizing the plasma membrane or by dialysing the cell interior with a patch pipette.

Protein-based calcium indicators can be targetted to the organelles

Although the fluorescent dyes have largely replaced aequorin for measuring cytosolic $[Ca^{2+}]_i$, the photoprotein has continued to be used for intra-organellar $[Ca^{2+}]$ measurements. This elegant approach, pioneered by Tullio Pozzan and Rosario Rizzuto in Padua, relies on the advances in molecular biology which make it possible to manipulate the aequorin (Aeq) gene and to transfect the Aeq cDNA into cultured cells. In contrast to the fluorescent dyes, a Ca^{2+} -sensing protein like aequorin has the tremendous advantage that it can be targetted unambiguously to different organelles by making use of the cell's own protein-targetting machinery (Rizzuto et al., 1994). For instance, adding an N-terminal 12-amino-acid signal sequence and a C-terminal 4-amino-acid ER retention sequence to the Aeq cDNA "directs" aequorin to the ER. Difficulties which will probably limit the *widespread* use of this method include the problematic calibration of aequorin signals and the necessity of doing experiments in cells which can be readily transfected with cDNA constructs (usually cell lines). Perhaps the most significant drawback of targetted aequorin is that the weakness of the bioluminescence signals requires them to be recorded from populations of cells, whether adherent or in suspension, so that single cell information cannot be obtained.

Protein-based fluorescent calcium indicators – the Cameleons

Last year Roger Tsien's and Tony Persechini's groups reported the development of protein-based fluorescent Ca^{2+} indicators based on Green Fluorescent Protein (GFP) (Romoser et al. 1997; Miyawaki et al. 1997). These Ca^{2+} indicator proteins, dubbed "Cameleons" by the Tsien lab, can be targetted to organelles in the same way as aequorin, but their much brighter fluorescence signals can be recorded from single cells. Although the first generation Cameleon indicators have a relatively small dynamic range, experience with GFP (where the fluorescent properties have been greatly enhanced by systematic mutation of the protein) suggests that improved versions will

emerge rapidly. It is thus possible to look forward to a future where the only barrier to measuring free $[Ca^{2+}]$ inside your organelle of choice will be the task (admittedly a non-trivial one) of delivering the cDNA into the cell.

What do we know about Ca^{2+} regulation in the ER lumen ?

Much of the work on $[Ca^{2+}]_{er}$ has centred on trying to measure its absolute value. Measurements with fluorescent dyes consistently give values around 50-400 μM . Measurements with ER-targetted aequorin are much more variable, ranging from as low as 2 μM to as high as 3-4 mM. The only measurement with ER-targetted Cameleon indicators suggests around 400 μM (Miyawaki et al., 1997). In general, some sort of consensus has emerged that the true value for loaded stores, at least in non-muscle cells, is likely to be a few hundred micromolar. Details of the various estimates can be found in an excellent recent review by Meldolesi and Pozzan (1998).

One major question remains the identity of the Ca^{2+} buffers within the ER. The total amount of Ca^{2+} stored within the ER can reach 10-20 $mmol.l^{-1}$ ER volume, an order of magnitude or more above $[Ca^{2+}]_{er}$. Early attention focussed on calsequestrin (in muscle) and its non-muscle homologue calreticulin. However, it seems that quantitatively there is not enough calreticulin to explain all the intra-store Ca^{2+} buffering (see e.g. van de Put & Elliott, 1997). Since several other ER-resident proteins (e.g. BiP, Calnexin, Protein Disulphide Isomerase) can also bind Ca^{2+} with millimolar affinity, it seems probable that many different proteins actually contribute to intra-ER Ca^{2+} buffering. Most of these intra-ER Ca^{2+} -binding proteins are also molecular chaperones, and are induced following cellular or ER stress, raising the possibility that altered ER Ca^{2+} handling may be an important part of the cellular response to environmental toxins.

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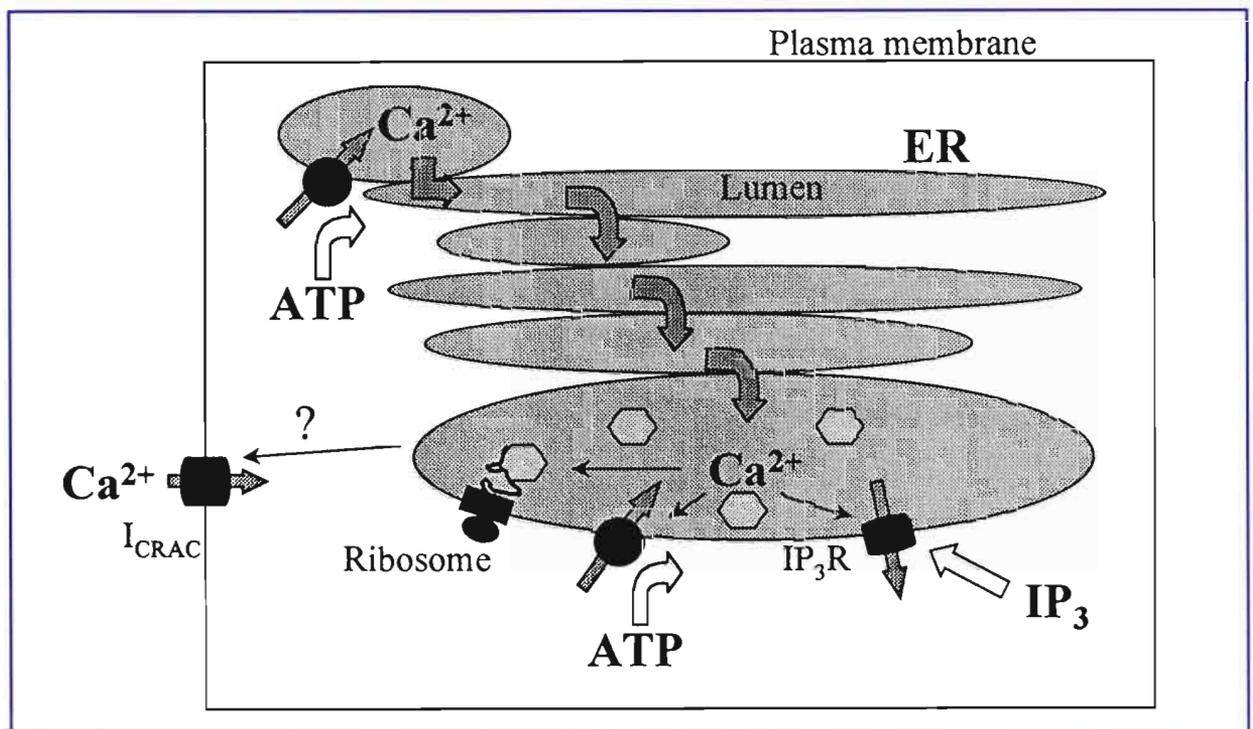


Fig 1. Cartoon indicating actions of $[Ca^{2+}]_{ER}$. The shaded ovals indicate the ER cisternae, and large grey arrows indicate movements of Ca^{2+} ions. Ca^{2+} is pumped into the ER by the SERCA Ca^{2+} -ATPase, and can be released via IP_3 receptor (IP_3R) release channels. Ca^{2+} ions within the ER interact with Ca^{2+} -binding proteins (hexagons), which also act as chaperones to help protein folding. Small arrows show regulatory actions of $[Ca^{2+}]_{ER}$ on ER Ca^{2+} uptake, ER Ca^{2+} release, protein chaperoning and also (by an unknown mechanism) on plasma membrane Ca^{2+} entry through the I_{CRAC} channel.

Save British Science



Peter Cotgreave

One of my ancestors was a surgeon at the turn of the nineteenth century. He saved a number of lives, but he recognised that his success rate was too low. He appreciated that the reason for this was his lack of understanding about how the human body worked. So when he died, he left all

his money to those hospitals whose leading surgeons offered some hope of finding new insights. If my forbear could come back now, and spend just 15 minutes in a modern hospital, he would be delighted by all the physiological advances that allow the use of proton-pump inhibitors, defibrillators and modern anaesthetics. He would also be amazed by the heart monitors with their electronic output, and the fibre optics being used in keyhole surgery.

His delight and amazement would be so great because, however hard he had tried, he could never have foreseen the scientific and technological breakthroughs, in physiology and other disciplines, that have revolutionised our lives over the past 200 years.

Save British Science exists to make sure that everyone appreciates that even though we cannot predict what a hospital, or a farm, or a classroom will look like in 100 years time, we know that scientific advances will have brought new benefits to them all. Not all science is used for the common good, but in general, science is an investment in our future health, environment and quality of life. And because some science can be abused or misused, the public needs to have a fair understanding of science and technology, so that we can hold our politicians to account.

Science is worth doing for its own sake discovering the intricacy and apparent cleverness of the functioning kidney is as emotional as listening to a Beethoven symphony. But it is also worth doing

as an economic investment, because it generates products and services that people value enough that they are prepared to pay for them. Science is worth doing for its own sake discovering the intricacy and apparent cleverness of the functioning kidney is as emotional as listening to a Beethoven symphony. But it is also worth doing as an economic investment, because it generates products and services that people value enough that they are prepared to pay for them. Building a consensus in favour of investing in science requires activity on an endlessly widening variety of fronts. Most obviously, SBS talks to the people who run the country, including Government Ministers, their advisors, and civil servants. But we also spend time talking to businessmen, industrialists, and financiers, trying to spread the message that by investing in science now we will improve our trade and industry in a few years. We also try as often as possible to talk to practising scientists, and any sector of the wider public that will listen. We hold seminars for bankers, industrialists and academics to help bridge the gap between the best science and the best methods of wealth creation. We organise lectures on science education, and produce reports to provide information for the press, public consultations and parliamentarians. In fact, we do anything that might help win the basic argument in favour of investing in science. The message that is perhaps most difficult to get across is that research is an investment even when it has no obvious purpose. Even when we cannot possibly imagine what use an experiment might have, I would still be prepared to bet on its long-term usefulness.

Of course we know that scientific research is important because an understanding of the universe is always more likely to be useful than ignorance. There is also the argument that almost every piece of research in our universities and science parks has some effect in helping to train new scientists, who will develop the innovations that will improve out lives in the future. But even if they ignore these arguments, sceptics cannot avoid the

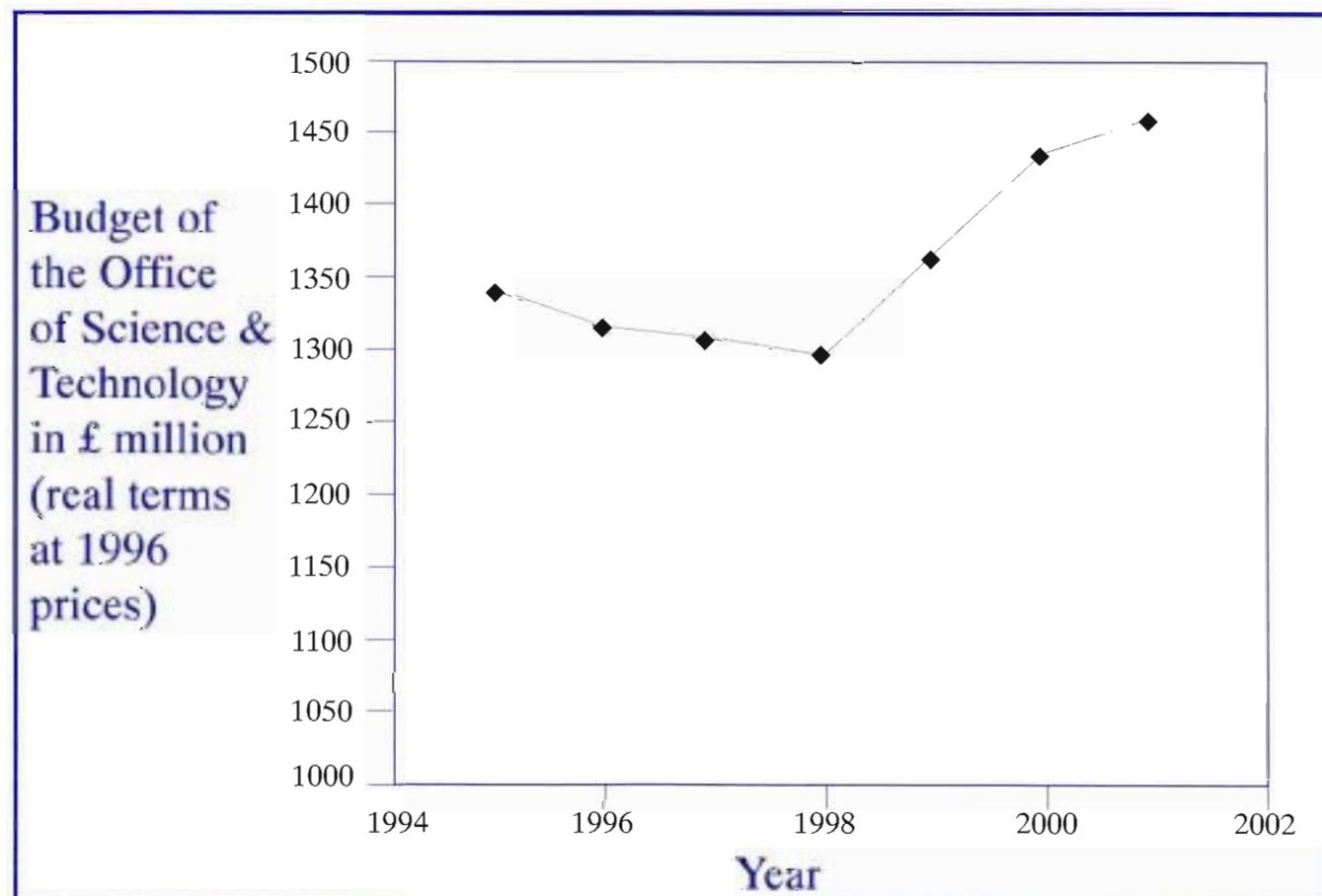
empirical evidence that history is littered with examples proving that off-the-wall, seemingly daft experiments have turned out to revolutionise people's lives. Nobody can possibly believe that William Harvey would have been awarded a Government grant to carry out his research into the circulation of the blood. And independent researchers like Harvey can no longer be part of the scientific research community, because world-class science needs world-class levels of investment.

The present Government has shown a sense of purpose by finding 1.1 billion of new money over the next three years. But that is only a start, and the pressure must be kept up. We need to ensure that we strengthen our investment in physiology, immunology, thermodynamics, ecology, organic chemistry, and every other scientific discipline. In America, scientists take their Congressmen and Senators seriously, and politicians take the scientists seriously. We need to move towards that situation in this country.

The people working in the Science Base, and elsewhere in British Science must not be complacent. We must continue to present a clear voice to Government, and SBS will maintain and strengthen its efforts. We recently moved our offices to London to be nearer the centre of things, and we also have a Scottish group, which will be important once the devolved Parliament is up and running. We know that our activities have made a difference, and we plan to continue to be effective.

Of course we need more members, and I would be delighted to hear from you if you are interested in joining. You can write to me at SBS, 29 Tavistock Square, London, WC1H 9EZ, or visit our website at <http://dspace.dial.pipex.com/sbs/>.

Peter Cotgreave,
Save British Science



The budget of the Office of Science & Technology is set to rise in real terms over the next three years, after a steady decline since 1995

Web Watch

The Web – Commerce or Cooperation

Can we make better use of the World Wide Web for teaching than we are currently doing? There is no doubt that in some areas the use of the Web has been a revolution. It is now the norm to access databases such as Medline or GeneBank by this route and updated software drivers from supplier sites has saved the day for many a computer officer. Web servers allow us to deliver a wider range of media to students than ever before – colour, animation, video, simulations, interaction. Excellent Web-based resources now exist, the Whole Brain Atlas¹, a site containing CT, PET and MR brain images of the “top 100 brain structures”, being a good example. There is also a number of sites devoted to indexing subject-specific material such as Neurosciences on the Net².

But is it making the impact into teaching that has been predicted for it, particularly bearing in mind the claims of some that Internet-based distance learning will be a significant competitor to the conventional campus university? A future is predicted where the free roaming student will search out and find materials from the best sites worldwide, constructed by the top-class “virtual” universities.

However, extravagant claims are not unusual on the introduction of new technology and it is often difficult to predict its ultimate impact. The telephone, for instance, was initially thought of as a means of providing piped music, rather than communication. Given that the diversity of teaching within the university system is one of its prized attributes, it may turn out that the vast majority of web-based development will actually remain focussed on delivery within individual institutions. The main value of the Web may then be its potential as a resource for the academic, rather than for the student. Students might well “surf the web” looking for interesting material but, in the absence of a coherent local programme of study, this is not likely to be an effective learning experience.

The problem for the academic is getting access to teaching material capable of living up to the potential of the new medium. Hand-drawn diagrams,

which didn't seem out of place on photocopied lecture notes, somehow become an embarrassment when delivered in 24 bit full colour and sound. Many academics now regularly turn to the Web in search of better materials. But, are they actually finding it? And if they do, can they use it legally.

As yet, there are no accepted norms for “fair dealing” with electronic media or blanket licenses like that managed by the UK's Copyright Licensing Agency for photocopying printed Media. Even in that case, the recent CLA Higher Education Accord³ which clarified what was, and was not, permitted has caused screams of anguish throughout the academic community – largely due to those involved being unable to continue their traditional malpractices in blissful ignorance. Basically, apart from looking at it, one cannot use any material (pictures, text, animations) at all from a web site without the explicit permission of the author. This may well be granted, but it may not be always obvious whom to contact. These copyright issues are widely recognised as a problem by H.E. institutions and publishers alike (so much so that my own university has recently appointed a Copyright Officer). However, after some years no obvious solution is yet in sight.

Discussions seem to be taking place largely in the context of a commercial distribution model (not surprising since publishers are involved) aiming to place a value on each item and to find some means of charging for it. This approach to teaching materials sits rather awkwardly with the relatively free exchange of information and software common in research. Free distribution of reprints is accepted practice and there are numerous successful examples of research software packages being supplied as “freeware”, Wayne Rasband's NIH Image⁴ package is a glowing example of this, as is the GENESIS⁵ and NEURON⁶ nerve cell stimulators. Web sites offering research software are usually quite explicit about what kind of use can be made of the software, usually allowing download and free use for research and teaching

but excluding commercial exploitation. Curiously, many sites hosting teaching materials seem to lack this type of information. Why this should be so is unclear, but is more likely to be due to omission rather than a deliberate wish to restrict use.

How can we improve this situation? One of the simplest ways, at almost no cost to anyone, is to adopt the practice of placing potentially interesting teaching resources on to existing departmental web pages. Such resources need not be highly polished multimedia products.

Something as simple as a good quality drawing or micrograph is likely to be of use to someone, somewhere. Equally, computer simulations, which may not be worth marketing as a commercial product, may still be valuable as a teaching aid. It is hard to believe that there is not a substantial amount of unpublished high quality material scattered around departments worldwide.

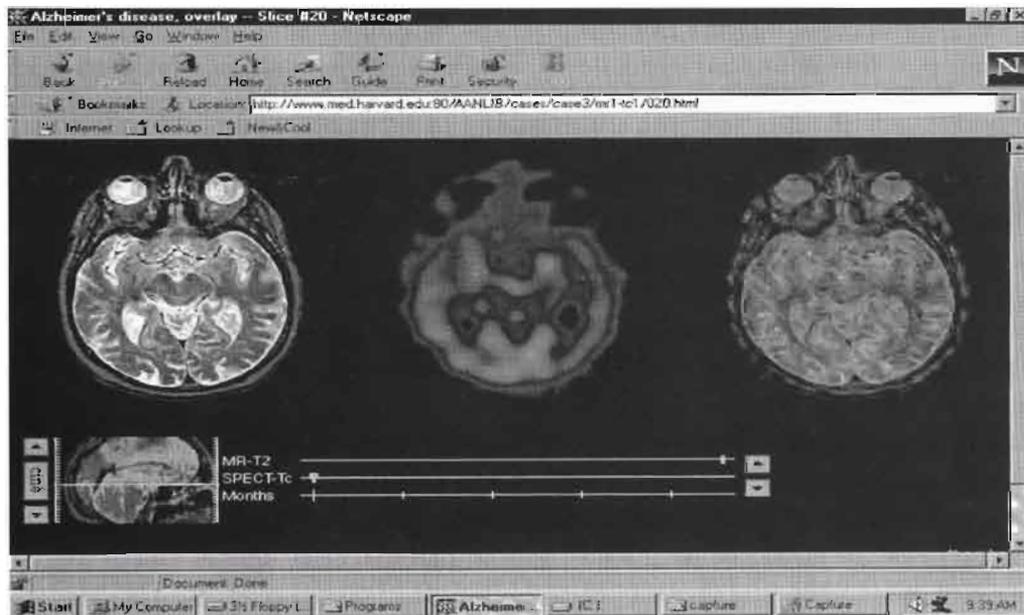
Much of this material is of little monetary value in itself, but could become a valuable shared resource

teaching and for non-commercial purposes, with the proviso that the source is acknowledged.

There are definite practical benefits to be gained by departments, if altruism isn't a sufficient reward in itself. Web pages are increasingly being seen as a showcase for a department with the aim of attracting good research students and undergraduates. Lists of staff e-mail names and the title of their last paper however tend to make less than exciting reading. Most departments, however, will have one or more research groups with some technique or specialisation, which generates interesting and perhaps unique material. In the long term this approach, if encouraged, could create an effective shared worldwide resource for teaching material in the physiological sciences, with little real effort.

John Dempster

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MR and other types of brain images from Alzheimer's patients, from the Whole Brain Atlas web site, developed by Keith Johnson and Alex Becker, Harvard University and MIT

if it could be made available, and the Web is an ideal medium for this. This "grass roots" approach can quite easily coexist with the conventional commercial production of multimedia products, just as lecture notes coexist with textbooks.

It will also be necessary to make an explicit statement on the web page concerning the conditions under which such material may be used. This may simply take the form of a statement granting users permission to use the material in support of their

Notes

- 1 <http://www.med.harvard.edu/AANLIB/home.html>
- 2 <http://www.neuroguide.com/>
- 3 Details of the rules for photocopying and a discussion of electronic media issues can be found at <http://www.cla.co.uk/>
- 4 <http://www.rsb.info.nih.gov/NIH-image/>
- 5 <http://www.bbb.caltech.edu/GENESIS/genesis.html>
- 6 <http://neuron.duke.edu/>

Computer Modelling and Thermodynamics of Ion Transport

Tuesday 4th May to Friday 7th May inclusive

Course Organisers

Professor B J Harvey & Dr S Randall Thomas

Venue

Wellcome Trust Cellular Physiology Research Unit, and the Department of Physiology, University College, Cork, Ireland

This Techniques Workshop will teach an intensive course in thermodynamics and computer modelling of membrane transport. The course is based on the application of thermodynamic principles to ion transport across biological membranes.

This is an intensive 'hands-on' programme suitable for final year undergraduates and postgraduates pursuing degree and research programmes in physiology as well as for postdoctoral workers wishing to develop into this area. The course is also aimed at teachers in Physiology wishing to strengthen their basic understanding of the thermodynamics, biophysics and computer modelling of solute transport.

The workshop lectures are intended to provide a solid understanding of the various flux equations, their uses and their limitations: the principle of coupling between fluxes across a membrane: the differences among facilitated transport, active transport, secondary active transport.

There will be a computer modelling assessment at the end of the workshop and participants will receive a parchment from the University recognising their completion of the course.

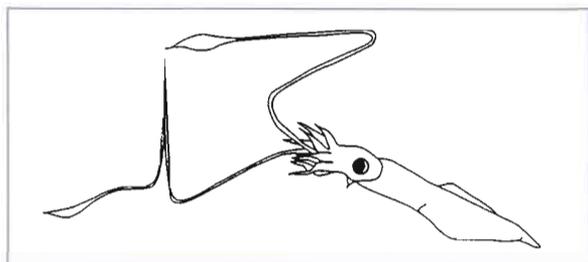
This workshop is being sponsored through the Education and Information Sub-Committee of The Physiological Society and we are aiming to have a maximum of 10 participants. A bursary towards travel and accommodation costs will be available to participants. For further information and to register interest please contact either Professor Brian Harvey (harvey@ucc.ie) or Dr Prem Kumar (p.kumar.bham.ac.uk).

If you are interested in running a workshop in any area of Physiology please contact P Kumar for further details.

MICROELECTRODE TECHNIQUES FOR CELL PHYSIOLOGY

16th Workshop 8-22 September 1999

Laboratory of the Marine Biological Association of the UK,
Citadel Hill, Plymouth, PL1 2PB



Information for applicants

• The workshop provides intensive practical experience of a number of microelectrode, patch clamp and optical techniques applied to single cells. It is intended for postgraduate students, post doctoral workers or established scientists wishing to apply these techniques in their research.

• **The following basic techniques are offered:**

Two electrode voltage clamp	Patch clamp
Single electrode voltage-clamp	Dye injection
Ion-sensitive microelectrodes	Fluorescent indicators

In addition there are lectures and demonstrations of electronics, computing, microscopy, bilayer recording, flash photolysis, single cell measurements of secretion.

• **There are 16 places.** Participants work in pairs and have the opportunity to do three 3-day experiments in the two weeks. In addition, lectures and practical sessions of electronics, data acquisition and computer analysis, and microscopy will be given. Daily lectures given by teachers and visiting lecturers cover the basic techniques taught and certain specialised topics. A copy of the Plymouth Microelectrode Handbook will be provided.

• **Accommodation** (for 14 nights- arrive & depart on Wednesday) is close to the laboratory and includes breakfast, lunch is provided in the lab each day and an allowance is given for an evening meal.

• **The course fee of £1100** includes accommodation, meals and tuition. Participants are responsible for their own travel arrangements.

THE CLOSING DATE FOR APPLICATIONS IS 30 APRIL 1999

• Applications will be acknowledged on receipt. Please provide 2 self-addressed envelopes.

A meeting to assess applications will occur during May and all applicants will be notified of the outcome.

How to apply:

There is no application form.

1. Please give a concise description of your research, your reasons for wishing to attend and your experience of techniques taught on the workshop. List in order of priority four techniques you would like to learn.
2. Provide a brief CV (2 sides maximum), including list of publications (no reprints please).
3. The application must be accompanied by a letter of recommendation from an academic referee, preferably PhD supervisor or Head of Laboratory. This letter should indicate how your career, the laboratory in which you work and the area of research that you intend to pursue will benefit from your participation in the workshop.
4. What is your likely source of funding ?

Funding

Applicants with MRC or BBSRC Studentships – simply state you have a studentship in your application. Do not apply to the Research Council directly.

Dale and Rushton Funds of the Physiological Society – help with funding (up to £500) is usually available for young physiologists working in the UK. If you wish to apply please indicate in your application to the workshop. There is no need to apply directly to the Dale and Rushton funds before workshop applications are assessed.

Bursaries – The workshop can provide some half bursaries – if you think you will have difficulty finding the full fee please indicate in your application.

Applications should be sent to:-

David Ogden, Microelectrode Techniques, NIMR, The Ridgeway, London NW7 1AA, U.K.

E-mail dogden@nimr.mrc.ac.uk

Information on internet: microelectrode.htm

Joint Meeting with the Chilean Physiological Society Pucón, Chile 13-16 November, 1999

Announcement of Joint Meeting of Chilean and UK Physiological Societies

The scientific committee of the Chilean Society for Physiological Sciences (Mauricio Boric, Juan Bacigalupo, Rosa Déves, Ramón Latorre, Francisco Sepúlveda and David Yudilevich) are delighted to invite The Physiological Society to join the Chilean Society in a Scientific Meeting in Pucón, Chile.

(See <http://physiology.cup.cam.ac.uk/meetings/future.htm/>).

This Joint Meeting is scheduled for 13-16 November 1999, and will be centred around a number of themed symposia, which include Sensory Physiology, Microvascular and Endothelial Physiology, Ion Channels, Epithelia and Membrane Transport, Chemoreception and High Altitude, Intracellular Calcium Stores, Muscle and Neurobiology, and Molecular Physiology. Seven to eight symposia focused around our Special Interest Groups would run in the morning sessions, leaving the afternoon for communications and posters. Evening plenary lectures have been planned for the 14 and 16 November with the main dinner scheduled for 15 November. Small discussion groups will be scheduled with the main speakers, encouraging the participation of students and young researchers.

The Society has agreed to set aside a sum of £30,000 to support this meeting, and it is envisaged that a number of participants from the UK would have their Apex airfares to Chile paid by the Society, with their internal costs met by our Chilean hosts. Following discussion with our Chilean hosts, it would be expected that all invited symposium speakers would stay for the duration of the Meeting and participate in extra events such as teaching postgraduate workshops, scheduled during the course of the Meeting. Young physiologists are encouraged to attend the Meeting, and the Meetings Secretary will endeavour to raise other

support through, for example, the Wellcome Trust and British Council, as well as draw attention to potential participants that the Affiliate Travel Grant Scheme and Dale and Rushton Funds are available.

Chilean Society of Physiological Sciences – Committee Members and Brief History

The Chilean Society was founded in 1986, as an affiliate of The Chilean Biological Society, following the growth and diversification of the latter Society. The Chilean Biological Society is the largest scientific organisation that attracts most Chilean scientists working in diverse fields of biology and has just held its XLI Annual Meeting in Pucón.

Membership of the Chilean Society is drawn from over ten Universities throughout the country. The current Committee includes the following: President (Dr Mauricio Boric, P. Catholic Univ. Chile), Vice President (Dr Enrique Jaimovich, Univ. Chile), Past President (Dr Claus Behn, Univ. Chile), Treasurer (Dr Beatriz Ramirez, Univ. Santiago), Secretary (Dr Rodrigo Iturriaga, P. Catholic Univ. Chile) and Committee Members (Dr Julio Alcayaga – Univ. Chile, Dr Juan Bacigalupo – Univ. Chile, Dr Pablo Caviedes – Univ. Chile, Dr Adrián Palacios – Univ. Valparaiso, Dr Luis Sobrevia – Univ. Concepción).

Since 1986, the Society has organised thirteen annual meetings, which were attended by both national and foreign scientists. The participation of undergraduate and postgraduate students in these meetings is highly encouraged by the Society. The members' main areas of interest include biophysics, ionic transport channels, general physiology, sensory physiology, neurobiology, reproduction, cardiovascular, renal and respiratory regulation.

The Society's main objective is to promote the advancement of physiology and our understanding of regulatory mechanisms from molecular elements to organs and ultimately the whole body. The Society strives to play an important role in fostering interactions between different physiologists, and with this aim the Society is currently in the process of incorporating many established and young Chilean physiologists living abroad as corresponding members. Honorary members of our Society are prestigious scientists, such as Professors Héctor Croxatto, Joaquin Luco, Luis Vargas, Carlos Eyzaguirre, Mario Luxoro, Teresa Pinto and Elisa Marusic.

Venue for the Joint Scientific Meeting in Pucón, Chile

The small town of Pucón situated at the base of the Villarica volcano, by the edge of Lake Villarica, is without doubt one of the most visited places in the south of Chile (see <http://www.akubra.cl/>). Pucón is situated in the IXth (Araucarian) Region of Chile, 780 km from Santiago and 110 km from Temuco (see <http://www.cepri.cl/araucarias/pcn.html>). It is in a landscape of astonishing beauty, an area of lakes, national parks, hot springs, waterfalls and volcanoes, the most spectacular of which is Villarica volcano, which looms over the town. It is climbed by several hundred people every year. The Villarica volcano is one of the most active volcanoes in South America and with a summit of 2840 metres offers an incredible view of the surrounding seven lakes and

other volcanoes in the region and the Andes Mountains. Climbing a live volcano is definitely not something done everyday, but it is an experience that one will never forget. The adventure begins with a six to eight hour climb towards the crater and the lava bubbling down below. If you are lucky, you will be able to see and hear the volcano in action!

Economical Accommodation in Pucón, Chile

Bed and breakfast places in Pucón are for those who wish to save money on lodging (see <http://www.chile-travel.com/BEDPUCON.HTM>). Bed and breakfast places are clean with bathrooms often shared. When you stay be prepared for a possibility of a light or heavy breakfast. All of the places listed are generally less than \$29.00US per person and many are less than \$19.00. A sales tax of 18% is included in the price. Some places do not charge the 18% to foreigners. There are also tourist cabins in beautiful wooded surroundings

(see <http://usersdbworld.net.au/~andrew/pucon/index.html>).

These cabins vary from one bedroom to three bedrooms and are appropriate for two to nine people. Each cabin has colour TV, a kitchen, toilet and shower, with a swimming pool and games room on site. The cabañas are on the road to Volcano Villarica, about 1 km from the lake.

*Giovanni E Mann
&
Mauricio Boric*

First Announcement
CHLORIDE CHANNELS
OXFORD 1999
A SYMPOSIUM ON CHLORIDE
CHANNELS
To be held at ST CATHERINE'S
COLLEGE, OXFORD
13-14 April 1999

LIST OF SPEAKERS

E Barnard Royal Free Hospital, LONDON
- Transmitter-gated chloride channels: common and divergent features

A W Cuthbert Department of Pharmacology, CAMBRIDGE
- Functional role of CFTR chloride channels in airway and gut epithelia

J C Ellory University Laboratory of Physiology, OXFORD
- Title to be confirmed

R F Greger Physiologisches Institut der Universität, Freiburg, GERMANY
- Epithelial chloride secretion and its pharmacological inhibition

C Higgins Imperial College School of Medicine, LONDON
- P-glycoprotein and the regulation of cell volume: activated chloride channels

J R Hume University of Nevada, RENO
- Volume-regulated chloride channels in heart and smooth muscle

T J Jentsch Hamburg University, GERMANY
- Properties of CIC channels and their role in disease

K Kirk Australian National University, AUSTRALIA
- Anion-selective osmolyte channels: not just for chloride

J Lambert Ninewells Hospital and Medical School, DUNDEE
- GABBA-Gated chloride channel as a site of drug action

W A Large St George's Hospital Medical School, LONDON
- Properties and role of chloride channels in smooth muscle

B Nilius KUL Campus Gasthuisberg, BELGIUM - VRAC
- a multifunctional volume-regulated anion channel in vascular endothelium

J A C Smith Plant Sciences, Oxford University, OXFORD
- Anion-selective channels in plants

K Strange Vanderbilt University Medical Centre, TENNESSEE
- Cellular and biophysical characteristics of a swelling-activated anion channel

COST

£150 Delegates from Industry

£75 Delegates from Academia

To include registration, reception, lunches and banquet.

Enquiries to Dr Roland Z Kozlowski
 C/o Deanna Gallagher, University Dept of Pharmacology, Mansfield Road
 OXFORD OX1 3QT

Tel: +44 (0) 1865 271 879

Fax: +44 (0) 1865 271 853 *

Email: deanna.gallagher@pharm.ox.ac.uk

Bed and Breakfast Accommodation and Parking available at St Catherine's. See registration form for details.

SPONSORS

Zeneca Pharmaceuticals
 Yamanouchi Pharmaceutical Company
 Oxford Molecular
 Bristol-Myers Squibb
 Almirall Prodesfarma
 Pfizer Limited

Neurology for Neuroscientists V
Magdalen College,
Oxford 29-30 March 1999

The Guarantors of Brain have kindly agreed to sponsor a fifth symposium on Neurology for Neuroscientists. The aim of this symposium is to provide neuroscientists with the clinical background to neurological diseases, and with insights into how neurological diseases can illuminate basic neuroscience. Topics to be covered are detailed elsewhere.

The course is limited to ~60 participants and will start at 10:00 am on Monday morning, finishing around 4:30 pm on Tuesday. Priority will be given to laboratory scientists.

If you wish to attend, please apply for application forms, or download Wprd versions from the Web which should be returned to Professor J B Clark, Department of Neurochemistry, Institute of Neurology, Queen Square, London WC1N 3BG. Tel (0171) 837 3611 Ext 4201 (email: - nneurosc@ion.ucl.ac.uk).

*Successful applicants will be notified shortly afterwards when a Registration fee of £25.00 will become payable. This includes accommodation for the night of 29th March and food throughout the symposium. Limited accommodation will be available for the night before/after at the participants own expense. There is no parking available at the College and the public car parking is limited and rather expensive. The best form of transport would be by train to Oxford Station or coach; both are within walking distance of the college.**

THE BENEVOLENT FUND OF THE PHYSIOLOGICAL SOCIETY ANNUAL GENERAL MEETING

TO: All subscribers and donors to the Benevolent Fund during the year 1998.

The Committee gives notice that the Annual General Meeting of the Benevolent Fund will be held at 12:30pm at the offices of The Physiological Society, Fourth Floor, Dilke House, Malet Street, London WC1E 7JN on Wednesday 21 April 1999. A copy of the Agenda for the AGM appears below.

Those subscribers wishing to receive a copy of the previous year's minutes and Report of the Committee and Accounts should write to the Administrator of the Benevolent Fund, Dilke House, Malet Street, London WC1E 7JN.

Grace Murray

Fund Administrator

For and on behalf of the Committee

12 February 1999

AGENDA

1. Minutes of previous Annual General Meeting.
2. Consideration of the Report of the Committee and Accounts for the year ended 31 December 1998.
3. Election of Committee.
4. Date of next meeting.

NOTE:

At the last Meeting of the Trustees held on 13 May 1998, it was noted that technically all those purchasing raffle tickets at Society Dinners were also subscribers to the Fund as well as those taking out covenants and sending donations by cheque. As the Fund's Trust Deed stipulates that all subscribers during the preceding year are entitled to attend and vote at the AGM, it was agreed that notice of future AGM's would be placed in the Society Magazine. This would comply with the Charity Commission guidelines that a Charity should only do what is reasonably practicable (both administratively and financially) to contact all donors.

It was also agreed that a copy of the previous year's minutes and a Report of the Committee and Accounts would no longer be sent out to subscribers as of right. The Notice in the Magazine would, however, state that those wishing to receive copies of these documents could write with their request to the Administrator of the Fund. This would reduce substantially postage costs and ease the administrative burden on the Benevolent Fund staff.*

No notice is carried for more than three successive editions. Notices are starred so that readers can see at a glance whether this is the first (one star) or final (three stars) appearance of the notice. Notices for the summer 1999 edition (to be distributed on 4 June 1999) should reach the Administration Office by 16 April.

TALKING SCIENCE+

Talking Science+, the national database of speakers on science, engineering and technology is having a recruitment drive. Talking Science+ is aimed at any organisation or representative of a community group who needs a SET speaker for anything from a small informal chat to a group to an international conference. Talking Science+ is looking for willing speakers throughout the country who have experience of giving talks on any science, engineering or technology based subject.

Further information from Robbie Aitken, Talking Science+ Administrator, British Association, 23 Saville Row, London, W1X 2NB.
Tel: 0171 287 0980,
email:ba.talk.science@mcr1.poptel.org.uk
lbryan@bcm.tmc.edu

The Maternal Brain: An International Meeting on Neurobiological and Neuroendocrine Adaptation and Disorders in Pregnancy and Postpartum.

Topics: Neuroendocrine adaptations: neurosteroids, lactational infertility, prolactin, plasticity of oxytocin neurones, and modulation of stress hormone responses.
Neurobiological systems: maternal behaviour, neuroimmune mechanisms, desensitisation to pain, puerperal psychosis, and regulation of appetite.
The presentations will consist of molecular through to clinical research. There will be plenary speakers, free communications and poster presentations. For further details see Web site:- <http://www.phl.ed.ac.uk/wmbrain/> or contact Dr Richard Windle by email at maternal-brain@bristol.ac.uk or at Dept of Anatomy, University of Bristol, Bristol, BS8 1TD. *

VISITING SCIENTISTS

Foreign visitors of the status of at least post-graduate student, working in laboratories of Members of the Society, may be made "Visiting Scientists" by the Society. The names of such persons, with the dates of their visits and a letter of support, should be sent to the Foreign Secretary, Professor D A Brown, Dept of Pharmacology, University College London, Gower Street, London WC1E 6BT. **

Accommodation Facilities at The Novartis Foundation

Any scientifically or medically qualified person on a working visit to London is welcome to use one of fifteen bedrooms for a period of up to two weeks. Charges as from 1 January 1998 are £44 for a single and £56 for a twin room which includes breakfast. Further details from the Reservations co-ordinator/ Receptionist, The Novartis Foundation, 41 Portland Place, London W1N 4BN. Tel: 0171 636 9456, fax: 0171 436 2840.

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Fifth Symposium on Neurology for Neuroscientists

Magdalen College, Oxford 29-30 March 1999

The aim of the symposium is to provide neuroscientists with the clinical background to neurological diseases, and with insights into how neurological diseases can illuminate basic neuroscience. For further information and application forms please visit the Web site:-

<http://www.ion.ucl.ac.uk/neurochemistry/coursedet/html>

Application forms should be returned to Professor J B Clark, Dept of Neurochemistry, Institute of Neurology, Queen Square, London, WC1N 3BG

Email:- nneurosc@ion.ucl.ac.uk *

PULMONARY CIRCULATION VII

June 27-30, 1999. Prague, Czech Republic. Immediately preceding the Second Congress of the Federation of European Physiological Societies/ International Union of Physiological Sciences (Prague, June 29- July 4, 1999). Contact Vaclav Hampl, PhD, Associate Professor, Dept of Physiology, Charles University Second Medical School, Plzenska 130/ 221, 150 00 Prague 5, Czech Republic.

Tel: +4202 57210345

Fax: +4202 5721 0995

<http://www.if2.cuni.cz/departments/physiology/hampl/>

MAIN TOPICS

- Mechanisms of oxygen sensing in the pulmonary vasculature
- Pulmonary vascular connective tissue
- Nitric oxide and other radicals in the pulmonary circulation
- Long-term nitric oxide treatment
- Adult respiratory distress syndrome
- Pulmonary embolism update
- Primary pulmonary hypertension
- Lung transplant

ARE YOU AN EXPERT WITNESS?

Readers will be only too aware that litigants are ever more willing to resort to courts to seek redress. However, like all problems, this presents opportunities for some professionals. Possible one of the most interesting is to become an expert witness.

Strictly speaking, an expert witness is an individual who possesses knowledge or experience beyond that expected of a layman and who makes that knowledge available to a court. As a result, the role carries a heavy burden of responsibility and ethical obligation: the opinion must not be biased by any personal, professional or financial interest, and must reflect the current developments in the field. The expert witness must obviously be knowledgeable, but should also be able to communicate clearly and be willing to moderate opinion in the light of new evidence.

The *UK Register of Expert Witnesses* is the first point of contact for any readers who feel they have the qualities needed for this demanding role. Your details can be listed in the printed *Register* and distributed to over 3,000 firms of solicitors throughout the UK. Once passed for inclusion a unique range of services becomes available to you, such as: access to factsheets in issues connected to your expert witness activities, a quarterly newsletter, a helpline and specially negotiated rates for PI insurance.

For more information contact Kate Porter at J S Publications, PO Box 505, Newmarket, Suffolk, CB8 7TF. Tel: 01638 561590 Fax 01638 560924, E-mail ukrew@jspubs.com

World Congress on NEUROHYPOPHYSIAL HORMONES

28 August - 2 September 1999

Edinburgh

This meeting will cover a wide range of topics including endocrinology, neuroendocrinology, nephrology, reproductive biology and behavioural studies.

Further information from Alison Douglas or Mike Ludwig, Department of Physiology, Edinburgh University Medical School, Teviot Place, Edinburgh, EH8 9AG. Tel: 0131 650 3274/3275, fax: 0131 650 6527, e-mail: wcnh.1999@ed.ac.uk, WWW address: <http://www.phl.ed.ac.uk/wcnh/>***

Computer Modelling and Thermodynamics of Ion Transport

Tuesday 4th May to Friday 7th May inclusive

Course Organisers:

Professor B J Harvey & Dr S Randall Thomas

Venue:

Wellcome Trust Cellular Physiology Research Unit,
And the Department of Physiology,
University College, Cork, Ireland

This Techniques Workshop will teach an intensive course in thermodynamics and computer modelling of membrane transport. The course is based on the application of thermodynamic principles to ion transport across biological membranes. This is an intensive 'hands-on' programme suitable for final year undergraduates and postgraduates pursuing degree and research programmes in physiology as well as for postdoctoral workers wishing to develop into this area. The course is also aimed at teachers in Physiology wishing to strengthen their basic understanding of the thermodynamics, biophysics and computer modelling of solute transport.

The workshop lectures are intended to provide a solid understanding of the various flux equations, their uses and their limitations: the principle of coupling between fluxes across a membrane: the differences among facilitated transport, active transport, secondary active transport. There will be a computer modelling assessment at the end of the workshop and participants will receive a parchment from the University recognising their completion of the course.

This workshop is being sponsored through the Education and Information Sub-Committee of The Physiological Society and we are aiming to have a maximum of 10 participants. A bursary towards travel and accommodation costs will be available to participants. For further information and to register interest please contact either Professor Brian Harvey (harvey@ucc.ie) or Dr Prem Kumar (p.kumar@bham.ac.uk).

If you are interested in running a workshop in any area of Physiology please contact P Kumar for further details.

European Working Group on Cardiac Cellular Electrophysiology

8-10 September 1999, Orsay, France

'1949-1999: 50 Years of Cardiac Cellular Electrophysiology — A Tribute to Professor Edouard Coraboeuf'. 20 lectures by distinguished physiologists from around the world. For details contact Dr Rodolphe Fischmeister (*Fisch@vjf.inserm.fr*).

10-12 September 1999, Oxford, UK

23rd Working Group Meeting with lectures and strong emphasis on informal poster presentations. Registration deadline 1st May. For program details, fees, bursaries etc. please see meeting web site: <http://EWGCE.physiol.ox.ac.uk/> or contact Dr Peter Khol (*EWGCCE@physiol.ox.ac.uk*).

APOLOGIES

The photograph on the front cover of the Winter 1998 Issue was kindly provided by *Michael Duchon*.

AFFILIATE TRAVEL GRANT SCHEME APPLICATION FORM

Affiliate Ref / Membership No. _____

Name _____

Age _____

Address _____

Degrees (inc subjects & dates)

Tel _____

Nationality _____

Post/Status _____

PhD year of study (1st, 2nd, 3rd, etc.)

Meeting to be attended, including date and location

Title and authors of abstract to be presented

Oral communication

Poster communication

Invited speaker

Please tick one box

Estimated cost breakdown (travel, accommodation, fees etc.)

Total sum requested £ _____

Funds awarded / requested from other sources (give expected dates of notification)

Applicants are expected to have applied to their research sponsoring organisation (ie source of salary) if it awards travel grants, and any award from the Society will take this (and funds from any other sources) into account.

List your last three principal publications, including titles.

List your recent presentations at Physiological Society Meetings, including title (up to three).

Please indicate the specific relevance of the meeting to your current research or future career development. In addition, you should explain the importance of the meeting as a forum for presentation and discussion of new research in physiology.

Member of Physiological Society sponsoring this application (supervisor / senior colleague)

Name _____ Address _____
Tel _____ Dated _____
Fax _____

If you are awarded a grant we would like to transfer the funds directly into your bank / building society account. Please complete. (All information is confidential).

Bank / Building Society _____
Account Number _____
Sort Code _____
Name of Account Holder _____

After completion, please return **SIX TYPED COPIES** of this form and supporting documentation (including copies of the abstract detailed overleaf) to: The Administrator (Affiliate Travel), The Physiological Society, PO Box 11319, LONDON, WC1E 7JF.

