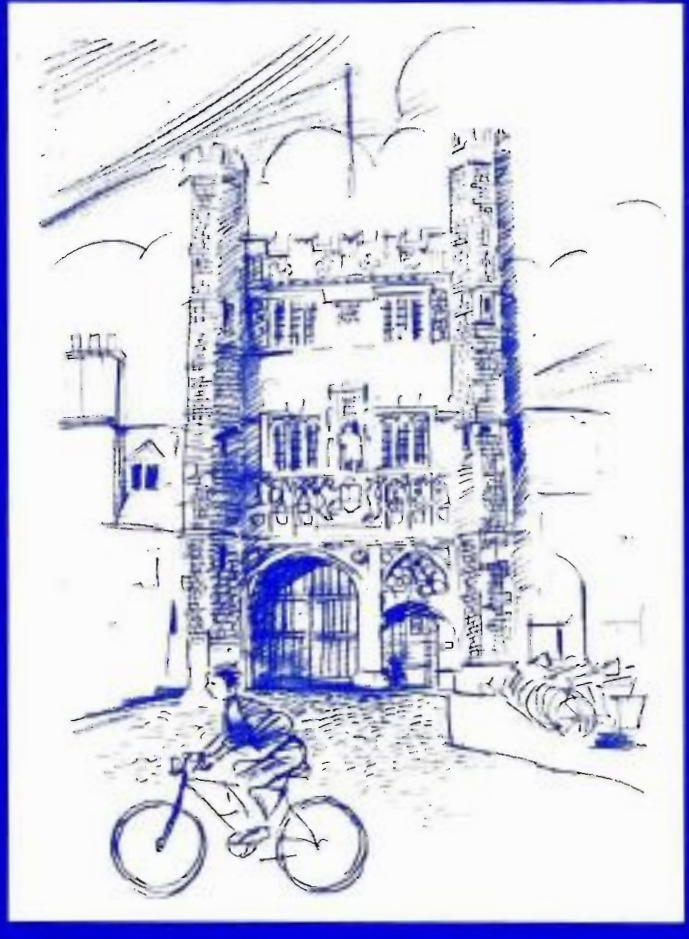
The Physiological Society Magazine



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The Physiological Society
Magazine
September 1992

Physiology at Cambridge

Since the Society met in Cambridge last year, the Physiological Laboratory, as well as suffering the irritations to which all scientific departments are currently liable, has been coping with a special local problem. The publication of the formula used by the UFC for disaggregating block grants to universities has revealed that the biology departments in Cambridge receive substantially more than the amount notionally provided for them, and although Peter Swinnerton Dyer has said explicitly that there is no requirement for universities to distribute the funds they receive in accordance with the formula used to calculate the block grant, it is virtually impossible for central university bodies to resist pressures from notionally underfunded departments to change the allocations in the direction that the formula suggests. The consequent squeeze on biology departments has aggravated the already severe pressures on the Physiological Laboratory caused by the use of a local resource re-allocation formula that is unfavourable to departments, most of whose students go on to professional training instead of staying to do research. To make the savings required of us, we have given up our field station at Laundry Farm, made four members of our technical staff redundant, left many technical posts unfilled and accelerated the shrinkage of our academic staff that has been going on for some years, so that there are now only 30 of us, compared with 44 in the late 1970s. Despite this shrinkage, we have been able to appoint four new lecturers (or assistant lecturers) in the last four years, and we hope very soon to be able to announce the appointment of a new Professor of the Physiology of Reproduction.

Editor

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Very surprisingly – since it has not been the result of deliberate policy – three of our four new lecturers are medically qualified: two have their MRCP and one is a consultant physician at Addenbrookes. In other ways too, both in teaching and research, we have increasingly close contacts with the clinical school. However, although we welcome this growing collaboration, we are apprehensive about the General Medical Council's enthusiasm for vertical integration because of the implied threat to the third year advanced courses in single subjects that are an important feature of medical education in Cambridge. Fortunately, this danger is recognised by the Faculty of Clinical Medicine as well as by the preclinical departments.

Our advanced course in Physiology, which was split into a Neurobiology option and a Mammalian, Clinical and Reproductive Physiology option four years ago, continues to flourish. Next year the Neurobiology option has to compete with a broader, but perhaps shallower, interdepartmental Neuroscience course (in which we are also involved). Despite this competition, however, the number of applicants to our own course has risen.

In the first and second year Physiology courses taken by medical, veterinary and natural science students, there has been a major change in the practical classes, which form an important part of our teaching. With some help from industry, and by mortgaging part of our equipment grant over the next four years, we have been able to replace our ageing oscilloscopes and pulse stimulators, and our ancient Palmer kymographs, with a computer-based system designed by Roger Carpenter. It is known as EPIC (Experimental Physiology Instrumentation Computer) and it employs an ordinary personal computer, and two pieces of auxiliary hardware developed by Cambridge Research Systems in close consultation with the Laboratory. The design is such that the entire system is easily configurable for particular experiments: only those facilities and commands actually required for the experiment are present, so that the student is not overwhelmed by irrelevant technology. The system provides on-line help about the experiment in progress and about its own use. New mechanical and respiratory transducers and an improved nerve–muscle bath have also been developed for use with EPIC. After two years of testing with different groups of students, and minor modifications, the new system was introduced in October 1991 and proved an instant success. The students find EPIC exciting and easy to use and they produce more work of better quality. Fewer demonstrators are required and they can spend less of their time fiddling with the apparatus and more talking about the experiment. The fears of some

(ii) respiratory physiology – the role of adrenoceptors in chemoreceptor function and lung volumes.

(iii) renal physiology – estimation of creatine clearance in normal and sickle cell patients, effect of local herbs on renal function.

(iv) reproductive endocrinology – the effect of non-steroidal anti-inflammatory agents on the oestrus cycle, ovulation and fertilisation in rats.

(v) metabolic responses to hypothermia and hyperthermia.

Summary

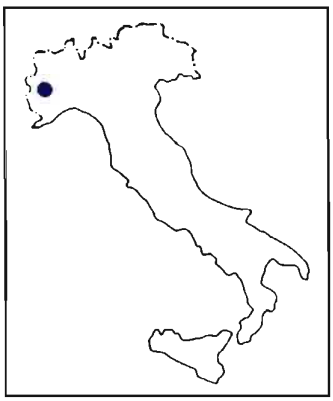
All in all, the Department of Physiology in Lagos counts itself as being probably one of the few in Africa that has made some impact in the areas of both teaching and research. We hope that as the future unfolds we may be able to continue to build on what we have at present, with a little help from our friends.

At the moment, the government is reviewing conditions of service for university staff and this may offer some hope for the system so that it can be strengthened to save it from further sliding downwards.

O A Sofola

Physiology at the University of Turin

Background



Physiology at the University of Turin is taught in a number of different faculties with the staff in each faculty belonging to a number of different departments. Membership of a department is a matter of personal choice and depends on various factors, one being the physical space available. Physiology is taught within the faculties of Medicine & Surgery, Veterinary Medicine, Science and Pharmacy. In the Faculty of Medicine the subject is named Human Physiology, in the Faculties of Science and Pharmacy it is named General Physiology, whilst in the Faculty of Veterinary Medicine it is called Physiology of Domestic Animals.

The largest department of physiology is that of Human Anatomy & Physiology which was created in 1985 from the merging of the Institute of Human Anatomy and the Institute of Human Physiology, the latter having been founded in 1895 as the Institute of Physiology. Physiologists on the academic staff of the Department comprise five professors, three associate professors, three research fellows and a number of PhD students.

The major area of physiological research in the department is neurophysiology, specifically membrane physiology, circuit reorganisation and regeneration in the cerebellum, plasticity of eye movements, synaptic plasticity, peripheral mechanisms in the somatovegetative integration, and experimental psychology. A smaller group consisting of a professor, an associate professor, a research fellow and a PhD student are involved in cardiovascular physiology. The current interests of this group are in the myogenic control of the coronary vascular bed, the effect of ventricular contractility on coronary flow and the effect of components of snake venoms on cardiac performance.

From the above summary, two important facts appear: (1) the predominance of senior staff, and (2) the prevailing interest in neurophysiology. The predominance of senior staff is due to a shortage of opportunities for junior scientists. This makes it difficult to recruit new faculty members in a period in which great changes in Italian universities and the advancement of research emphasise the need for new positions. The reason for the shortage of opportunities is easily explained if one considers the huge deficit in the Government budget. Obviously, financial difficulties affect several other aspects of the university management and scientific research. The prevailing interest in neurophysiology is common all over Italy.

Funding

Public funds for research are granted to individual scientists by the University, the Ministry of University and of Scientific and Technological Research, and the National Research Council. Funding is allocated yearly on the basis of an evaluation of the research projects and the recent scientific production (publications) of the applicants. The funding is not generous and so needs to be supplemented by financial support from private companies or foundations. However, most of the grants from these private bodies are usually given to cancer research and to departments of Pharmacology, rather than to those of Physiology!

Apart from the shortage of financial resources, a serious problem faced by Italian physiologists, as well as by other scientists engaged in biomedical research, is the campaign of antivivisectionist organizations. Sometimes this campaign succeeds in persuading the public against biological research and science in general. Recently Parliament has passed a new law which, by providing much more specific guidelines, should help scientists against unjustified attacks. Obviously no law can protect anybody against illegal acts such as release of animals from animal houses or physical damage to laboratories.

Physiologists in the Department of Human Anatomy & Physiology of the University of Turin are involved in a number of international collaborative projects. Constantine Sotelo (Paris), Eric Kandel (New York), Hans Dieter Lux (Munchen), Antonio Garcia (Madrid), Dieter Swandulla (Gottingen), Ronald J Linden (London), Nico Westerhof (Amsterdam) and Neville A Marsh (Brisbane) are among the scientists with whom fruitful collaborations have been operating for a number of years. Finally, Members of the Society will be pleased to learn that Ronald Linden, a former Treasurer of the Society, has recently been awarded an honorary degree of Doctor of Medicine by the University. The graduation ceremony will be held next October in Turin.

Gianni Losano

Grants Sub-Committee

(members: Graham Dockray, Annette Dolphin, Chris Fry, Peter McNaughton)

IUPS Congress 1993

As promised in the last Newsletter, the details of the application procedure for grants for attendance at the Congress have now been agreed and a tear-out application form appears at the back of this Magazine. It is hoped that the Society will be able to meet all of the reduced registration fee for students and about half of the registration fee of other eligible applicants.

To be eligible, all applicants (other than those qualifying for the reduced fee for students) should have submitted an abstract for the Congress.

As you will see in the Final Announcement being mailed to Members with this Magazine, the registration fee has now been fixed at £250 (or £125 for students) for those registering before 31 January; thereafter it will be increased to £300. The end of January is also the deadline for receipt of Abstracts for the Congress and the deadline for grant applications to reach the Society's Administration Office in Oxford. Grant cheques will be sent out in March.

See also the Events section of this Magazine for further information about the Congress.

Dale and Rushton Funds

Graham Dockray has now succeeded Peter McNaughton as Chairman of the Fund Managers. Applications forms for these Funds are now available from, and returnable to, the Society's Administration Office in Oxford.

Treasurer's advisory Sub-Committee

(members: John Widdicombe, David Cotterrell, Jim Gillespie, Ian McGrath, Nick Standen, Ron Edmondson, Victoria Penrice)

Special Journal Subscription Terms for 1993

In the light of the increase in membership subscriptions for those Ordinary Members still receiving *The Journal of Physiology*, it has been agreed that the special rate offered to qualifying university departments in the UK and Eire be held at £100, to encourage departments to ensure that copies are available for all their staff and students. This is well below cost price and means that there has been no increase in the cost to those departments since the scheme was introduced five years ago.

The special subscription rate for Foreign Members has also been held at £200 or $400. To qualify for this rate, a Foreign Member's subscription must be paid up to date and his/her institution must continue to subscribe to the *Journal of Physiology* at the normal commercial rate. Renewal notices will shortly be sent to all Foreign Members currently subscribing; any other Foreign Member wishing to take up this offer should contact the Society's Administration Office in Oxford.

Members of the Society (and qualifying departments in the UK and Eire) will be able to subscribe to *Experimental Physiology* for only £31 – 25% of the commercial subscription rate and an increase of only 3.3% on 1992. Any Member who would like to subscribe next year (other than those who have already placed a standing order for payment by direct debit) should complete the tear-out form at the back of this Magazine and return it to the Society's Administration Office.

Prizes and Prize Lectures Sub-Committee

(members: David Cotterrell, David Eisner, Jim Gillespie, Cecil Kidd, Nick Standen)

Pfizer Awards

Pfizer has offered to make a one-off payment of £10,000 to the Society to fund a number of Pfizer Awards to postgraduate students. Although the details have yet to be agreed, it is envisaged that up to six prizes per year of £150 each will be awarded (normally to postgraduate students in their final year), by a committee consisting of the Sub-Committee and two representatives of Pfizer. These awards may further encourage participation in Special Interest Groups, since the awards would be linked to those Groups relevant to Pfizer's interests. Discussions with Pfizer are still taking place – watch this space for further details.

Affiliates

The Committee extends a warm welcome to the following newly approved Affiliates:

Louise Bleazard, Patricia Boyle, Jill Cook, David Dick, Rade Durbaba, Richard Egleton, Richard Evans, Lynda Fletcher, Julie Gratton, Paul Greenhaff, Helen Harty, Abdul Hassoni, Simon Hester, Peter Heywood, Debbie Hooker, Lesley Houghton, Paul Howarth, Jacky Larcombe-McDouall, Fiona Lebeau, David Lewis, Sarah Lister, Niall MacFarlane, Rachel McCabe, Ian McFadzean, Shakeeb Moosavi, Mary Morrell, Ruby Naqvi, Paul Overton, David Owen, Ian Purdy, Aleksander Radunovic, Sian Rees, Louise Robson, Mehri Sarfarazi, Dean Sewell, Paul Sharp, Peter Sneddon, Dominic Wells

New Committee Members

All nine candidates who stood for election to the vacant Committee places at this year's AGM were approached sometime before the AGM and asked to provide a short statement outlining why they had agreed to stand and what they hoped to achieve during their time on the Committee. The replies received from those elected to the Committee are set out below.

Laurence Smaje

Why do I wish to serve on the Committee for the second time? The main reason is that the scientific scene in the UK has changed and my perspectives on science have enlarged since I served previously (1981-85). I have new experience to bring to the Committee

A brief biography: having been intrigued by Physiology during an intercalated Bsc during my medical studies, I returned to Physiology, where I have remained. After nearly ten years as Professor of Physiology and Head of the Department of Physiology at Charing Cross & Westminster Medical School, I joined the Wellcome Trust in 1987 as Programme Director responsible for Physiology & Pharmacology. Three years later I took over responsibility for a new Trust initiative, the Wellcome Centre for Medical Science.

This was touched upon by Julian Jack in the June Newsletter in his article on the Wellcome Trust. Apart from its services to the research community, the Centre's aims are to contribute to a greater public understanding of the excitement and processes of biomedical research as well as the long term benefits in everyday life.

Although my responsibilities have changed from Research Funding to the Wellcome Centre, I still have contact with research via Wellcome Trust Scientific Committees. I am a visiting Professor at St Mary's Hospital Medical School, I am the current President of the European Society for Microcirculation and I serve on the editorial board of two international journals on microcirculation: *Microvascular Research* and the *International Journal of Microcirculation: Clinical and Experimental.*

If elected I would play my part as a Committee member in striving to serve the needs of Members by holding first class scientific meetings, and to this end I would do what I could to encourage increased membership by young people. By nature I am a reformer. The main reason the Committee has nominated me, however, is that I will be able to bring my previous experience on the Society's Education and Information Sub-Committee and my current responsibilities in the area of the public understanding of science to help the Society raise its public profile in a positive manner. The major issues are recruitment of able school leavers into Physiology and thereafter into research, public understanding about animal experimentation, and the need to help the public become more informed about science in general and Physiology in particular. Public understanding and support are vital to the future of our subject.

Noel McHale

The two most common observations that I have heard from members of other scientific societies is that The Physiological Society was very exclusive and that it did not appeal to young people. Two years ago the Committee recognised these shortcomings, particularly the need to bring more young people into the Society. The initiatives proposed at that time have already been very successful in engendering interest among postgraduate students and postdoctoral fellows, as is evidenced by the greatly increased proportion of young participants attending recent Meetings. I enthusiastically support these initiatives and would argue in the future for further measures which would make membership of the Society more accessible to physiologists at the beginning of their careers and indeed to members of other societies (such as the British Pharmacological Society) who are keen to join but have found the process rather intimidating.

I think that it is important that there be a geographical spread in the representation on the Committee and that this is particularly true in the case of Ireland. Because of the greater expense involved, Irish Members tend to attend fewer Meetings and to be less in touch with the life of the Society. I am in regular contact with most Irish physiologists, both informally and through meetings of the Royal Academy of Medicine in Ireland. If elected, I would consider an important part of my role to be that of conveying the views and suggestions of physiologists from both parts of the Island to the Committee and of keeping Irish Members in touch with what is going on in the Society.

Gareth Leng

I have been a Member of The Physiological Society since 1981, and have been an enthusiastic supporter of both Scientific Meetings and *The Journal of Physiology*, publishing 10 papers and the abstracts of over 20 Communications and Demonstrations in the *Journal*. When the Special Interest Group in Neuroendocrinology was initiated, I acted as convenor for its first years.

The Society, properly in my view, includes amongst its roles: a concern for career structures and opportunities for younger, non-established scientists; a voice in defence of public funding of fundamental research; and a role in public education to rebut the propaganda of antivivisectionists. In each of these areas the Society must continually re-appraise its responsibilities and strategies.

A particular challenge facing the Society, which I am unsure that it has met effectively, has come with the attrition in this country of a rational career structure for scientists. The Society has traditionally been the preserve of established scientists. Establishment is now a long time coming for young scientists but, as funding resources have shifted to new fields and to the application of new technologies, it is often the non-established scientists who are now making the most exciting contributions to advances in physiological understanding. In my opinion the Society cannot afford to seem to patronise this generation of scientists, but must defend – indeed should aggressively promote – their interests.

I gladly accepted the invitation to stand for the Committee: the Society has an important place in the affections of many of us. In recent years the Society has been notably open, democratic and enlightened: it deserves and gets conscientious and committed service from the Committee, and I would be pleased to be elected to a job worth doing to help continue that tradition.

Richard Vaughan-Jones

I have been a Member of the Society since 1978 and I have regularly contributed to Meetings and to *The Journal of Physiology* since 1976. I have also recently been appointed as an Editor of the *Journal* (commencing July 1992). I have invariably utilised both the Society's Meetings and its journals as the principal forum for my own work, simply because I have such a high regard for their scientific quality.

I have agreed to stand for election as an Ordinary member of the Committee. Having enjoyed the Scientific Meetings and publications for many years, I would now like to offer my own services in helping to run the Society. My main aims are:

(1) to try to ensure that the high quality of science is maintained both at the Meetings and in the Society's various publications. This must be of paramount importance. If Meetings and journals are to remain key players on the international scene, then there must be not only high academic standards but also a continuing high quality of scientific events and a high quality of finish and layout in published material. This latter point is important because high quality publishing (as we have at the moment in *Experimental Physiology* and *The Journal of Physiology*) is expensive but, without an attractive format, top class submissions for publication will decline; success in the future will depend on a delicate balance between these factors and this balance must be monitored carefully.

(2) to support the Society in its Joint Scientific Meetings with other national and international societies. This is particularly important for fostering scientific exchange between countries. Joint Meetings also assist the health of the Society's journals by encouraging quality submission from overseas.

(3) to continue to support and encourage younger scientists to participate in Meetings and to seek membership of the Society. Only in this way is the academic future of the Society secure.

If Members think that I can be of help to the Committee, then I am very happy to serve.

David Miller

I believe that the Society's Committee has an important role in representing and shaping the profession of physiologists in the UK. There are two areas I would hope to pursue under the auspices of the Society if elected to the Committee.

The first concerns the use of animals in experimental work. I strongly agree with the more active and positive advocacy of the use of animals currently adopted by many scientists and organisations such as the Research Defence Society. Against this approach, of particular concern to me is the attitude adopted by some departments over animal work by undergraduates. Allowing "optional" participation in labs requiring animals seems to me an inappropriate and logically indefensible response to pressure from undergraduates. The essential coherence of the subject is under threat if curriculum content is dictated by these forces. Those determined to maintain the quality of undergraduate experience and training in physiology are potentially undermined by these developments. Even those who, like me, work mostly with isolated tissues are far from immune from these pressures. In my university, questions have already been raised against the use of tissue homogenates and the like in biochemistry labs. Histological sections are probably next! Moves to centralise animal facilities and other organisational changes are placing even more constraints on research work. I would like the Committee to represent the Society in defining a clear policy on these issues.

My second concern is for the threat to the profession posed by the lack of a career structure for postdoctoral scientists. The restrictions in appointments to career posts in the universities, now of many years standing, seem likely to continue indefinitely. The piecemeal provision of longer term "senior fellowships" by research councils (thankfully, augmented and largely initiated by research charities) fails to address the problem: research scientists in the academic world find themselves in a select band with seasonal workers and jobbing bricklayers in being certain when their contract terminates, but without the benefits of employment "on the lump". The inability of AUT to maintain – much less improve – the conditions of service of "permanent" university staff generally has consequently worsened the situation for postdocs. Maintaining and developing the science of physiology requires a continuity of recruitment and training. The current mix of occasional "permanent" lectureships, more frequent "fixed term" lectureships and predominant short term postdoc posts increasingly fails to meet this demand. As a subject only represented in a minority of universities (however defined or labelled), physiology is especially at risk from the vagaries of this "system". Yet, as the science fundamental to medicine and a key element in modern biological sciences, our task in persuading politicians and the public ought to be amongst the easiest. Again, the Committee could provide a focus defining suitable targets for lobbying, advertising or wider organising to address this problem.

Abe Guz

I have agreed to stand for election to the Committee of the Physiological Society for the following reasons:

(1) I have developed a great affection and loyalty to the Society to which I and my group have been presenting our work over the last 30 years.

(2) The objective of keeping standards high is one to which the Society continues to aspire and I have felt at home in this scene.

(3) I am a practising physician and head a department of Medicine of a London medical school. During the last 15 years I have noticed that clinicians – even academic ones – have a diminished interest in the sort of biological science that is presented to the Society. There are many reasons for this, but I continue to believe that Physiology – aided and abetted by Biochemistry and Molecular Biology – remains a fundamental subject for those of us interested in Clinical Science. Hence my own department has numerous Physiologists working side-by-side with clinicians.

(4) Clinicians, like myself, may be able to bring an integrated "whole body" approach to physiological questions which remain unanswered and often even unposed in some departments of Physiology today. The patient presents us with errors of normal integrated physiology all the time.

If elected to the Committee I hope to achieve the following:

(1) Use of the Society as a base to achieve (i) a rewarding career structure for physiologists within academic departments of Medicine and (ii) tighter preclinical-clinical "bonds" within our medical schools in accordance with the wishes of the General Medical Council.

(2) Promote a greater interest in the Society by academic clinicians.

Ole Petersen (Foreign Secretary)

My primary aim would be to contribute to the ongoing integration of European life sciences. Physiologists have made less progress than molecular biologists and biochemists. EMBO and FEBS are effective and successful (see "Science and Europe" in *Science*, 24 April 1992). In contrast, the Federation of European Physiological Societies (FEPS) has only recently been established (see *Pflügers Arch*, **419**, 223-224, 1991) and has not yet had an opportunity to play a major role. The Physiological Society has a good tradition of arranging joint meetings with other societies but I believe that there is now a need for an annual European meeting where most active physiologists in Europe would be present. Only in this way can effective links between different laboratories with similar interests be established on a large scale. It is also an absolute requirement for the creation of a truly European job market for physiologists.

The Society has long established links with the American Physiological Society and it would be nice to have a joint meeting with the APS in the US in a couple of years' time. The Far East is also increasingly important and we should build on the good relations established by the joint meeting held here last year with the Japanese and Korean societies.

In the short term, the most pressing task would be to ensure attendance at next year's IUPS Congress in Glasgow from the East European countries now facing such severe problems. We must look for imaginative solutions that will allow a reasonable proportion of our colleagues in this part of the world to come to Scotland. This is just a small part of a big problem. How can we help physiologists in the republics of the former USSR and the new democracies in Eastern Europe to survive the difficult next years? There is no single answer to this complex problem but one big task for the Foreign Secretary would be to help establish contacts between research groups here and in Eastern Europe. In many cases, a mutually attractive solution would be for them to work in our laboratories for a period. This would ease the burden for their home institution and may help them to get vital research done. It would also enable our laboratories to do more.

Britain has many contacts with countries in the Third World and I would like to contribute to the establishment of further practical links, enabling realistic research goals to be attained in their laboratories. In order to fulfil obligations to those physiologists less fortunate than ourselves, we must be strong. Today this strength can only be achieved by having an effective and smoothly working partnership in Europe. The Physiological Society is at the moment the most effective organisation of physiologists in Europe and I believe we have a particular responsibility and a marvellous opportunity to take the initiative in getting physiologists in this region of the world to co-operate effectively. It would be nice to think that if *Science* were to look again at European science in ten years' time, they would have rather more to say about Physiology than they did in April this year!

A Physiologist as President of the Royal College of Physicians

Leslie Turnberg assumed office as the new President of the Royal College of Physicians on 30 July. He was elected in April, using the College's remarkable and ancient procedure: this has been likened to the procedure for choosing a new Pope, although to your correspondent (who was present and voting) a closer resemblance might have been to the Grand National.

Warm congratulations are therefore in order. First, Members of the Society will be delighted that such a popular and unassuming man has been chosen for this key and very public appointment. Second, we must all be very glad that the physicians have selected as their leader for the next few years a person who, as well as being an excellent doctor, is also a first-rate scientist.

Why is the President of the Royal College of Physicians important? The Royal College of Physicians (together with its sister Colleges in Scotland and Ireland) is central to the postgraduate training and education of physicians and to the maintenance of the highest standards of specialist medical practice. Modern clinical medicine is closely influenced by the latest developments in biological science and the College is highly influential across a number of areas that are of importance to the biomedical community in general, and to The Physiological Society in particular. The President of the College has the potential to influence decisions on such matters as the funding of biological and medical faculties in universities, the scientific resources available in hospital practice, the possibilities for clinicians to engage in worthwhile research, and so on. At a time of turmoil in the health service and the university system, a firm and sensible hand to guide the College, and to make sure that its voice is heard appropriately, is essential.

Physicians and physiologists have a long history together, although sadly they have grown apart a little in the last few decades. Medical practice is an important impetus across a wide range of physiological research and in earlier centuries more physiological research was conducted by physicians than by any other group. One of the first recorded public expositions of William Harvey's theories on the circulation of the blood was to the College of Physicians. It was the natural audience at the time. Incidentally, we should note that Harvey is said to have declined the possibility of becoming the President of the College because, at the age when he was proposed, he felt that his health was inadequate to the task. Since the foundation of The Physiological Society in 1876, there have been 24 Presidents of the College of Physicians and four have also been Members of The Physiological Society. In the early years of the Society, relations with the physicians were close and Sharpey-Schafer's history records an expression of condolence at a Meeting of the Society when a President of the College of Physicians died, even though the President was not himself a physiologist. Physicians were particularly strong in helping the Society overcome prejudice against animal experimentation.

Leslie Turnberg was educated at Manchester University; after working for a time in London, he returned to Manchester, where he eventually became Professor of Medicine and Dean of the Faculty of Medicine. He was elected to The Physiological Society in 1983 and has recently been a member of the Committee. His research has mainly been concerned with gastrointestinal physiology and pathophysiology and he is the author of a number of heavily cited papers on mechanisms of transport of salt and water across gut epithelia. We are sorry that the pressures of his new appointment make it likely that we will see him rather less often at Meetings of the Society, but we can all rest in the knowledge that the interests of medicine and the relations of physiological science to medicine are in very sound hands.

Table of Current Committee Members

Name	Years served	Status	Address	General Scientific Interests
K Appenteng	1	Ordinary member	Physiology, Leeds	Neuroscience, Anatomy & Embryology, Pharmacology
J C Atherton	4	Designated member	Physiological Sciences, Manchester	Electrolyte & Water Balance, General Physiology, Renal
D Cotterrell	5	Committee Secretary	Multidiscipline Labs, Leeds	Blood, Cardiovascular
G J Dockray	4	Designated (Chairman)	Physiology, Liverpool	Gastrointestinal, Endocrines, Neuroscience
A C Dolphin	2	Ordinary member	Pharmacology, Royal Free HMS, London	Biophysics, Neuroscience, Pharmacology
R E J Dyball	2	Ex officio	Anatomy, Cambridge	Neuroscience, Electrolyte & Water Balance, Endocrines
D A Eisner	3	Ordinary member	Preclinical Veterinary, Liverpool	Biophysics, Cardiovascular, Cellular & Tissue
P H Ellaway	1	Ordinary member	Physiology, Charing Cross HMS, London	Neuroscience, Muscle & Exercise, General Physiology
J I Gillespie	3	Meetings Secretary	Physiological Sciences, Newcastle	Cellular & Tissue, Cardiovascular, General Physiology
A Guz	0	Ordinary member	Medicine, Charing Cross HMS, London	Cardiovascular, Muscle & Exercise, Respiration
J A Kemp	3	Ordinary member	Merck Sharp & Dohme, Harlow	Neuroscience, Pharmacology, Biophysics
C Kidd	5	Ex officio	Physiology, Aberdeen	Cardiovascular, Neuroscience, Pharmacology
G Leng	0	Ordinary member	Animal Physiology, AFRC, Babraham	Neuroscience, Endocrines, Reproduction
J M Marshall	2	Ordinary member	Physiology, Birmingham	Cardiovascular, Comparative Physiology, Respiration
J C McGrath	4	Designated (IUPS)	Physiology, Glasgow	Cardiovascular, Neuroscience, Pharmacology
N G McHale	0	Ordinary member	Physiology, Queen's, Belfast	Cardiovascular, Smooth Muscle, Ion Channels, Microcirculation
D J Miller	0	Ordinary member	Physiology, Glasgow	Cardiovascular, Cellular & Tissue, Muscle & Exercise
D Noble	7	Designated (IUPS)	Physiology, Oxford	Biophysics, Muscle & Exercise
O H Petersen	0	Foreign Secretary	Physiology, Liverpool	Biophysics, Gastrointestinal, General Physiology
H P Rang	3	Ordinary member	Sandoz Institute, London	Neuroscience, Pharmacology
L H Smaje	0	Ordinary member	Wellcome Trust, London	Cardiovascular, Cellular & Tissue, General Physiology
N B Standen	1	Ex officio	Physiology, Leicester	Biophysics, Cellular & Tissue, Neuroscience
R D Vaughan-Jones	0	Ordinary Member	Physiology, Oxford	Heart/cardiac muscle, Membrane transport
J G Widdicombe	2	Treasurer	Physiology, St George's HMS, London	Respiration, Pharmacology, Environmental

Journals Management Group

(members: Graham Dockray, David Cotterrell, Richard Dyball, Jim Gillespie, Dave Jordan, Cecil Kidd, Nick Standen, John Widdicombe, with Victoria Penrice in attendance)

The Journal of Physiology

Recent years have seen greater emphasis on the publishing record of scientists to secure funding and this has necessarily meant that scientists have become more eager to submit their papers for publication. In January 1990 the Editorial Board removed the requirement that contributors to *The Journal of Physiology* be listed in alphabetical order. The rationale for this was to encourage the submission of more high quality papers from around the world. The Board has certainly been successful in achieving this.

Submissions to the *Journal* have grown steadily. In 1989, 722 papers were submitted, of which 412 were accepted. In 1991, 568 were accepted from a total submission of 980 – an increase of 38% in the number of papers accepted over three years. The delay from receiving a paper to the distribution of the *Journal* containing it has crept up along with increased submissions. The median delay is now 9.8 months, the highest it has been since 1987, and the Society considers that any further increase in publication delay is undesirable.

Increasing *Journal* size to accommodate the additional papers is not a solution to publication delay without problems of its own. The Society relies on steady income from the *Journal* to be able to plan its future activities (whilst the Stock Market can be lucrative, it is also volatile). The market for the *Journal* is mature and under threat from shrinking library funds world-wide. Publishing is a costly activity, the greatest cost being page composition, which is directly related to the number of pages being produced.

Therefore the Society has a difficult balancing act. It must endeavour to publish papers rapidly whilst keeping the Journal a reasonable length.

The Journals Management Sub-Committee, in conjunction with the Editorial Board and Treasurer's Advisory Sub-Committee, has spent much time considering ways in which to maximise *Journal* income whilst minimising publication delay. Experiments in the Administration and Publications Office along with the Press Office have demonstrated that it would be possible to make minor changes to the layout of the *Journal* which would result in more papers being accommodated without increasing *Journal* size. This may result in a few more papers being published but is not sufficient in itself. What is required is a completely new approach to publishing the *Journal* that will substantially reduce the production cost.

The Society's Committee has agreed, therefore, to invest in desk top publishing technology and skills. Although the initial expenditure is considerable, the potential savings are high. Should these be realised, the volume size of the Journal could increase to its maximum of 800 pages, thus reducing the publication delay and maintaining a steady income for the Society.

Some changes will occur at the Press Office because of this. The introduction of desk top publishing will result in a considerably enhanced workload for the Press Office staff, something they have greeted with enthusiasm. The Society will effectively be taking on production work that has hitherto been done by Cambridge University Press and the present staff will have to be trained in new production techniques – in itself time consuming. Expert computing skills are required to ensure that equipment bought is suitable for the Society's needs and, to accommodate the extra equipment and staff, the Press Office will need to move to a larger office within the CUP building.

As a result, the Society has made the following appointments:

CLIVE SEMMENS Desk top publishing editor

Clive's background is in computing and he has worked in India training hospital technicians in the use of high-tech equipment. He has taught computing in the Western Isles and also worked as co-ordinator selecting equipment, software and managing systems. Most recently, he has been employed as Director of Information Technology in a London school. Clive will be responsible for recommending a DTP system, training staff and ensuring that the new production methods are implemented successfully.

AMANDA KINGSMILL Senior copy editor

Mandy has a degree in Agricultural Science and experience gained as a nutritionist and research assistant. She won a scholarship to study and work in Australia and is presently employed as Copy Editor/Proof Reader on *The Journal of Physiology*. Mandy will be responsible for work allocation during the transitional period and for ensuring that the move to the new office goes smoothly.

MIRANDA BENSON Copy editor/proof reader

Miranda has an MA in Physiology. She currently works as a vet, although she has experience of document production, using DTP, and of typesetting for a music publisher. She also has experience of teaching physiology and of supervising students.

The Society hopes that by the end of the year camera ready copy will start to replace traditionally typeset pages in the Journal. Although appearances should remain the same, the Society will have greater control over the *Journal*'s size and cost and this should ensure a firmer financial footing for years to come.

The Journal of Physiology

Name	Years served	Location	General scientific interests
M L J Ashford	NEW	Pharmacology, Cambridge	ATP-sensitive and calcium-activated K^+ channels
J F Ashmore	3	Physiology, Medical Sciences, Bristol	Special senses; theoretical and mathematical topics in neurobiology; membrane biophysics
C D Benham	1	SmithKline Beecham, Harlow	Smooth muscle, arterial and vascular
S G Cull-Candy	4	Pharmacology, UCL, London	Synaptic transmission at cellular level; ion channels opened by fast synaptic transmitters; quantal release of synaptic transmitters
N Curtin	6	Physiology, Charing Cross HMS, London	Skeletal muscle (contraction, mechanics, energetics, metabolism); aspects of exercise related to muscle
P B Detwiler	NEW	Physiology & Biophysics, University of Washington, USA	Cellular physiology of sensory receptors; sensory transduction; G protein-coupled signal transduction; retinal neurobiology; cyclic nucleotide gated ion channels
A C Dolphin	1	Pharmacology, Royal Free HMS, London	Cellular electrophysiology; signal transduction; voltage-sensitive Ca^{2+} channels; GTP-binding proteins and G protein-linked receptors; neurotransmitter release
R E J Dyball	6	Anatomy, Cambridge	Neuroendocrinology; electrophysiology and morphology of the hypothalamus; central actions of peptides
D A Eisner	1	Preclinical Vet Sciences, Liverpool	Cardiac muscle (cellular aspects); smooth muscle; intracellular ionic measurements and regulation
J Ekstrom	3	Pharmacology, Goteburg, Sweden	Autonomic nervous system; digestive tract; lower urinary tract; denervation supersensitivity; polyamines
B P Fulton	5	Anatomy/Developmental Biology,	Electrophysiology of neurones (spinal motoneurones, dorsal root ganglion neurones) and glial cells in adult and developing animals, particularly ionic mechanisms controlling neuronal firing properties
B H Gahwiler	1	Brain Research Inst, Zurich, Switzerland	CNS, electrophysiology and pharmacology; development; neuroendocrinology
W R Giles	5	Medical Physiology, Calgary, Canada	Cardiac electrophysiology and pharmacology; excitation-contraction coupling in heart
G Gordon	6	Physiology, Oxford	Somaesthetic, including human microneurography; non-neuropharmacological aspects of pain mechanisms; spinal cord anatomy and physiology
P M Headley	NEW	Physiology, Medical Sciences, Bristol	Nociception; spinal cord; neurotransmitters and modulators, especially in sensory processing (somatic and visceral);
C Huang	1	Physiology, Cambridge	Intramembrane charge movements in skeletal muscle
H R A Hultborn	1	Neurophysiology, Copenhagen, Denmark	Motoneurones; spinal cord; neuronal network; motor control; locomotion; human neurophysiology; generation of motor patterns
M Hunter	NEW	Physiology, Leeds	Epithelial transport; ion channels; volume regulation; cellular physiology
M Irving	3	Biophysics, Cell & Molecular Biology, KCL, London	Skeletal muscle, including excitation-contraction coupling; muscle contraction, energetics and mechanics; measurements of intracellular calcium; intracellular ATP and calcium jumps with "caged" compounds
G Isenberg	NEW	Physiology, Koln, Germany	Smooth and cardiac muscle
D A Jones	NEW	Physiology, UCL, London	Skeletal muscle physiology with particular reference to fatigue and damage; human exercise and training studies; effects of ageing on musculo-skeletal systems

Name	Years served	Location	General scientific interests
D Jordan	3	Physiology, Royal Free HMS, London	Neural control of circulation and respiration; cardiovascular and respiratory sensory afferents and responses; autonomic nervous system
H Kuriyama	NEW	Pharmacology, Kyushu Univ, Japan	Immunology; gastrointestinal physiology; pharmacology
R N Lemon	6	Anatomy, Cambridge	Neurophysiology: cerebral cortex; motor systems and pathways; behavioural and neurophysiological studies; spinal reflex mechanisms and supra-spinal control; somatosensory system; human reflex neurophysiology; motor unit studies
J W Lichtman	3	Anatomy & Neurobiology, Washington Univ, USA	Development and modification of synaptic connections; neuro muscular junctions; autonomic ganglia; spinal cord (sensorimotor); general developmental neurobiology; visual system
H Ch Luttgau	4	Cell Physiology, Ruhr Univ, Germany	Excitation-contraction coupling in skeletal muscle fibres; muscle fatigue; Ca^{2+} channels; K^+ channels
K L Magleby	3	Physiology & Biophysics, Miami, USA	Biophysical studies of single channels; channels in muscle; neuromuscular transmission; mechanism of transmitter release, generation of EPPs or EPCs
J M Marshall	1	Physiology, Birmingham	Cardiovascular system; microcirculation; cardiovascular respiratory interactions; exercise physiology; hypoxia; temperature regulation
A Marty	3	Neurobiology, Ecole Normale Superieure, France	Synaptic transmission involving second messengers; receptor-operated and voltage-dependent channels
T C Muir	NEW	Physiology, Glasgow	Autonomic pharmacology and physiology; microelectrode recording; gastrointestinal pharmacology; transmitters
R A Nicoll	3	Pharmacology, UCSF, USA	Electrophysiology and pharmacology of CNS neurones
A Noma	1	Physiology, Kyushu Univ, Japan	Ionic mechanisms of cardiac membrane excitation; pacemaker mechanisms of the heart; regulation of ion channel activity
R A North	3	Oregon Health Sciences Univ, USA	Neuropharmacology; opiates; gastrointestinal motility; enteric nervous system; autonomic electrophysiology; potassium currents; *in vitro* electrophysiology; synaptic transmission
D C Ogden	1	Neurophysiology, NIMR, London	Ion channels and membrane receptors; Ca^{2+} ion regulation; synaptic transmission; flash photolysis; microspectrofluorimetry
D J Potts	4	Physiology, Leeds	Kidney: function at whole organ, tubule and cell levels
R Ribchester	6	Physiology, Medical School, Edinburgh	Developmental neurobiology; use and disuse of nerve and muscle; electrophysiology of muscle; synaptic transmission
B Sakmann	5	Cell Physiology, Max Planck Inst, Germany	Single channel analysis, particularly transmitter-gated ion channels; ion conductances during development
T J B Simons	6	Physiology, KCL, London	Membrane transport; general and cellular physiology
N B Standen	8	Physiology, Leicester	Ionic channels in cell membranes; regulation of intracellular calcium
L B Strang	4	France (formerly UCL, London)	Fetal physiology; physiology of respiratory epithelium; respiration
W Stuhmer	1	Membrane Biophysics, Max Planck Inst, Germany	Voltage-gated Na^+ and K^+ ion channels and Ca^{2+}-dependent K^+ channels: biophysical and molecular approaches
D A Titchen	3	Veterinary Physiology, Sydney, Australia	Nervous and hormonal controls of functions of the alimentary tract; digestive physiology of ruminants; autonomic nervous system
R D Vaughan-Jones	NEW	Physiology, Oxford	Heart/cardiac muscle, Membrane transport
G Westheimer	5	Physiology & Anatomy, Berkeley, CA, USA	Visual system, particularly processing of spatial signals; extra- and intra-ocular motor systems; physiological optics

*Chairman

Name	Years served	Location	General scientific interests
B E Argent	NEW	Physiological Sciences, Newcastle	Biophysics; biomedical engineering; neuroscience
J R Blair-West	5	Experimental Medicine, Melbourne Univ, Australia	Ruminant and large animal physiology
G J Dockray	2	Physiology, Liverpool	Gastrointestinal physiology
R Green	1	Physiological Sciences, Manchester	Renal physiology
A Guz	6	Medicine, Charing Cross HMS, London	Human cardiopulmonary physiology
W Janig	4	Physiology, Kiel Univ, Germany	Autonomic control mechanisms
C Kidd*	6	Biomedical Sciences, Aberdeen	Cardiovascular control mechanisms with particular reference to central nervous control; effects of hyperbaric conditions on human and animal cardiopulmonary control
J R Levick	2	Physiology, St George's HMS, London	Circulatory physiology with particular reference to microcirculation
B Matthews	5	Physiology, Medical Sciences, Bristol	Neurophysiology with particular reference to oral physiology
D J Mellor	5	Physiology & Anatomy, Massey Univ, New Zealand	Ruminant and large animal physiology with particular reference to nutrition and fetal physiology
A Silver	6	Physiology, Cambridge	Neurochemistry
J B Wakerley	3	Anatomy, Medical School, Bristol	Endocrinology

*Chairman

Scientific Meeting Dinners

Dear Sir

I am writing in response to Andrew Doyle's letter in the July edition of the Newsletter. I would like to endorse his comments on after dinner speeches. I am sure that these speeches could be dispensed with.

Another problem with the dinners is the cost. At a recent Meeting, the dinner (excluding wine) cost £19. This is rather an expensive evening out. Could I suggest that an adventurous host department might endear itself to a significant fraction of the Membership by putting on a less expensive dinner? If this comprised a buffet then it might allow one to talk to more people and thereby deal with another of Andrew Doyle's comments.

Finally, Andrew Doyle complains about the lack of an audience on the last day of the Meeting. While his theory that this is due to the delayed effects of ethanol intake may have some validity, in many cases it simply reflects the small number of people attending the Meeting. In my opinion, this and the saving in travel costs are among the many reasons for reducing the number of Meetings.

David Eisner

Dear Sir

Andrew Doyle makes some pertinent points in his letter (July 1992) but I would take issue over his use of "outdated" to describe the rituals associated with Society dinners. "Updated" is probably more apposite.

Civic receptions with Mayoral handshakes are a relatively modern phenomenon and have increased as university and departmental hospitality funds have dwindled. Admittedly the wait at Newcastle was over-long but the march (or amble) through St Andrews, led by a pipe band and with a police escort, was a pleasant price to pay for an extremely generous supply of drinks.

The "awful after dinner speeches" – and I agree that some of them are truly awful – represent another departure from tradition. Speeches used to be entertaining, witty and, above all, short. It is only over the last 15 or so years that speakers, both guest and host, have mounted their soapboxes to go on and on and on ..... no wonder Members relieve the tedium by running sweepstakes on the length of each effusion! If speakers are itching to cast pearls perhaps they should use the wider medium of the Newsletter. The readers should at least be sober.

Ann Silver

MRC Outline Plans

First of all, it is worth saying how useful it is to have in concise form a statement from the research funding bodies about future plans. I would not want to be negative about the MRC's paper and the decision to pitch postgraduate stipends at a healthier level (which will buy more bread if not cake) is to be applauded, as are the decisions to increase funds for Genetics and Neurosciences.

However, I do see a shortcoming in the document, and presumably in MRC policy. This is a kind of credibility gap between the stated aims and the adoption of the appropriate pro-active stance in relation to achieving them. It is proper that the MRC should seek to promote medical research across a very broad spectrum of activities and necessary that it should define its strategy as precisely as possible. It is vital that "the best quality graduate students are attracted into studentships" and that the MRC plans encourage "more people to seek careers in research" and further the "career development of medical research workers". Whether these aims can be pursued realistically is an issue that is not addressed. The tone of the article suggests that there is a "current funding climate" which is, regrettably, unfavourable but is nevertheless an unalterable fact of life. Is it not possible for the MRC to adopt a more active stance in seeking to divert more funds in their direction? Could they not be a vital channel of communication through which the concern of the scientific community that is sinking to Third Division status is brought into the consciousness of politicians? The MRC should be prepared to attempt to change attitudes and a funding climate which has always been subject to public and political opinion.

Credibility also seems to demand, in my view, a conception of their activities by the MRC in relation to the aims of the major charities. I had imagined that the aims of the charities and the MRC would have been formulated to be complementary and that strategies must already be in place to prevent unhelpful duplication of effort. I would have welcomed some attention to this issue.

David Wallis

Research Funding Bodies – Reflections

It is always helpful to get first hand information on the current focus of interest of the grant awarding bodies whom we shall increasingly rely on to support our research with the demise of the DR component from the UFC. The identification of specific areas to receive support and the establishment of specific initiatives, ie directed research, will increasingly become the norm. It is also clear that to achieve any hope of success with the MRC it will be necessary to have a direct medical link, preferably a collaborative project involving clinical input.

One of the most cost effective ways in which research can be achieved and future generations of scientists trained in research methods is through the various three year studentship schemes. I am heartened to see there is a continuing commitment to these schemes and I hope this programme will develop. However, it is important that the studentships are financed at a realistic level to attract high calibre applicants and be able to compete with other comparable posts. This will mean increased finance.

Another area which will gain in importance is the opportunity for applicants to apply for small grants which are vital for the support of pilot studies and the more speculative research ideas. This type of support will increasingly disappear from the UFC-funded departmental remit. It is likely that resources will increasingly be directed to centres of excellence to the exclusion of large areas of the scientific community. I consider there is a place for both and it is important that the research funding bodies share this view and resist the "block grant" approach to selected institutions. I have a feeling it is far more cost effective in terms of output of published material to fund eg 100 grants at £100k each than ten at £1m each. I do not know if there are any available statistics on this, I am sure the funding bodies have such data.

Certain research funding bodies are to be congratulated on the increasing level of feedback on unsuccessful grant applications. While sympathising with the comments made by the BHF, I do not consider their decision to provide feedback in only 20% of cases helpful or indeed encouraging to unsuccessful applicants. There are few things more depressing than to receive a curt note rejecting an application which represented many hours of work. Some constructive comments and the possibility of resubmission softens the disappointment a little.

As a means of keeping postdoctoral scientists within research, continued support in the form of fellowships and lectureships is essential. Again, I am heartened to read of the commitment of the research funding bodies in this area. There is a need to develop a policy which leads to a clearly defined research career structure for full-time researchers. The comments on this by the Wellcome Trust are most helpful and the Trust is again to be congratulated in tackling this problem.

The name of the game increasingly will be collaboration both between scientists in submitting multidisciplinary research programmes but also between research funding bodies to maximise the use of their resources. The funding of workshops to bring together scientists from different disciplines is to be welcomed.

An area which needs clarification as quickly as possible is the position of the charities to indirect costs. Unless this can be solved in a positive manner it is going to create considerable problems for institutional finance. The whole situation regarding overheads needs to be addressed and a coherent policy established. I think it very helpful that the CRC report highlights this area. It would be most unfortunate for those of us in universities if the charities were forced to abandon university research in favour of research institutes. It would also be detrimental for British medical research.

My overall impression is that the opportunity for us to undertake research is going to become increasingly bleak. Anything which can be done to slow or even reverse this process is welcome. Our system has produced excellent research at minimum cost and it would be a disaster if a significant proportion of our Higher Education teaching took place in a research-free environment.

Robert Walker

Etiam vermis se defendet

A short while ago whilst I was collecting and collating the departmental profile for the then forthcoming UFC second round, Kwabena phoned and asked me to comment upon the articles in the two recent newsletters about funding. When asked politely to do something I usually agree especially when there is no way that I could see the request coming and therefore duck! Funding, as everybody is aware, especially that from external sources, is now of paramount importance to departmental survival. The government, in its increasingly contemptuous attitude to Academia, is cutting its own costs and striving towards an increasingly larger input from the industrial and commercial sectors. We are forced to play along with this move in order to maintain the standards of university education with its inviolable right to teach from a research base. As we all know, good research these days means expensive research and we are in the position, led by the UFC (an acronym which lends itself to positively vulgar translations), which has decreed that intellect is measured in pounds (£) of income per pound (lb) body weight of researcher! The average research spend of a physiologist is among the lowest in the biological field. Physiologists must therefore be of lower average perceived intelligence in the academic community. Judged by the success rate of attracting research income by physiologists who prefer their experimental preparation to be covered with skin and have an appendage at each of its four corners, those working on problems concerned with the behaviour of intact systems must be extraordinarily thick (in £/lb).

But enough of this splenic hysteria. To the articles. They were all informative even though for one or two you had to read between the lines or even search frantically under much UFC generated paper – (does it really take over 30 pages of instructions to fill in four forms and generate three sides of licensed hyperbole?) – to find the MRC's corporate plan and scientific strategy. Of the articles, the big three money providers (The Wellcome Trust, MRC and SERC) are willing to fund almost anything from basic intellectual investigation to the application of new science. To maximise a grant application you should include the words genetic, membrane, molecular, neurobiology, Aids and developmental and I hasten to add – allegedly. The other six articles were from charitable organisations funding fairly specific disease states with the codicil that they have to show a practical return for the money spent but can still finance basic research workers. In all articles there was the idea that those showing academic excellence would be funded. Academic excellence is an ill-defined concept but must be attained by peer review presumably by those who have invented the UFC system of peer review. In the case of medical science, the scientists who perform this review are now heavily biased towards genetics, membrane function, molecular biology, molecular medicine, neurobiology and developmental biology. Judging from the comments I have seen from referees on rejected grant applications from those wishing to work on the whole animal, they wouldn't be able to recognise a good research proposal even if the animal got off the page and bit them somewhere. A few years ago I did a survey of holism and reductionism in physiological departments and came to the conclusion that apart from a few outposts we might as well wave experimental animal physiology good-bye. However, unless we can manage to maintain a few laboratories to keep training experimental animal physiologists the application of discoveries made at the molecular and genetic end of the spectrum to the intact animal is going to be almost impossible. We might find ourselves in the position of the Americans of apparently not

being able to competently teach Physiology – unless you are one of those strange people who think that teaching is the transmission of the précis of the chapter in the textbook from your piece of paper to the students' pieces of paper without going through the minds of anybody.

All of the problems which we face are addressed by the authors of the various articles. Interestingly, they were coherently and intelligently spelled out by the charities. Is it really correct to take our brightest graduates and reward them with a scholarship with a punitive level of personal finance? The less bright can be employed as Research Assistants and even after paying their fees, which can be fiddled into small payments, are usually better off than their intellectual superiors. How can we keep attracting the bright people at the quality end of the spectrum into university life when they are in intimate contact with a system that demoralises, underpays and underfunds those who have a position in the system? How long is it reasonable to subject a young research worker to the instability of soft money for their employment? Everybody is trying to find solutions to these problems but they all fall down when long-term employment is considered. Another problem which the research councils are starting to address is the level of research support students should have. If the sixties support is inflated to today's costs then a bench fee of £2,000 would be appropriate. The present day allocation of £400 per student per year is totally inadequate. This imposes unfair burdens on departmental grants and external funds if students are to be allowed to do the amount of research which is demanded for a higher degree. The leaders of the research councils should have the moral fibre to stand up to Government and point out the scientific and economic facts of life to the temporary occupants of the left hand side of the screen, seen in the TV soap called "Today in Parliament". If Government does continue the sneakiness of shifting funds from the UFC to the research councils it should be pointed out that unless university departments get back funds from the councils in direct proportion to those shifted out of their usual budget then even more university jobs will vanish. Filling in research proposals these days calls for a marked degree of creative accountancy to estimate levels of overheads, the direct costs of services provided and even how much you can charge non-grant holders to use grant-generated equipment!

In the present climate of University changes to devolved budgeting (a laughable device for passing the buck downwards), research and teaching accountability, modularisation, semesterisation, increasing student intake with increasing student loads without the extra resource required etc., thought might be given to those who arrive at the top of their profession and are awarded a chair. This usually comes as a result of scholarship in research and is followed swiftly by a promotion to management and paper pushing. Perhaps charities might consider giving heads of departments grants to employ managers or, failing this, for giant waste paper bins or an environmentally friendly grant for a paper recycling kit! There seems to be no easy solution to all the problems we face for funding. As a personal observation I cannot see things changing until the sycophants at the top of the university funding tree do what all the downtrodden eventually do – revolt.

The highlight of reading these articles was the serendipity, or alternatively editorial brilliance, of juxtaposing Chance & Design between the first and last sets of articles. Almost all of the articles on funding are concerned with funding research by design. Nowhere is there a mention of funding research merely to provide a "what if" scenario. As a head of a large department I am called upon to provide funds for people doing good research into problems which are of no immediate interest to research funders. This one does for two reasons. Firstly, in the hope that something unexpected may ensue from their efforts and second, to keep alive whole animal physiology to show to final year and research students that there are new discoveries to be made other than at the membrane or molecular level. After all, without the discoveries made in whole animals the molecular men would have nowhere to start, would they? Problems associated with intact animals still abound, eg cardiac disease, cancer, Aids, schizophrenia, senile dementia etc.

As a postscript, on reading *The Observer* (26 July), it was interesting to note that in order to buy the next general election Lamont is aiming to cut £10bn in public spending. One of the targets for cuts is the "demand driven" programme of higher education. Having committed themselves to an increase in those going on to higher education (surely "government driven"), they are now presumably poised to cut their costs even further. Such hypocrisy and stupidity can only be generated by those whose collective cerebral cortices have fallen so low as to be in imminent danger of compression every time they sit down. Etiam vermis se defendet.

Tony Angel

Research Funding Statements – A Commentary

I have been asked to comment on the statements produced by the various bodies who fund our research. These were printed in the May and July issues of the Physiological Society Newsletter, and should be consulted for the details. The MRC and SERC, as befits bodies which produce lengthy independent accounts of their activities, limit themselves to qualitative remarks on their policies. Most of the charities give a breakdown of their expenditure so it is easy to see how their money is spent. This shows the admirably small fraction of their income charities spend on administration (eg Wellcome Trust, Fig 1). Another feature emphasised by the graphics is the large fraction spent on molecular biology (eg ARC, Fig 1). For physiology departments this is two edged; many of us use the tools of molecular biology, but we still need staff capable of teaching and relating to the whole body.

We live in a time of considerable change. Part of the need for this is the normal process of examining the way we do things and thinking up better ways of doing so. A larger part, however, is the perceived need by the government and others for "initiatives". These initiatives are often poorly thought through and applied rapidly with very little consultation. I have the suspicion that most of them originated from the desire to save money and so were a form of camouflage. Many will probably have considerable and largely unpredictable effects on our research activity, so I shall discuss some of them in considering the research statements.

Kenneth Baker, when briefly Secretary at the DES, announced the separation of teaching and research funding for universities, a subject which had just been looked into by your Committee. I wrote pointing out that the old arrangement was rather efficient; most physiology departments used research equipment to teach advanced undergraduate courses and often used teaching

equipment for research during the vacations. This meant that separate funding might increase rather then decrease the costs of running a department, surely not his intention. He replied at some length saying in effect that they had not considered any of the details.

The initiative of transferring research funding from the UFC to the Research Councils means the dual support system is largely dead, so that overheads for research need to be paid by the research funding body. This may work for research council funding, provided the money is not lost in the system, but has severe consequences, not yet resolved, for the medical charities. At present it looks as though the charities (who were not consulted before the change) will not pay for overheads. In the interim period the government are paying through the UFC, but it is not clear how long this will last. Several of the charities dwell on this point in their articles. If the government continue to pay for the charity overheads this may bring our system nearer to that in the USA where donations to universities are tax free. This of course means that a fraction of the private money donated to US colleges is really treasury money.

The idea for three classes of universities first appeared in the *Strategy for the Science Base*, produced by the ABRC. (This document reminds me of the Bible in that you can find any view you care to think of in it somewhere.) This was based on two misconceptions but fitted current philosophy. The first error was that we had too many universities doing research (not true compared to other advanced countries). The second one was that most research council money already went to the top ten universities, so really there was no change planned. While this was true it was irrelevant; simple maths shows that bigger universities are likely to get more money than smaller ones; when allowance is made for size, research money is widely distributed. Fortunately for many research workers, the research councils and charities continue to support excellence wherever it is found.

The final new initiative relevant to research funding was the setting up of IRCs. This again fitted in with the government's practice of wanting to impose central control (though not their stated intention of increasing personal freedom) and seemed attractive to some in that it might lead to more money for research. When we questioned Robert Jackson (then at the DES) about it, he regarded it as an experiment rather than as a device to obtain more money.

This is clearly a complex question, for whether progress is made by groups or by individuals depends on the subject and on the level of development of it. Particle physicists need large groups to afford the equipment, electrophysiologists can work by themselves. Some of the strongest advocates of IRCs were used to working in groups rather than as individuals and so had less experience of what may be the norm for physiologists. I found the section by Dai Rees particularly interesting in that he goes to some length to emphasise the MRC's commitment to project grants. When the heads of physiology departments met him some years ago these did not seem to be his views then. I would have found it interesting to have some figures for project versus other forms of support for both the MRC and SERC as is given by most of the charities. The figures given by the charities emphasise their commitment to supporting individuals.

Since 1979 the UK has taken part in a massive economic experiment. This seems to have been unsuccessful in that we have dropped to 13th out of the 22 most advanced nations in World Competitiveness (report of the World Economic Forum, 22 June 1992). In our branch of the economy a superficial glance at these eight statements might lead to the view that the UK does well in support for the science base. This is not so. In 1979 our civil research funding was about average (as % of the GNP), now it is the lowest of advanced nations. We are the only country to have decreased the fraction spent on research over these years. Without the invaluable contribution made by the medical charities, our kind of research in the UK would have almost collapsed. To put government support figures into context, the total cost of civil research in the UK is about 6p per person per day, compared to several pounds for defence and social security. (If research improves the economy by even a small amount it ought to pay a government to fund it well.)

What of the future? Since the last election there has been a very significant change in the arrangements for the research base. William Waldegrave, Chancellor of the Duchy of Lancaster, was appointed as the Minister for Science and Technology with a seat in the cabinet. He is ably supported by Bill Stewart as Chief Scientist in the Cabinet Office. The DTI is likely to be much more active in supporting industrial R & D with Heseltine as Secretary. It is to be hoped that both remain in post for longer than the average 12 month tenure of their predecessors.

Soon after Waldegrave was appointed he asked to meet Save British Science (we were second after the President of the Royal Society). John Mulvey, Richard Joyner and I met him with Robert Jackson and Bill Stewart on the 13 May. We were impressed by his intelligence, his obvious understanding of our problems and his hope that he could form a long-term plan for stability of the research base in the UK. I felt he would agree with the remark that "an investigator is a man who has an itch to find things out, and he goes ahead and does it because it pleases him". This is a welcome change from the views of his predecessors. Waldegrave stressed the need for a diversity of research funding – a point well illustrated by the eight research statements in the newsletter. We came away with the strong feeling that he was someone we could work with to repair and improve the state of the research base in the UK.

Joe Lamb

Research Funding Bodies – Some Comments

So it's all change. Polytechnics are now to become universities, there is the transfer of funds from the UFC to research councils to cover total costs of research (apart from academic salaries and space), the greater importance of student numbers in resource allocation, the use of gradings achieved in the UFC Selectivity Exercise as a yardstick for who gets what from the meagre resources of the UFC and research councils. These changes are all going to have an impact on our research activity. Such changes will challenge the ability of the research councils and charities to meet inevitable increases in demands for funding. I was, therefore, interested to read how these organisations are going to deal with the future needs of research.

I found the accounts by each organisation informative and helpful and they should be complimented. However, in general I could say there were only snippets of encouragement for the future and I was perhaps a little disappointed by the paucity of ideas for dealing with present problems. I know it is easy to say this and I am aware that all of these bodies are dealing with other people's money in one way or another and therefore can't be too radical in their approach.

Overall, it is a bit of a gloomy picture. Apart from the Wellcome Trust, whose imaginative brokering has increased the funds available for research enormously, all the other funding bodies are finding it difficult to match income to inflation. This gives me considerable worries because the changes I have referred to are going to result in an increase in demand for funds at least in the short term. The funding bodies are clearly aware of this and each suggests strategies that might help, eg setting priorities and concentrating resources to make more efficient use of the limited funds. Who of us has not been discussing more focused research groups, mission oriented groups, IRCs and the like? There are clear benefits arising from such approaches, not the least that such groups provide a fertile environment for ideas and new techniques and also foster collaboration between disciplines. However, a word of warning is pertinent. Firstly, emphasising programmes that fit national goals undermines investigator-initiated research as a driving force. Secondly, there are dangers in sinking too much resource into what might be termed a "flavour of the month" approach. These groupings must have the flexibility to change and the provision for embarking in new directions without damaging individuals. For these reasons, I was pleased to note that virtually all the grant awarding bodies emphasised their support for the project grant, which I believe is still one of the best ways of ensuring value for money. There are disadvantages, of course, particularly in these days of intense competition for funds. There is now more uncertainty of extending the funding after three years and when the jobs of young scientists are dependent on a succession of short term contracts this type of funding may be less acceptable. Early application is essential but this leads to having to re-apply when perhaps a grant has been running for only two years. I would have liked to have seen some imaginative attempt to tackle this problem. There ought to be some better way of safeguarding the better projects. Maybe the MRC will come up with something in their review of the project grant scheme, which evidently is under way. It seems to me if a project has good output indicators that it need not go through the normal committees for approval of an extension.

Another common feature in each of the reports was the recognition of a need to train more young scientists and clinicians in research. The statement in the MRC report encapsulates the tone of other funding bodies when it says there is an intention to provide more personal awards and long-term fellowships to scientists and clinicians to give them more security. This is to be welcomed, but let us hope that there will be enough applications, particularly from clinicians, and the positions will not appear impossible to gain. Despite this element of hope, I am still not sure that the funding bodies have come to terms with the real problem: that of a true career structure for researchers in universities. Maybe it is not their role, but it is a serious problem. As we are being forced into taking more students, we will depend more and more on our young research scientists to maintain the research output.

Another feature which struck me was the heavy involvement of charities in supporting research in universities. I wonder if we have made enough of this as a public relations point. In a sense, this is "near market" research, for which we are criticised for not doing enough. Where else would or could it be done? The subscribers to a charity have an expectation that research monies will produce tangible clinical benefits in the shortest possible time and hence there is pressure on us to achieve this. The charities feel they are being penalised by the changes in charging for overheads in universities. I noted that Nigel Kemp of the CRC wrote in the *British Medical Journal*, vol 296 (1988), that if high overheads are going to be charged then the CRC will start looking again at its policy of spending large sums of money in universities. This was reiterated by T A Hince in the July Newsletter of the Society. Although it is easy to argue that "true" or "real" costs should be borne, this is the public's money, most of which has already been taxed and some of which goes to support the educational establishment. Anyway, much of the mission-oriented research supported by the charities in the end could save the public purse considerable sums of money. In any case, on humanitarian grounds it seems worthwhile to waive at least part of the overheads charge to charities. I can fully understand the concern of a subscriber who learns that 40% of the donation is going to maintain university administration etc. This could seriously affect the income to charities. In any case, since it is more "near market" research and probably is more likely to contribute to the nation's economic well-being, it should be handled sensitively by our political masters.

One final thing concerns studentships. We have been through a period when young people were reluctant to extend their undergraduate training to a period of research. I think now the tide is turning but we are faced with the difficulty of finding funds. I noted that most of the charities have given this area high priority and they are to be commended for leading the way with enhanced payments to PhD students when research council awards were ridiculously low (although these are also now being increased). Studentships are crucially important to the future of biomedical research in this country and there are still not enough of them. Recently, whilst going through the MRC list of awards, I was struck by how few Physiology departments received them and also noted that they were not necessarily going to departments with the highest UFC research ratings. This seems to me somewhat odd but I will leave it there, as I know research ratings have generated a lot of strong feelings. I am encouraged to see that training award schemes is another area under review by the MRC. I am sure Dai Rees and his colleagues will take note of views expressed at a research meeting called by Bernadine Healy of the National Institute of Health (NIH, USA) and reported in *Science*, vol 257, 3 July 1992, pp 20-21. Here it was conceded that the NIH would have to commit more resources to the training of the next generation of scientists. The problems that led to this statement are the same in the UK.

These are just a few thoughts that came to mind as I read the series of articles commissioned from a number of grant awarding bodies and appearing in the May and July Newsletters of the Society. I hope they are not too disjointed.

John Coote

New Physiology Research Building in Liverpool

On 29 October this year the formal opening of the new Physiological Laboratory at Liverpool University will take place. This event will be marked by a one-day symposium on "Frontiers in Cellular and Molecular Physiology". A number of world leaders in this field, including Bert Sakmann, Michael Berridge, Platon Kostyuk and Denis Noble, have kindly accepted our invitation to participate in this event.

Although not yet formally opened, the laboratory has been operational for several months. The new building (see picture) is linked by a glass corridor to a larger complex housing the teaching laboratories for Physiology as well as the departments of Pharmacology, Human Anatomy and Cell Biology. The new two-storey Physiology Research Building has a floor area of close to 2000 m² subdivided into four quadratic wings of 400 m² each containing the actual research laboratories and a central area in which general facilities (including a substantial tissue culture suite) are placed. Each of the four blocks has a particular dominant colour by which it is known. The Red Block is largely occupied by Bob Burgoyne's team working on molecular mechanisms of exocytosis. The Yellow Block mainly houses Sue Wray's research group working on the regulation of smooth muscle contraction in the uterus (see Newsletter July 1992). The Green Block is the home for Graham Dockray, Rod Dimaline and Andrea Varro's team studying regulatory peptides in the gastrointestinal tract and the Blue Block contains the laboratories in which the research group working on Ca^{2+} signals and stimulus-secretion coupling, led by David Gallacher, Alexei Tepikin and myself, is sited. The new building has been funded by grants from the UFC and the Wellcome Trust.

The Physiological Laboratory in Liverpool has a notable history. The old building that we have just vacated was built for Sherrington and opened on 8 October 1898. On this glittering occasion a number of distinguished scientists, including Rudolf Wirchow and Lord Lister, were present. These laboratories were state-of-the-art for that period and served Physiology in Liverpool well for almost a century. Sherrington's research put Liverpool firmly on the scientific map and it was during his 18 years as George Holt Professor (1895-1913) that he wrote the celebrated book *The Integrative Action of the Nervous System* (Yale University Press, 1906).

Liverpool's second golden period came many years later during Rod Gregory's long reign as George Holt Professor (1948-1981). In the 1960s gastrin was isolated and sequenced (Gregory & Tracy, *Gut*, **5**, 103-117, 1964). Later after Graham Dockray's arrival, cholecystokinin octapeptide was isolated from the brain and sequenced (Dockray *et al*, *Nature* **274**, 711-713, 1978). These and many other findings were cornerstones in the rapidly evolving field of gut-brain peptides which, under Professor Dockray's leadership, continues to be one of the most important research areas in the department.

My appointment to the George Holt chair in 1981 coincided with the patch-clamp revolution of electrophysiology which had a major impact on the work of the laboratory. The work of Yoshio Maruyama showed directly receptor-activated second messenger-mediated opening of single ion channels and several Ca^{2+}-dependent epithelial K^+ channels were characterised for the first time at the single channel level (Petersen & Maruyama, *Nature* **307**, 693-696, 1984).

Later in the decade, John Garthwaite made the important discovery that endothelium-derived relaxing factor is released on activation of NMDA receptors and acts as an intercellular messenger in the brain (Garthwaite *et al*, *Nature* **336**, 385-388, 1988). Bob Burgoyne's group, in collaboration with Mike Berridge in Cambridge, investigated the distribution of intracellular Ca^{2+} pumps and their relationship to agonist-sensitive Ca^{2+} stores in chromaffin cells (Burgoyne *et al*, *Nature* **342**, 72-74, 1989). The mechanisms by which Ca^{2+} signals lead to exocytotic secretion is a major research area in the department and Professor Burgoyne's group now works on the identification of a number of proteins that are targets for the action of Ca^{2+}.

Real advances in physiology depend on technical innovations and often invention of completely new methods. Our most recently appointed lecturer, Alexei Tepikin, has invented a droplet technique that for the first time allows measurement of Ca^{2+} extrusion from single cells. Since 1990, this technique has been used here in Liverpool to demonstrate directly pulsatile Ca^{2+} extrusion by the Ca^{2+} pump occurring synchronously with receptor-activated cytosolic Ca^{2+} spikes (Tepikin *et al*, *J Biol Chem* **267**, 3569-3572, and 14073-14076, 1992).

The Physiological Laboratory in Liverpool has made real contributions to physiological knowledge for more than a century. This has been based not on massive grants and enormous numbers of research workers, but rather on effective small groups of innovative individuals with a rare ability to make incisive experiments. Although it may be unfashionable, we hope to maintain this tradition also in our new building.

Ole Petersen

The full programme for the symposium marking the opening of the new Physiological Laboratory on 29 October 1992 can be obtained from Mrs B Fairfoull, The Physiological Laboratory, University of Liverpool, PO Box 147, Crown Street, Liverpool L69 3BX, tel (051) 794 5322, fax (051) 794 5327.

Some issues of concern to Physiologists

For those who have been educated and have worked for years in a particular scientific field, it is distressing to see its stature diminish. There are, of course, disciplines that do become obsolete, overtaken by progress and the emergence of new areas. Such a decline is evidenced by loss of a distinct teaching role and a lack of growth of knowledge, an intellectual stasis. I would argue that such is not the case for physiology.

Physiology, one of the older of the biological disciplines, is viewed by many as no longer a leading area; yet physiology remains a major, indeed central, subject in the teaching of biological sciences, particularly in relation to medicine. There are subjects that remain important in teaching but in which little new is developing. However, this is not the case with physiology, which continues to be a very active field of research, much of it at a high level. Why, then, does physiology appear to have lost its prominence?

There appear to be several reasons. One is the emergence of new areas which have expanded rapidly, have been aggressively promoted and have captured the public imagination. The most noteworthy is molecular biology, a field that has made spectacular advances. The emphasis on a "molecular" approach appears to threaten physiology; some of its proponents, in fact, take the view that it alone will solve all biological problems. This view, in my opinion, is shortsighted. In the long run molecular biology will only increase the need for physiology as it opens up new areas whose functional roles remain to be explored.

Neurobiology is another field that can be viewed as competing with physiology. It developed from a merger of a number of disciplines concerned with the nervous system: neuroanatomy, neurophysiology, neurochemistry, neuropharmacology and psychology. The fascinating and profound questions of how the brain functions give unity to this highly attractive field, even though the approaches, both intellectual and technical, are often quite disparate. Neurophysiology, at molecular, cellular, and systemic levels comprises a major portion of this huge area of investigation.

Cell biology, an area with less intellectual coherence, has taken root largely from anatomy and physiology at cellular and subcellular levels. Both neurobiology and cell biology have usurped some areas of research and teaching that, in the past, would have been considered as physiology or anatomy.

How, then, is physiology defined? It is the discipline that seeks to understand biological function in terms of underlying physical and chemical events. The roots of physiology are biophysical and biochemical, but physiology is also concerned with the ways in which elements are organised, interact and are controlled in biological systems. Thus, physiology is concerned with relations between structure and function. T H Huxley described it in the last century as the mechanical engineering of living machines. A broad field, it has dealt since its very beginning with function at molecular, cellular, and systemic levels. Obviously, there is considerable overlap with some of the new "biologies". Both physiology and neurobiology aim to apply what is learned at molecular and cellular levels to overall function. Such approaches are by no means solely reductionist.

Many of the early studies in physiology dealt largely with the overall behaviour of major systems such as the cardiovascular, respiratory, gastrointestinal, endocrine and nervous. In large part, such research would now be considered applied. Subsequently, studies at cellular and molecular levels gained in emphasis. Modern physiology remains an actively growing and intellectually lively field. The importance of physiology in teaching has also not remained static, although some physiology is taught under the guise of cell biology or neurobiology. While its role in curricula has not diminished, it suffers a loss of identity because of such fractionation. One may ask if that loss of identity is important. I think so, because it threatens the existence of departments whose major theme is physiology. Such departments provide a setting for research in which interactions may occur between investigators working on a variety of physiological problems. For example, a neurophysiologist working on ionic channels in nerve cells may relate to those working on the general physiology of membrane function. The neurophysiologist moving to a department of neurobiology might benefit from different contacts, some of which could be quite helpful. However, to my mind, the broader and more general intellectual atmosphere of an outstanding physiology department provides a unique atmosphere. One can always reach outside one's department for assistance with specific technical problems.

Another important role of a physiology department is in teaching and in graduate training. Where else can students acquire the broad knowledge of physiology that will allow them to excel in this field?

What causes people and institutions to diminish the identity of physiology? Many see more promise in some of the newer "biologies". Institutions are tempted to change the direction of departments of physiology into something more "exciting", to seek leadership and to commit resources to other areas. As the visibility and popularity of physiology diminishes, fewer students become attracted to graduate study and the number of teachers and investigators diminishes. This and the scarcity of academic positions present the greatest dangers to the field.

Perhaps present trends cannot be reversed but I think they should be resisted. After the current enthusiasms run their course, the scientific community may come to realise again the need for physiology. If that comes too late, one can easily imagine the development of crash programmes for the training of physiologists.

In Britain, The Physiological Society has had a very positive influence in sustaining the image of physiology, where it has a great tradition. In the United States there has been a greater tendency for departments of physiology to be converted to other fields. It is curious that the flight from physiology there has been more pronounced in the strongest and richest private universities. State universities have more often retained Physiology as a departmental designation. Some departments have adopted qualifying adjectives such as Molecular and/or Cellular Physiology to suggest that they are more modern. While this may help their image, one should remember that there is still much to be learned from studies of animal physiology. This, of course, raises the additional problem of animal rights activists.

The current resurgence of antivivisection activity is particularly troubling to physiologists. The cost of animals and the time-consuming bureaucratic requirements pertaining to their use have mushroomed. Most of this has little relevance to the humane treatment of experimental animals. In my experience, physiologists are extremely careful not to cause pain or distress in their experiments. Extremist animal rights activists, some of whom even condone violence to seek their ends, present a danger to society and science by interfering with important research.

What can be done to sustain physiology in these times? It is important to maintain the teaching and research activities of physiology at the highest possible level and to sustain graduate training in the discipline. The other need is to educate scientists and the public about physiology.

Public education is not an easy task in these times. To generate real understanding of our discipline requires more than image-building and public relations. Imaginative leadership, skilful communication and sustained effort are necessary. If its substance could be more adequately communicated, physiology might once again become fascinating and relevant in the public eye.

Carlton C Hunt

Learning from others

Scientific research is pre-eminently an international activity. The formal international collaborations are only the tip of an iceberg of individual and group contacts, collaborations, and rivalries. Progress is judged and standards are set, in all fields, by a constantly aware and critical community with instant access to the latest results via all the wonders of modern electronic communication. If we are to do better than stay afloat, if we are to continue swimming with the leaders, if we are to gain full advantage from international collaborations, we have to have at least competitive levels of resources – in finance and personnel. Researchers unable to do their best, frustrated by lack of necessary support and fatigued by the continuous effort required to keep a head above water while colleagues abroad forge ahead, quickly lose motivation, or move.

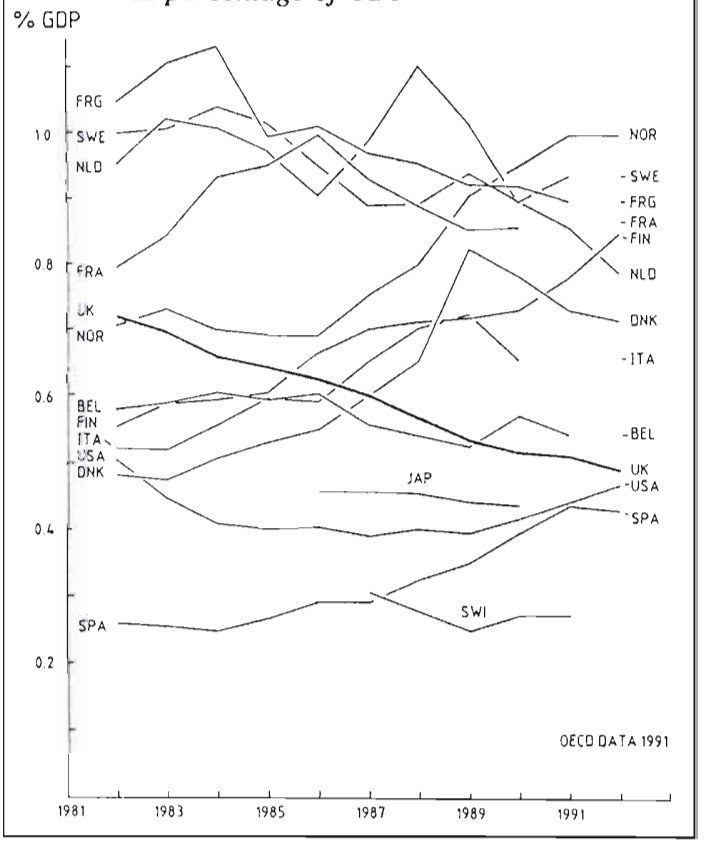
Let us see where Britain stands in comparison with its European neighbours – the closest in terms of background culture and structures. It is notoriously difficult to make these comparisons, but when a similar picture emerges (as it does) from different studies one may have some confidence in the conclusions. The most extensive and often quoted statistics are those compiled by the OECD (Organisation for Economic Co-operation and Development) in Paris. A recent report [1] by Save British Science (SBS) presents OECD data showing that over the period 1981 to 1991 British government expenditure in support of all civil research and development (R & D) has fallen from 0.72 to 0.5% of national wealth, measured as Gross Domestic Product (GDP); in current cash terms that is a fall worth about £1.2 billion per annum. This fall is unique in Europe, taking Britain from fifth position, in a group near the top of the league, to tenth position, just above a rapidly rising Spain.

Support for academic research, in Higher Education Institutions (HEIs), is one part of civil R & D and, according to the OECD, the British came tenth in Europe in 1988 counting all sources of funding; looking at the fraction paid for by government, Britain came bottom out of twelve countries (including the USA) at 77%. SBS estimates government support for research of the science base (HEIs plus research councils) to have fallen from 0.35% of GDP in 1981 to 0.28% of GDP in 1991; in current cash terms a "deficit" compared to 1981 of about £400 million per annum. This figure, it turns out, is close to that estimated by other analyses [2] to be the short fall in funding of the British science base compared to expenditures in countries like France and Germany.

Why is it that British academic scientists appear not to be thought worth the support their colleagues overseas enjoy? A chain of muddled and wrong thinking seems to be responsible both for the decline in government support for civil R & D through the eighties, and the failure to fund science base research adequately. In spite of, perhaps because of, the outstanding successes of British science the economy was not competitive; the science base was seen as consumption, not investment; R & D was the business of industry not government; anyway, R & D was unimportant because manufacturing industry was not the future, thus the science base was irrelevant; public expenditure, of any kind, was bad. The fact that the British science base was frequently of significant value to foreign firms was resented rather than understood.

In SBS we very quickly realised that the health of the science base could not be considered in isolation: there are intimate connections with education and training on one side, and the applications of science and technology – requiring investment by industry in its own R & D to develop and innovate – on the other. An essential missing element, compared with more successful countries, was clear: Britain had no overall policy for investment in science and technology – indeed when we put this point to Sir Keith (now Lord) Joseph at our first meeting with a cabinet Minister, in February 1986, he was astonished that we should think a government ought to have such a policy!

Government expenditure on civil R & D as percentage of GDP



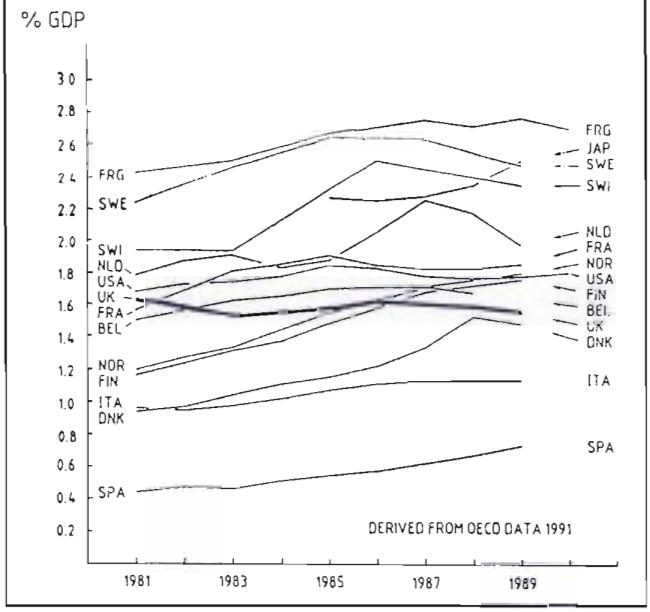
How do others do it?

In both *France* and *Germany* there is in cabinet – or the equivalent – a strong ministerial responsibility for science and technology; in both cases the holders have been in post for several years – itself unheard of in Britain – ensuring stability and continuity of policies. Both are scientists: Curien in France is a distinguished physicist and Reisenhuber, the Minister for Research and Technology in the German Federal Government, was an industrial chemist. In both cases the Ministers have direct control over a major part of the central government expenditure on R & D – 55% of Federal expenditure in Germany and about the same in France – and a dominant co-ordinating role over the other Ministries in determining the government policies and budgets for R & D – including the use of measures to help and stimulate industrial investment in R & D, and policies on training. In Germany, for example, the Ministry is responsible for the Fraunhofer Society laboratories that are currently much admired in Britain as a model for bridging the interface between the science base and industry.

In the *USA* the separation of the legislative and executive instruments of government leads to a quite different structure, and one which is very dependent on the personal preferences of the President. After a somewhat idiosyncratic Reagan – with little influence from any formal channel of scientific advice but a major intervention from Teller to trigger "Star Wars" – Bush returned to an earlier practice by appointing a strong Presidential Adviser for Science, Yale physicist Professor Allan Bromley. He has been very active in the White House, where he is head of the Office of Science and Technology Policy, and in Congress. Rather like the Ministers for Research and Technology in France and Germany, his remit for advising the President, and the scope of his evidence to Congressional Committees, extends across the whole range of science and technology from recommending renewal of measures giving tax credits for R & D investment in industry, to the need for a doubling of the National Science Foundation budget, science in schools, and the case for funding the gigantic new particle accelerator complex, known as the SSC, in Texas. Faced with increasingly severe competition from Japan, the US government knows there must be a substantial increase in civil R & D, and is seeking ways to redirect more of its huge expenditure in military R & D towards the civil sector.

Japan is different again, but, while not an easy model to copy, offers some very clear lessons. The powerful Ministry of International Trade and Industry (MITI) played a crucial role in the earlier years of the "Japanese miracle", working very closely with Japanese industry in the development of strategies for manufacturing, and helping – through contracts, indefinite low-interest loans, and other ways – to cover industry against losses in long-term R & D and product development. The success of Japanese industry is a demonstration of the importance of long-term investment in research and especially development, and financial habits and structures have developed to sustain it with less need to rely on government. The big firms have built up very strong research laboratories (including some sited in the UK) carrying out high quality basic and strategic research and sending the Japanese score in publication and citation rates rocketing up, especially in the physical sciences. On the other hand, the universities in Japan have been behind in research and poorly equipped, except for a handful of top institutions. However, this is now recognised as a serious weakness and there are powerful pressures inside the Japanese government, MITI backed, to emphasise the importance of basic research in the universities and make a substantial increase in government funding within a plan to double government support for all civil R & D to about 1% of GDP – as in Germany and France. Total expenditure on civil R & D in Japan is estimated to be already about 2.5% of GDP, second to Germany at 2.7%; Britain lags in eleventh place at a little over 1.5%.

Estimated total expenditure on civil R & D as percentage of GDP



The characteristic scene in *Britain* has been consistent underfunding of research by government and industry, coupled with an obstinate refusal of governments to adopt an overall policy for science and technology. So government departments suit themselves; the Ministry of Defence insists it cannot consider anything off the battlefield; the Department of Trade and Industry withdraws support from "near market" research which no-one near the market will take up; and even within the Department of Education and Science (DES) the Advisory Board for the Research Councils (ABRC) has been unable to sit down with the University Funding Council to get a coherent approach to the funding of the science base. One committee cannot talk to another about the advice they may be offering to their Ministers on the same topic. The House of Commons is almost free of scientifically or technologically educated members, is ill-informed on the issues* and so ignores science and technology policy. The only occasional voice of sanity to be heard has come from the House of Lords Select Committee on Science and Technology, saying things are in a mess and getting worse.

After the election on 9 April we have a new Conservative government and change is in the air. In one of his first actions John Major, Prime Minister and "his own man", startled SBS – and we believe everyone in the DES – with the bold decision to give William Waldegrave, Chancellor of the Duchy of Lancaster with a seat on the cabinet, overall responsibility for science and technology policy and control of the research councils, transferred with their staff and the ABRC office from the DES.

This is a significant step towards what SBS has long advocated – a Ministry along the French or German pattern. Although the Chancellor will have other responsibilities – for the civil service and the citizen's charter – the budget for the research councils, of about £1 billion and roughly 30% of the total government

spend on civil R & D, will be his only demand on the Treasury. The new arrangement also gives the government's Chief Scientific Adviser, Professor Bill Stewart FRS, a biologist from Dundee and past Chairman of the Agriculture and Food Research Council, a position of considerable power and responsibility as Head of a new Office of Science and Technology (OST) in the Cabinet Office.

SBS met the Chancellor, Professor Stewart, and Robert Jackson MP – who is Parliamentary Under-Secretary of State in the Office of the Minister for the Civil Service – on 13 May. We were assured that the government is looking afresh at the needs of science and technology, including the funding and management of the science base, and that the OST under Bill Stewart has already begun a wide ranging review covering all sectors of science and technology across all government departments with the aim of developing a coherent long-term policy for government to follow – for the first time in Britain.

One of the Chancellor's tasks, accompanied by the Chief Scientific Adviser, will be to represent the government at meetings in Brussels on EC research policy. Again for the first time, Britain is fielding a minister of cabinet rank matching the seniority of Reisenhuber, Curien and other EC Science Ministers; and just in time as in July Britain takes over the presidency of the EC and chairmanship of its committees. This will also give the Chancellor good opportunities to see how others do it.

We welcomed these moves, assured the Chancellor we were ready to help with advice, and told him we would be watching his progress with keen interest. It will be a tough job to break through the jealously guarded barriers between the Departments and it will be some months before we can judge the results, but there are hopeful signs that important lessons are being learnt.

** although the good work being done by POST, the Parliamentary Office of Science and Technology started with industrial donations on the initiative of Sir Ian Lloyd MP, will help if government will agree to take over its funding.*

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John Mulvey

(Executive Secretary, Save British Science Society)

Manuscript dated May 1992.

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PRISM – A New Development at the Wellcome Trust

The last two years have been times of change and challenge for the Trust, with the refurbishment of the building in Euston Road, the creation of the Wellcome Centre for Medical Science, which will be housed there, and the establishment of a biomedical science policy research unit.

The unit for Policy Research in Science and Medicine (PRISM) has close links with the Centre, most particularly with the Information Service. The Unit reports to the Centre's Programme Director, Laurence Smaje, and is governed by the Trust's Centre Committee.

The Trust's policy and grant-giving procedures have been described in the Newsletter (July 1992) by Julian Jack. The Science for Life exhibition and other aspects of the Centre will be described at a later date. This article outlines the work of PRISM.

Unit for Policy Research in Science and Medicine (PRISM)

For many funding bodies, the present climate for funding and managing research poses increasing problems, as rapid advancement of scientific knowledge continues, whilst research budgets are being restricted or cut. This has led to an increasing emphasis on evaluation and accountability, as funding bodies question how research can be most effectively supported and managed. In turn, this raises other policy questions such as how the output and impact of different programmes can be assessed, how achievable objectives for future research support can be identified and how priority setting in basic science can best be informed.

To address these types of questions, PRISM was set up by the Wellcome Trust in 1990 as a centre for independent analysis and advice in biomedical science policy, a unit that could serve both the Trust and external organisations. The objectives of the Unit are:

(a) to investigate key management issues facing policy-makers in biomedical research and provide fresh insights and a factual basis for decision-making;

(b) to disseminate findings widely and so contribute to national debate on policies for biomedical research.

The work of PRISM falls into two broad categories: that carried out primarily for the Trust (internal policy audit) and policy research of wider relevance, ie of interest also to external organisations and the biomedical research community. Some of the internal policy audit does, however, have implications for other funding bodies, and the area of peer review is one such example.

Peer review and decision making on grants

Work on internal policy audit has involved examining the Trust's own peer review system, particularly the criteria used by reviewers and panels when assessing project grant proposals, and the consistency of information gathered both on application forms and on final report forms.

A few months after PRISM began this work, the Working Group on Peer Review, set up by the Advisory Board for the Research Councils and chaired by Margaret Boden, published the findings of their year-long study [1]. They had been primarily

concerned with examining peer review practices in the research councils, comparing these with other funding bodies, and making recommendations for the future.

The subsequent debate in the policy arena extended to peer review in other types of organisation and prompted PRISM to set its own work in a wider context. This led to the publication of a paper on peer review (by Harriet Moxham and Joe Anderson) in *Science and Technology Policy* [2]. The paper addressed general issues in peer review and examined the decision making process on project grants, with reference to recommendations contained in the Boden Report; for example:

"The Boden Working Group concluded that track record indicators (such as publication counts) could not replace peer review and gave very good reasons why. However, it is clear that the publications records of applicants, their previous ability to attract research money, and their esteem in the scientific community do influence final decisions; the peer review process could be made more equitable by collecting such information systematically, and presenting data in a consistent format. Otherwise, an opinion may depend more on the amount of information available on an applicant, than on his/her actual ability to undertake successful research."

However, strong emphasis was placed on possible developments to improve the system and on the importance priority setting may have for funding organisations in the future:

"Perhaps, then, what is needed now is to extend the debate from peer review into broader considerations of how strategies are formed. This is vital because it could be argued that strategic choices will always be necessary, even if funding levels for research were to be increased dramatically."

Policy research of wider relevance

Ongoing projects of wider relevance include analysing trends in biomedical research funding and manpower, analysing the changing patterns of research output, developing new approaches to priority setting and examining the different funding styles adopted by various research funding agencies.

Biomedical research funding and manpower

The emphasis of the Unit's work so far has been on academic biomedical research, with a view to tracing the career development of researchers in these fields and identifying issues of relevance to policy makers.

As universities receive both general recurrent income and specific recurrent income, changes in the pattern of sources of research funding have been examined over time, along with details of staff supported on general and specific income. Of particular interest to the Trust is the way the proportion of research funding contributed by the charitable sector has increased in recent years. Other data being analysed according to different biomedical disciplines are age, sex, grade and qualifications of staff.

These are vital considerations for agencies developing new research funding strategies or career support schemes and, through provision of suitable data analyses, the Unit aims to help policy makers plan their funding schemes more effectively to match available resources.

Research output

The aim of this project is to develop methods to investigate the outputs of research. Charities are responsible for an increasing share of research funding – the inputs to research – but until now there has been no study on the corresponding changes at the other end of the research process – in outputs. Based on the assumption that the primary product of a research project is the scientific paper, the technique known as bibliometrics (the study and analysis of publications) can give an indication of the research productivity. Although bibliometrics can be carried out at a number of levels, from the individual scientists or their research groups to institutions or nations, the technique is generally accepted as inappropriate for use at the level of the individual.

Using bibliometrics, a sample of biomedical publications was analysed, taking all papers from 12 of the top journals spread across the biomedical field as the data set. By recording the institution(s) from which each paper was published and the source of funding acknowledged by the author(s), a map has been created of who is being funded where and by whom.

The results also show, for each journal, the proportion of papers acknowledging a particular funding source. For example, Fig 1 shows the proportion of papers in *The Journal of Physiology* that acknowledged the Wellcome Trust as a source of funding for the research published. In 1983 the figure for the Wellcome Trust was about 7% of all UK papers in the *Journal* but by 1988 it had risen to 15%.

Funding source

UK Publications in the *Journal of Physiology*

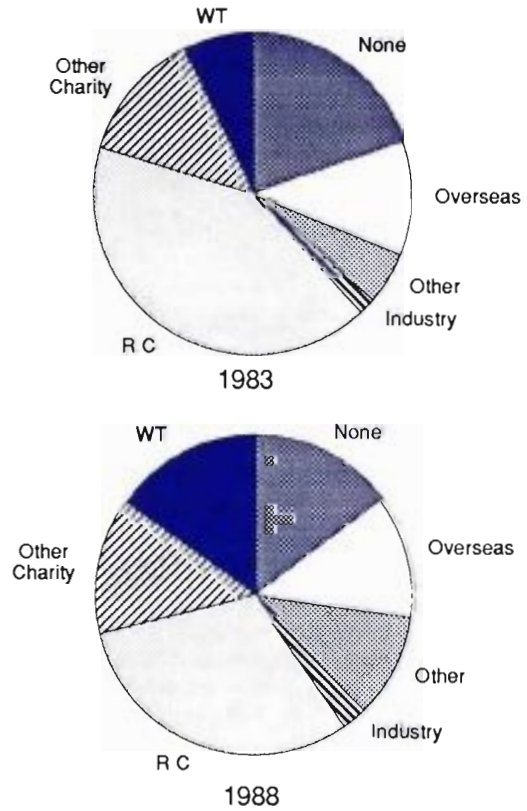

Fig 1 Funding sources acknowledged in UK publications in* The Journal of Physiology

* ie papers giving at least one UK address: see box opposite).

Total papers in all 12 journals:	
1983	4916
1988	5170
Total papers in Journal of Physiology:	
1983	482
1988	494
UK papers in Journal of Physiology:	
1983	156
1988	172

The overall findings from the entire database suggest that outputs from government-supported research are decreasing, at a time when outputs from other funding sources, notably the charitable sector, are increasing.

Foresight

As already mentioned, the need for priority setting in biomedical research funding is likely to exist regardless of available resources but becomes more acute as budgets are frozen or reduced. However, the process is complex and there are no well established procedures to address the issue in the biomedical research field.

Therefore PRISM is testing new analytical procedures for use in priority setting, which will generate visions of alternative futures for scientific fields. Such futures may be the setting up of a large specialised research institute, or targeting funds to particular disciplines, or concentrating on effective dissemination of results already obtained and ongoing work rather than new research projects.

The procedures involve combining a quantitative (bibliometric) analysis of the current state of research internationally, with a large-scale interactive survey of expert opinion, and a series of workshops in which alternative scenarios are explored. The focus for this programme is the cardiovascular research field and, in order to keep within this specification, methodologies have been developed to identify and delimit a chosen field. These methodologies will be applicable to other areas of biomedical research.

The programme is being carried out in collaboration with the Medical Research Council and the British Heart Foundation.

Funding styles

Styles of grant management may differ widely from one agency to another, from the initial approach and application through the award process and the subsequent progress of the work supported by the grant.

Some agencies prefer preliminary enquiries before full applications, others will not accept this; some give feedback at various stages of the decision making process, others do not. Only a few systematically monitor the progress of projects, though many encourage the dissemination of results.

Having sought the views of grant holders on the different approaches to research support, the aim is to improve understanding of "best practice" in grant-giving and grant management. For example, are there beneficial effects on the way research is carried out if the funding body develops a close relationship with the grant holder rather than when it keeps a distance?

Further work connected with this aim will address the relative effectiveness of project grants (typically three years duration) and longer term forms of support.

Policy services

In addition to its research programmes, PRISM is also developing a service role in certain areas. One of these is in science policy information, via the newsletter *SPIN*.

SPIN, or Science Policy Information News, is a weekly newsletter, produced in collaboration with the Information Service. It is designed to publicise policy issues concerned with biomedical research and began as an internal service to Trust staff. However, it is presently being distributed to a number of externally based researchers and interested parties for a trial period, so that the desirability of increasing the newsletter's circulation on a regular basis can be assessed.

STAFF OF PRISM

The Unit comprises six staff: five biomedical science policy staff, whose research backgrounds cover a wide range of scientific disciplines, and the Unit secretary, with a business studies background. The members of PRISM are:

Joe Anderson PhD, Head of Unit: Biologist with a research background in nutrition. Previously held research posts in science policy at the Ciba Foundation, Technical Change Centre and Thailand Development Research Institute. Interests include research evaluation, new approaches to foresight analysis and strategic management in science.

Sally Driscoll, Unit Secretary: BTEC General Diploma in Business Studies and qualified legal secretary.

Harriet Moxham Msc, Policy Analyst: Microbiologist with a research background in algology and mycology. Previously worked as a policy researcher at the Science and Engineering Policy Studies Unit at The Royal Society. Interests include R & D management information systems, research evaluation, funding, manpower and careers in biomedicine.

Lesley Rogers PhD, Policy Analyst: Biologist with a research background in immunology and biochemistry. Previously held a post-doctoral fellowship at the Walter and Eliza Hall Institute, Melbourne. Science policy interests include priority setting and quantitative techniques for assessing research outputs, manpower and funding.

Rose Trevelyan BA, Research Assistant: Social scientist and graduate of Social and Political Sciences, Cambridge University. Current work focuses on quantitative aspects of research evaluation and the application of social science techniques to science policy problems.

Nigel Williams PhD, Policy Analyst: Biologist with a research background in immunology. Formerly science editor of *The Guardian* newspaper. Interested in the development of techniques for foresight analysis, and science policy in government.

Harriet Moxham

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Chance & Design: Reminiscences of Science in Peace and War

by Alan Hodgkin

Two Reviews

This is Sir Alan Hodgkin's autobiography from his birth in 1914 until his retirement from the Mastership of Trinity College, Cambridge in 1984. It is his personal account of his life at school, as an undergraduate at Trinity College (1932-35), as a Research Fellow of Trinity College (1936-39), as a Rockefeller Fellow in New York (1937-38), in 1940-46 working on air-borne radar for the Air Ministry, after 1946 back in Cambridge as a Fellow of Trinity, Assistant Director of Research under Professor Adrian and later Fullerton Research Professor. He shared a Nobel Prize in 1968, was President of the Royal Society in 1970-75 and Master of Trinity College, Cambridge in 1978-84. Hodgkin's attractive accounts of these stages of his outstanding career include many references to his personal friends and scientific colleagues and comments on places such as the Marine Biological Station, Plymouth and Woods Hole, where some of his research was done.

Personal biographies, whether written by a friend or as autobiography, always include references to the subject's relationships with his family, friends and colleagues and this sometimes makes reading difficult. Confronted with the name of an individual, does the reader take the trouble to look in *Who's Who*? A physiologist, however, will find entertaining comments on other physiologists such as Barcroft, Adrian, Matthews, Rushton, Huxley, Katz and many others. Hodgkin seems uniquely able to make friends; one factor in his success has been that colleagues enjoyed working with him and he was a welcome visitor to American laboratories. The book also entertains by its account of domestic and academic life in Cambridge in the 1930s and in the years after the war.

A physiologist interested in the history of the subject will study chapters 6, 8, 10 and 11 in which Hodgkin describes the "chances" by which in 1933 he became interested in the physiology of cell membranes and the nature of the nerve impulse. By a further "chance" at this time, valve amplification and the cathode ray tube allowed the recording of small potential differences and a further "chance" was that Hodgkin had the skill to build his own apparatus – in those days electronic apparatus could not be bought off the shelf. Thus, in 1939, Hodgkin and Huxley recorded the potential difference between the inside and outside of the squid giant axon. They found that the resting potential difference of -50 mV changes to +50 Mv during the passage of a nerve impulse. The importance of this observation was obvious but there was time only for a brief note in *Nature* before both Hodgkin and Huxley were drawn away from neurophysiology to urgent war work.

Chapters 27 to 31 contain Hodgkin's account of his resumption of physiological research after 1945, starting from the Physiology Department at Cambridge of a Rockefeller Unit specialising in biophysics, led by Hodgkin with W Rushton, A Huxley, B Katz and R D Keynes amongst his colleagues. They were leaders in a new sort of physiology with terms such as "membrane conductance" and "voltage clamp" forming its language. The new physiology was on preparations from cold blooded animals and consisted of experiments designed to test theories. Its methods and outlook differed from those used by the older generation who were Hodgkin's undergraduate teachers; Barcroft, Adrian and Matthews had worked on mammals describing physiological processes in whole animals and not dealing much in theories. Fundamental changes in physiology were taking place, in which Hodgkin was a leader.

A central section entitled *Flight trials and tribulations* is Hodgkin's account of 1939-45 when he was working on air-borne radar in the Telecommunications Research Establishment of the Air Ministry. In addition to his own memories this is based on the log books of others who were involved in the experimental work and is an account of a little known piece of military history to which Hodgkin's scientific ability was important. In 1943 aircraft with radar proved an effective weapon against submarines.

The Nobel Prize in 1963, shared with Huxley and Eccles, was the climax of Hodgkin's experimental work and chapter 36, *Stockholm, 1963*, describes the award of the prize and the ceremonial occasion in Stockholm. A last chapter, *Postscript*, recounts work on vision which he continued in Cambridge alongside the onerous work as President of the Royal Society and the more pleasant duties as Master of Trinity College, Cambridge.

This book should be in the library of every department of physiology for its scientific value. It is also entertaining and above all makes Alan Hodgkin known to us.

William O'Connor

What makes a good scientist great? Certainly luck, planning, time and place all play some part, as this title implies. In this gloriously unassuming autobiography Alan Hodgkin describes his life and work, initiated during a period when scientific and world events were changing in ways difficult for many of us to imagine now.

As an undergraduate, Hodgkin became interested in cell membranes from reading such books as A V Hill's classic *Chemical Wave Transmission in Nerve*, and decided that the crucial evidence for an increase in membrane ionic conductance during the action potential was still lacking. His early experiments, although not entirely successful in this respect, gave results that could be explained by assuming that local electric currents can spread through a blocked region of nerve to increase excitability beyond the block, ie local circuit theory, which was still in dispute at that time. The existence of this effect allowed a neat way for Hodgkin to test that nerve impulses are propagated electrically by currents spreading passively ahead of the active region, by eddying outside the conducting axon. It is difficult, nowadays, to conceive of a time when the local circuit theory was not proven. A Trinity Fellowship followed, with a period spent at the Rockefeller Institute. During this time Erlanger, still sceptical about local circuit theory, suggested as a challenge to Hodgkin that if he could show that altering the electrical resistance of the fluid surrounding the nerve fibre altered the velocity at which it conducted impulses, then he (Erlanger) would take the idea seriously. This Hodgkin duly did with the single crab axon and, during a visit to Woods Hole, with the squid giant axon. At Woods Hole he had help from K S Cole and came away with the idea that it might not prove too difficult to record action potentials with an internal electrode from squid axons. The following summer in Plymouth he and Andrew Huxley succeeded in recording intracellular action potentials which, as we all know, turned out to be of the overshooting variety, described in a note to *Nature* entitled *Action potentials recorded from inside a nerve fibre*. It seems remarkable with hindsight to realise that, at this time (1939), it was not believed by some that the action potential arose at the surface membrane, or that during the nerve impulse the potential across the membrane reversed direction. As Hodgkin and Huxley demonstrated, it reversed by at least 40 mV rather than falling to zero as previously supposed from classical membrane theory.

This flow of ideas and experiments was interrupted in midstream for some eight years by the war effort and by bomb damage suffered by the Marine Biology Laboratories in Plymouth where the squid experiments were all done. It came as a surprise (to me, at least) to realise that such a substantial part of Hodgkin's most energetic years were spent in the war-time development of radar to the complete exclusion of any physiology (this forms one of the book's three sections, and in some detail). One wonders how changing fields at such short notice in this way might affect scientists today. Of course, many other scientists at that time were similarly seconded, and the story of radar development described in the book is peppered with many familiar names. This undoubtedly adds to the interest of this unexpectedly gripping topic. It also brings home just how *ad hoc* much of this important developmental work actually was. In places, the descriptions of lighter moments have shades of Ealing Comedy, which one feels may have been a more accurate description than one had realised. To convey something of this general feeling, in Chapter 16, entitled *Another Move*, Hodgkin describes how at the end of September 1940 the group he was associated with – the so-called centimetre work (referring to the wavelength of the radar) – and much of the rest of Telecommunications Research Establishment moved from its then location at Worth Matravers to an empty girls' school in the nearby village of Langton Matravers. He writes "It is characteristic of the period that A P Rowe later wrote that he could not remember why we moved ..... on finding that the electricity supply was completely inadequate [at the girls' school] we installed heavier fuses and drew ever-increasing loads until the walls became dangerously hot. This was appreciated by the mice which multiplied to a vast population and caused havoc by eating any notebooks that were left lying around." He goes on, "After our experience of the bitter cold of the previous winter, [Bernard] Lovell was rightly determined to be able to measure diagrams in reasonable comfort. He achieved this only by ordering enough Perspex to build a large greenhouse-like structure. By then we had mastered the business of filling in Air Ministry forms in pentuplicate and Lovell, who knew that it was as easy to order several thousand square feet of Perspex as a smaller quantity, built himself a fine crystal palace. Unfortunately this particular work was queried by headquarters and Lovell received a reprimand to which he very sensibly paid no attention." Despite these lighthearted touches there is a serious side and one can only marvel at the very great practical achievements, and sacrifices, in which personalities and ambitions came secondary to the main aims. Even so, from this account, life was very far from uneventful.

Starting Again, the third and final section of the book, re-enters terrain with a comfortably familiar feel – as far as the physiology is concerned. Most people have read the classical papers of Hodgkin, Huxley and Katz (from the 1950s) describing the current-clamp and voltage-clamp experiments on the ionic basis of the action potential in squid giant axons and the subsequent reconstruction on the electrical behaviour of nerve. Few will be aware of the various interactions, discussions and thoughts that gave rise to this famous landmark in neurophysiology (some flavour of this has come across previously, from a different angle, in K S Cole's book *Membranes, Ions and Impulses* and in an abbreviated form in some of Alan Hodgkin's earlier articles, such as *Chance and Design in Electrophysiology* that appeared in The Physiological Society's centenary book *The Pursuit of Nature*). In a way, one might expect to be less impressed by having the curtains lifted, but that was certainly not the case for me. It is equally illuminating to read about the background to the work with Keynes on radioactive tracers, with Caldwell *et al* on phosphate bond energy and active transport of Na^+ from axons, with Baker and Shaw on internal perfusion of axons, with Horowicz, Adrian, Chandler and Nakajima on single muscle fibres and, finally, the reason for the move to the retina in 1970.

Many scientific autobiographies seem to leave one wondering how the ideas got generated, if the significance of the work was realised at the time, whether it was fun to do, whether the author was buried in the lab for years on end to emerge only once the problem was cracked, and so on. Here you will find the answers to all these questions, and very much more besides, in this truly fascinating account.

Stuart Cull-Candy

Chance & Design is published by Cambridge University Press, price £40.

Sensory Computation Symposium

Newcastle, 1 April 1992

Here we report on the symposium on Sensory Computation which was held the day before the Newcastle Meeting of the Society, and was made possible by financial support from the Physiological Society and the Royal Society. Five presentations by invited speakers from France, the UK and the USA attracted a large and enthusiastic audience, many of whom stayed on to present Communications at the Meeting in the Designated Session on Neurobiology.

What is Sensory Computation?

We coined the term "Sensory Computation" to refer to a multidisciplinary research area whose goal is to understand how sensory systems function, in terms that can be translated into computational models. The themes it includes range from sensory physiology, where computation has always been very important, to neural computation, which is a fast growing discipline that uses computational approaches based on neural mechanisms to solve a wide range of problems. Accordingly, rather than trying to define the term "sensory computation" we will survey the main areas which were represented either in the symposium or in the Society Meeting that followed it. As we have hinted, this begins with sensory physiology and ends with neural computation.

Sensory Physiology

Sensory physiology provides the strand which linked together the five talks in the symposium. Traditionally physiologists think of this as the study of the physiology of the sense organs and the associated neural pathways, generally classified as "neurophysiology". However, although neurophysiology still forms a substantial fraction of modern sensory physiology, this picture of the discipline leaves out both the oldest and the most recent techniques in what is an interdisciplinary research area, involving, as did the symposium, "natives" of departments as disparate as Psychology and Electrical Engineering. The oldest technique in sensory physiology is psychophysics, often dismissed as "psychology", but which has provided us with much fundamental information about the function of the senses and continues to do so. The most recent technique is computational modelling, which provides us with new possibilities of integrating the knowledge derived from neurophysiology and psychophysics.

Neurophysiology

Traditionally this is based on extracellular recording and anatomy, which shows how information is coded, and how it may be partitioned between different sensory sub-areas and pathways. Substantial progress is still being made, as indicated by the award of a 1992 Rank Prize for Opto-electronics to Professors S Zeki FRS, J A Movshon, W T Newsome and E H Adelson for work in this area. Intracellular recording, which is still a relatively novel development for mammalian sensory systems, allows us to investigate the fundamental mechanisms of encoding and processing.

Extracellular recording from sensory neurones, first carried out by Adrian in the 1920s, allows us to study the output of each stage of neural processing, by monitoring the firing of action potentials. This shows how information is coded for transmission down sensory axons. For each neurone, the key to this code is given by the properties of the receptive field, which, by showing what sensory events make the neurone fire, define how that neurone codes information. The basic aim is to obtain a complete and succinct description of the receptive field properties of the neurones in a particular anatomical area. These will generally fall into a modest number of categories of similar types. Once this basic data is obtained, there are two further lines of enquiry.

The first of these is that of explaining the physiological basis of the receptive field properties. For example, it may be possible to explain the physiological observations by modelling the receptive field as a linear filter, with a multiplicative gain control. What are the mechanisms which determine the nature and the parameters of this filter? Early speculations about the ways in which inputs from different synapses interact can now be tested by analysing the microcircuitry and the biophysics of the underlying analog computations. Insight often comes from computer modelling of the interactions between the multiple ionic conductance mechanisms found in neurones.

The second line of enquiry is that of how the coding, as revealed by the study of receptive field properties relates to the basic tasks required of that sensory system. One obvious question is what type of representation of the external stimulus is formed and how complete is it. For example, some attributes of the stimulus may be ignored, or there may simply not be enough neurones to represent the available information in the way that we think it may be represented. Naturally, to follow this line of enquiry we need to combine anatomical work and computer modelling, and it may suggest further experiments in physiology or in psychophysics.

Psychophysics

Psychophysics is the systematic exploration of sensory performance. Physiologists often dismiss it as "subjective" and "psychological", but psychophysical observations can provide us with better (ie more reliable, less noisy) information than physical measurements. For example Stiles' two-colour increment threshold technique relies on subjects saying when they can just detect a flash of coloured light delivered to the centre of a large patch of coloured light. The spectral sensitivities of the cone mechanisms can be derived from the way in which the intensity required for subjects to report that they see the flash varies with the stimulus parameters. The quality and stability of these measurements of cone spectral sensitivity was unequalled by physical techniques such as retinal densitometry, and single cone microspectrophotometry, and has only recently been approached by the technique of single cone electrophysiology.

Psychophysics, then, has two main functions. First, it sets out what has to be explained by other techniques and gives their results some meaning. For example, neurophysiological information about receptive field properties of visual neurones, which describes how the cells respond to different patterns of light on the retinae, is completely meaningless without the information, provided by psychophysical observations, that the eye is the organ of sight. Furthermore, arguments about the likely roles of different types of neurone can only make sense if we know in some detail the sensitivity of the visual system under different conditions. Second, appropriate psychophysical experiments can suggest or test models of how the physiological mechanisms might be organised. An example of this which can never be quoted too often is that of colour vision, in which an ingenious interpretation of psychophysical observations allowed Young to propose his model of human colour vision, which waited more than a century for physiological confirmation.

In order to fulfil either of these functions of psychophysical investigation, we must relate the data it provides us on the performance of the whole sensory system to the physiological properties of the underlying neurones. Often we can get clues as to which neurones are most likely to be important at a particular

level by carrying out psychophysical experiments in a lesioned preparation. An example of this was provided in the symposium by Eric Young, who was led to focus on the role of the neurones of the dorsal cochlear nucleus in the localisation of broad-band sounds by the finding that lesions of this nucleus impair this ability in cats. In general, a psychophysical or neurophysiological result can only make sense (other than by extending the catalogue of known facts) if it is interpreted in terms of some model, however simple it might be, of the sensory system. This requires increasingly sophisticated models of sensory systems, a requirement which is most likely to be met by the burgeoning field of computational modelling.

Modelling

There are two very different approaches to the development of computational models of sensory systems. The first is a purely functional approach, in which any biological relevance is purely incidental. The second approach is to start from the biology and to try to develop a model of how the brain, or one of its subsystems, may work. Paradoxically, the devotees of this biological approach often manage to convince us of the functional superiority of their models.

Although the argument we have tried to develop here presents computational modelling as the bridge which links the islands of neurophysiology and psychophysics, it too has its "purists" for whom the goal is simply to develop a machine or a computer program which performs some sensory or perceptual task, such as pattern recognition or speech recognition, as effectively as possible, without any consideration of how a biological system might perform it. The goal of effectiveness is pursued to the exclusion of all biological considerations. The value of this approach is that it might reveal general principles which govern how sensory tasks may be performed, principles which would govern biological systems too. One well known example of this approach is the MIT Vision Machine, an artificial visual system founded on MIT's pioneering study of vision as an abstract information processing problem. The Vision Machine recognises objects in images recorded by a two-camera system by integrating the outputs of several modules each working to recover a distinct attribute of the visual world: colour, motion, depth, texture, and form. Each module is the result of a thorough computational analysis of the underlying problem, eg in stereo vision, the problem of finding corresponding points in binocular images for which to compute disparity. Another example comes from work on the analysis of visual motion, an area which, as we shall explore further below, has been exceptional for the cross-fertilisation between the different disciplines. Here the neurophysiological work for which Movshon, Newsome and Adelson received their Rank prize this year was the demonstration that neurones in the middle temporal area of the macaque visual cortex perform an inverse vector resolution operation, which was first shown to be necessary in a purely computational paper (Fennema & Thompson, 1979), in which the aim was simply to analyse the motion of different objects in a television clip. The nature of this vector resolution operation was subsequently explored in psychophysical experiments (Adelson & Movshon, 1982) before Movshon and his co-workers showed which receptive fields carry out the operation.

Not surprisingly, the emphasis in the symposium was more on computational models designed from and for biology. The goal of this second branch of computational neuroscience is to simulate the behaviour of the nervous system and by analysing these simulations, to understand its computational function. In other words, this approach starts with the solution implemented by the biological system, and attempts to reconstruct the computational problem it solves. Typical examples of biology-motivated computational models are the computer simulations of single cell spiking behaviour by Erdal *et al* (discussed by Gary Green in the Symposium) and the model of cortical microcircuitry proposed by Douglas *et al*. The inputs to these simulations are experimentally measured parameters characterising individual neurones, membrane time constants, ionic channel conductances and so forth – biological constraints. By building up networks of neurones so defined, one can simulate the behaviour of subsystems of the nervous system and thereby measure global activity that is normally inaccessible to the single cell recording techniques in a real animal. From these simulations, new general principles of neuronal behaviour may emerge which in turn may provide new insight into a "purely" computational problem. After all, biological sensory systems are the best existence proofs for solutions to the most perplexing computational problems.

Of course, there are overlaps between the computational approaches thus described. In the latter, although the models are derived from biology, they invariably rely on simplifications and suffer from the incompleteness of experimental data, and hence may be in some crucial way as biologically irrelevant as purely functional models.

Presentations at the Symposium

The multiple aspects of sensory computation were well represented in the symposium, beginning with Professor Tomaso Poggio of the Artificial Intelligence Laboratory at MIT, who showed how a mathematical theory of function approximation leads to ideas of how learning might occur in sensory systems. These ideas, which spring from a purely mathematical foundation, are already being explored in psychophysical experiments which show that very simple perceptual abilities, like vernier acuity, may actually be learned. Results from some of these experiments were presented at the Physiological Society Meeting by Dr Manfred Fahle of Tübingen.

Gary Green of the Newcastle Physiological Sciences department, explored how the input-output functions of sensory neurones can be described and modelled, and how relatively simple aspects of the input-output function might be used to explain psychophysical observations in hearing and vision. He was followed by Dr Horace Barlow of the Physiological Laboratory, Cambridge setting out "the fragments of a framework of a theory about the visual cortex", arguing that its function is to form a representation of "objects" which can then be used for associative learning.

Thus, in the first three talks we had the three main themes: computational theories leading to models of vision which were being tested psychophysically; descriptions of neuronal properties leading to explanations of physiological and psychophysical phenomena; and the search for a general model to unify a wide range of physiological observations. This left many of us feeling well satisfied, and perhaps ready for a brief nap to consolidate all this. However, we were delighted by an electrifying presentation from Dr Nicolas Franceschini of CNRS, Marseilles, who brought everything together in a single talk, starting with the analysis of single neurone selectivity to motion in the visual system of the fly and then proceeding to develop a visual control system, based on the fly's neurones, for a working mobile robot.

The afternoon session consisted of two talks exploring different aspects of the problems of sound localisation. First, Professor Chris Darwin of the Laboratory of Experimental Psychology at Sussex University discussed the problem that the auditory system faces in deciding which sounds belong together, having come from the same source, and which should be separated, because they come from different sources, and described a

number of psychophysical experiments which show how the different cues interact. The last talk of the day was from Dr Eric Young of the Department of Biomedical Engineering and Centre for Hearing Science at The Johns Hopkins University, who showed how the complex receptive field properties of single neurones in the cat dorsal cochlear nucleus would enable a cat to decode the complex cues to the azimuth and elevation of a sound source that are generated by the pinnae.

Andrew Derrington

Anya Hurlbert

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Who's doing what and where about the cochlea

A quick, unfair test of any physiology text book is to open it at the chapter on hearing and see how the hair cells are drawn. (Let me remind you that hair cells are the ear's sensory cells. They get their name from the collection of stereocilia or hairs on the cell's apical surface). Do the cells look on the skinny side? Do they look more like fly-whisks than real cells? Do they have only two stereocilia? Are there five rows of hair cells? Yes? Cross the book off the list! I do not exaggerate, these are all real examples. It reinforces a widely held conviction that the cochlea does not repay the effort of explanation. I shall try to describe a few of the current issues in hearing and who is doing what and where (but not how). "Hearing" is going to mean peripheral hearing as opposed to the central pathways described by Debbie Withington in the March issue of the Newsletter.

Recent research in hearing

First, a short refresher course: the cochlea sets the threshold behaviour of the auditory system when detecting low levels of sound and when separating out frequency components. It can operate at extremely low energy levels, detecting phonons with comparable energy to the single photons detectable by the eye. How it does that, despite what the text books say, is not understood fully.

The easiest way to think of the mammalian cochlea is as a coiled tube, divided into two main regions lengthwise by a collagen-fibre meshwork, the basilar membrane. In fact, the cochlea coiling is an irrelevance: it is only there to ensure that 34 mm of basilar membrane can be packed neatly into each temporal bone. Distributed along the basilar membrane and detecting its motion are about 15,000 hair cells. Hair cells are neuro-epithelial cells, with an apical surface bearing about 100 stereocilia organised into a specialised mechanosensitive structure.

Each octave of the frequency range is analysed by about 400 inner hair cells and 1500 outer hair cells. This pattern is remarkably constant within mammals and means that mammalian cochleas do not vary much in size between mouse and elephant. However, in lower vertebrates, frog, turtle and chick, from which most biophysical information about transduction is derived, a wide variety of structures have evolved for hearing.

The main, recent step forward in mammalian hearing has been the clear experimental demonstration that sound is amplified in the cochlea. This means that the basilar membrane motion is dramatically different between living and dead preparations. Although recognised as a possibility in the late 1940s by Tommy Gold (before he gave up physiology for cosmology), the experimental data was then hard to come by. The technical problem was – and remains – that the cochlea, buried in the temporal bone, is quite inaccessible; that the movements of the structures are measured in nanometres; and finally, but not least, that the cochlea is easily damaged during experimental manipulations.

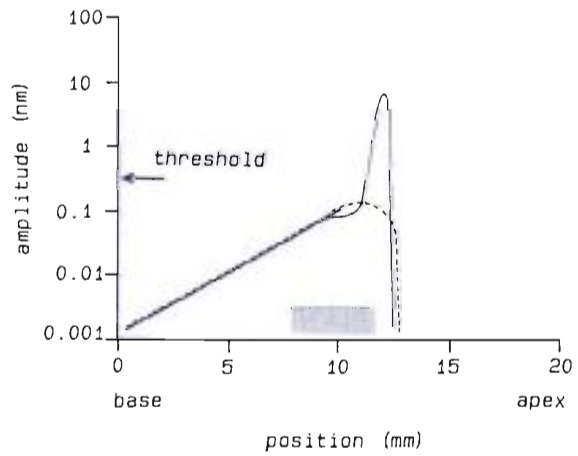

Fig 1 The peak disturbance of the basilar membrane (schematic) in the cochlea when sound enters at the basal end. The dashed line shows the envelope for a passively propagated sound wave. The solid line shows the effects of switching in the outer hair cells (region showed stippled). This peak amplification is observed in more recent measurements.

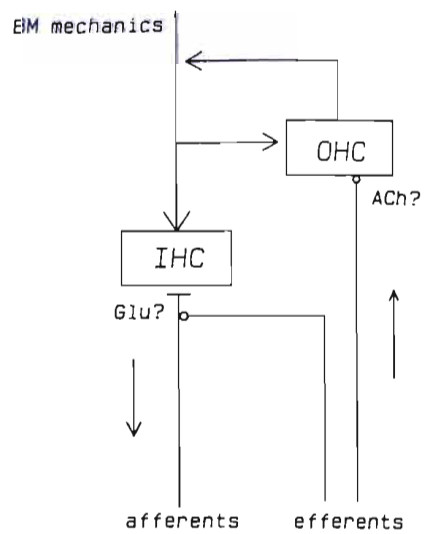

Fig 2 Summary of the interaction between inner (IHC) and outer hair cells (OHC) in each cochlear section. This section repeats itself 3000 times along the cochlea. IHCs synapse directly with the auditory nerve; OHCs are involved in a tight feedback loop which modifies the mechanics of the basilar membrane.

With the development of laser velocimeters over the past five years, there is a growing body of data which shows that the cochlea behaves like a mechanical amplifier, boosting the motion of the basilar membrane by about 40 dB, ie 100 times (see Figs 1 and 2). How that occurs and what structures are responsible are questions which remain at the forefront of cochlear physiology.

Hearing research in the UK

Research into hearing is well represented in the UK, but at a level of support dwarfed by the scale in the US. There are several important groups working on peripheral auditory mechanisms and the international impact of this work over the past 15 years has been considerable. The MRC has traditionally supported hearing and the MRC Institute of Hearing Research (IHR) was set up on the Nottingham University campus in 1981. A "special interest" charity, the Hearing Research Trust, located in Gray's Inn Road in London, was formed six years ago to assist both clinical and basic research and is starting to provide support on a modest scale.

The work on the cochlea ranges from molecular and cellular physiology through to psychophysical measurements and clinical applications. Critical pioneering work to measure tuning in the auditory nerve fibres was carried out at the University of Keele by Ted Evans. There is now a large group there which combines interests ranging from electron microscopy of hair cells through to behavioural measures of auditory function using animal models. Apart from the IHR and Keele, other basic hearing research is spread around university departments, but not necessarily in Physiology departments.

Molecular biology of hearing

This must be a growth area for the future. The first meeting specifically devoted to molecular studies in hearing took place in San Diego in May 1992. There is considerable interest in the genetics of deafness and there are beginnings of centres associated with Karen Steele at IHR , St Mary's in London and at Sussex University associated with Guy Richardson. Over the next few years it looks as though it may be possible to isolate specific genes associated with hearing deficits and to identify the expression of proteins specific to the cochlea.

Cellular biology of hearing

The ear has always been an area where there has been no shortage of elegant ultrastructural studies. The structures of the organ of Corti are very elaborate, almost designed for the electron microscope, and it is an ideal place where immunology meets electron microscopy.

In Bristol, Matthew Holley and I showed that there is highly specialised cytoskeleton, resembling a spring, associated with the outer hair cells. In Keele, Dave Furness and Carol Hackney have been studying the structure of microtubules and morphology of stereocilia of hair cells in the mammalian cochlea and in recent work have focused on identifying the transducer channel. In London there are active groups at Guy's (Laurie Bannister and Hilary Dodson) and at the Institute of Otolaryngology (Andrew Forge) concerned with cochlear structure.

Cellular physiology of hearing

Most of what we know about the biophysics of hair cells is based upon lower vertebrate physiology. This has stemmed in large part on the work of Jim Hudspeth and David Corey and co-workers in the US who together over the past 15 years have shown that transduction is associated with a deflection of the stereocilial hair bundle, that the channels are probably associated with the tips of the bundle and that open and closed gating of these channels may occur by tensioning a specialised linkage at the hair bundle tip. The gating is too fast to involve any biochemical cascade. This link is a fine extracellular protein, and was first pointed out (announced, in fact, at a Physiological Society Communication in 1983) by Jim Pickles, Spyro Comis and Mike Osborne from Birmingham. It is one of those features which, once seen, is reported retrospectively in all earlier electron micrographs as well.

The work at Cambridge performed by Andrew Crawford and Robert Fettiplace (who has now moved to the US) has provided some of the most elegant recent information about hair cell transduction. Together with Mike Evans they recorded single transducer channels in the turtle by exposing the cells to low calcium solutions. This probably chopped the tip links so that only a few channels are left to be gated in whole cell. No-one has yet managed to record single mechano-electric transduction channels from one stereocilium: once patched, how could a channel be opened? The nature of the transducer channel and its coupling currently remains one of the main unanswered questions in the cellular physiology of hair cells.

Slightly over ten years ago, Peter Sellick and Ian Russell managed with great difficulty to record receptor potentials from inner hair cells *in vivo*. They provided the first consistent evidence that, in the mammalian cochlea, inner hair cells act as sensors of a controlled basilar membrane motion. Over the past two years, Corne Kros, Alfons Rusch and Ian Russell at Sussex have developed a cultured mouse cochlea preparation to investigate whether the mammalian hair cells have similar biophysics to the lower vertebrate hair cells. So far the answer seems to be a qualified "yes".

In the mammalian cochlea, technical recording problems are implicit in the physiology. At the high frequencies (consider the frequencies used by echo-locating bats, for example), cellular structures are presumably able to operate cyclically at rates too fast for ion channel gating to occur. Or perhaps not. Investigating such rapid motion, with signals above 10 kHz, immediately runs into the limited bandwidth of conventional physiological recording systems.

At Bristol we have been interested in the other population of mammalian hair cells, the outer hair cells. First described in 1985, a mechanism within these cells allows them to develop forces at high frequencies. Our work suggests that they have a specialised motor, a molecule associated with the membrane, which might allow the cells to form part of the mechanical amplification system within the cochlea (eg Fig 2). The motor molecule has to be identified and it has to be shown convincingly that these forces are used in the cochlea. Despite that, and to keep cell physiologists occupied, hair cells have synaptic physiology as well! Gary Housley and I have investigated the synaptic mechanisms in the neural pathways which might control the forces in outer hair cells, a synapse associated with the centrifugal efferent system. So far this control system, a cholinergic pathway, is known to involve an interesting receptor type, classifiable neither as nicotinic nor muscarinic.

Otoacoustic emissions

One of the more surprising properties of the ear is that sounds come out of them. Otoacoustic emissions were first measured by David Kemp in London at the end of the 1970s. Although predicted by Gold, following from thinking about the ear as an active device, it took developments in low noise electronics to show that it really did occur. Otoacoustic emissions can be produced by delivering a click into the ear, and then waiting for the return echo. Spontaneous emissions can also be measured in some individuals without any stimulus at all, but may be present at low levels in all ears. The frequencies in these emissions are very stable over years. One family in Southampton emit at levels of up to 60 dB SPL. They have been studied systematically since the early 1970s, but the emissions have remained surprisingly constant. Fortunately for them, they are not disturbed by their own sounds as they have hearing loss at those frequencies. How these emissions come about is unknown.

This highlights a particular problem with the cochlea: there is no good model which explains all of its features and certainly not otoacoustic emissions. Indeed, there are no completely adequate models of cochlear function which integrate all the new physiological data. Emissions are believed to be somehow associated with the outer hair cells. But how? This is an area where good mathematical models of the cochlea need to be formulated.

Psychophysics of hearing

As with the other special senses, there has historically been a close interaction between psycho-acousticians and physiologists. Before the full emergence of cellular work in hearing ten years ago, electrical engineers were the first to colonise the cochlea and developed many of the recording techniques and paradigms to test hearing ability. (A sound stimulus was – and is – hard to generate accurately and the physiology poses particularly severe real time computing requirements.)

In Cambridge, the MRC Applied Psychology Unit has been studying computer models of sound and speech processing in the cochlea. There is an active department of Experimental Psychology at Sussex with a considerable involvement in hearing and an active psychophysics group at Nottingham. There are clear links in all of this work with clinical programmes to evaluate cochlear implants. One such group involved in cochlear implants is at UCL in the Speech and Phonetics Department.

It became quite clear nearly 20 years ago that individual auditory nerve fibres behave like highly selective filters, selecting out frequencies presented to the ear. It remains critical to characterise the performance of the whole cochlea, not just when analysing pure tones, but when dealing with complex sounds when all 3000 fibres are activated.

I have not mentioned what happens at the next synapse beyond the auditory nerve, at the cochlear nucleus and the superior olive. It should be left for another article. The response patterns of individual neurones beyond the second auditory synapse are diverse and suggest that this is an area which seems set to be the focus of considerable research effort over the next few years, providing systems for those interested in neural connectivity and pharmacology.

What is the Big Problem in hearing? The snappy answer is: how to put the cellular information back together to build a working cochlea. There are some obvious questions which are amenable to current techniques, however, and amongst those must be: what is the molecular structure of the hair cell transducer molecule? How do the cells interact to produce cochlear amplification? And perhaps most importantly when thinking about ways in which this basic research can be applied: can we make hair cells regrow?

I hardly need indicate the importance of that question. There are some clear pointers that the molecular biology of the cochlea is starting up in earnest. This year the first meeting devoted specifically to the molecular biology of hearing, homeobox genes and all, is taking place. If it does turn out to be possible to slow or reverse the onset of deafness then that would be a great step forward. It is known that in the chick hair cells do regrow after being damaged by loud sounds. There is some evidence from the group at Keele that a (very qualified) repair may occur in the mammalian cochlea.

This is a problem which affects everyone. Hair cell number seems to be fixed at birth. As far as we know this population seems to be relatively static and cells progressively die off with age. Damage to a small fraction, perhaps no more than 10%, may seriously compromise the ability to understand speech, and we are losing cells (even without a visit to the local disco) at a rate of around 1 cell every two weeks.

I leave it to you to think about how much of a hair cell you may have lost while reading this piece.

Jonathan Ashmore

Further reading

Any good text book, such as Pickles, J O (1988) *An Introduction to the Physiology of Hearing*, 2nd ed. Academic Press, London (1988).

Ashmore, J F (1991) The electrophysiology of hair cells. *Ann Rev Physiol* **53** 465-476.

Dallos, P & Corey, M E (1991) The role of outer hair cells in cochlear tuning. *Current Opinions in Neurobiology* **1**, 215-220.

Events organised or sponsored by The Physiological Society

Special Interest Groups - Designated sessions at the Cambridge Meeting

Placental & Perinatal Physiology Group

The Placental & Perinatal Special Interest Group goes from strength to strength. At the Cambridge Meeting we have a session extending over a day and a half and including some 30 communications. The highlight of the session will be the Plenary Lecture by Peter Nathanielsz, Professor of Reproductive Biology & Medicine and Director of the Laboratory for Pregnancy & Newborn Research at Cornell University. He will talk on "The fetal role in the initiation of parturition: neural and molecular messages". Peter Nathanielsz is well known for his work on fetal endocrinology, particularly the control of uterine activity and the determinants of preterm labour. His most recent work concerns the effect of destruction of the fetal paraventricular nuclei on the initiation of parturition. That the fetal pituitary is important for initiating birth in the sheep has been known for many years, but the process by which the signal to it occurs is not known. The exciting new findings of Professor Nathanielsz and his group, published last year, caused a stir in scientific and, indeed, lay circles.

It is good to see that once again the Placental & Perinatal SIG session contains several papers from other European countries. This emphasises the need for such SIG meetings and we expect this to be a continuing trend. Plans for meetings in 1993 and further ahead will be discussed at the Business Meeting to which all are invited.

The subjects of communications at this meeting range from studies of placental exchange mechanisms to investigation of human fetal behaviour *in utero*. One of the strengths of our group lies in this diversity, as we are concerned with integrative aspects of physiology. The increasing interest in this area may thus perhaps represent a return to an integrative approach after a period when it was unfashionable. We therefore welcome attendance from those working on ion channels!

Mark Hanson

Somatosensory & Motor Physiology Group

The Group will be having a Designated Session at the Cambridge Meeting and this should prove to be a lively and interesting session. I hope as many members as possible will be coming to the Session.

During the session (which runs from 9.00 am to 3.45 pm on Thursday 24 September in Lecture Theatre 4), there will be a short 15 minute Business Meeting, to elect an organiser and to discuss, among other things, future meetings and the possibility of having a Group Research Symposium during 1993. Let me know if there are any other items you would like discussed – tel (0223) 333761, fax (0223) 333786.

Roger Lemon

Smooth Muscle Group – Plenary Lecture by Professor J Mironneau

It is a great pleasure to have Jean Mironneau as a guest lecturer at the Cambridge Meeting of the Society. Although invited by the Smooth Muscle Special Interest Group, I'm sure his lecture, entitled "Ion channels and the control of smooth muscle contractility", will be of interest to many Members and guests attending the Meeting.

Jean Mironneau is from the Laboratoire de Physiologie Cellulaire & Pharmacologie Moleculaire, URA CNRS in Bordeaux. He is renowned as a smooth muscle electrophysiologist – an area not for the faint-hearted! Using the double sucrose gap method in voltage-clamped uterine smooth muscle, he has made a major contribution to our knowledge of the nature of the ionic currents underlying excitation. More recently, working with single cells and whole-cell recordings, his laboratory has investigated the electrophysiological properties of the calcium current in the myometrium. He has also been active in studying the nature of the intracellular calcium store in smooth muscle. In the pregnant rat uterus he has shown that there is probably no caffeine-sensitive calcium release store in the sarcoplasmic reticulum – a result which may surprise those studying SR calcium release in other cell types! Working with vascular smooth muscle cells, his group has been examining the control of calcium influx following receptor occupancy and the relation between the amount of calcium in the SR store and calcium influx. In a communication to the Society at the Cambridge Meeting (Pacaud *et al*), results will be presented which suggest that depletion of the intracellular calcium store, in the absence of agonist, induces a calcium influx.

Susan Wray

Fluorescence techniques in Cell Physiology

A Physiological Society Symposium and Workshop

A Physiological Society Workshop and Symposium on Fluorescence Techniques in Cell Physiology will be held on 28 and 29 September at the Royal Free Hospital School of Medicine, London NW3.

The meeting will consist of a series of review lectures by experts in the field together with some live demonstrations. In addition, there will be the opportunity for some "hands-on" practical sessions for those that wish to try their hands at this exciting new technique. The format of the meeting has been chosen to offer a large measure of both practical and theoretical training. While the meeting is open to all, young physiologists who are working or are intending to work in the field are especially welcome.

The provisional programme includes: single cell fluorescent microscopy (D A Eisner, Liverpool); pH measurements with dual emission dyes (R D Vaughan-Jones, Oxford); bioluminescent monitoring of intracellular calcium and cytoplasmic ATP in single mammalian cells (P Cobbold, Liverpool); studies using interactions between Fura-2 and divalent

cations other than Ca^{2+}(R Jacob, London); imaging of intracellular calcium concentration (S Bolsover, London); calcium imaging using the confocal microscope (P A McNaughton, London); simultaneous calcium and pH measurements in muscle (C C Ashley, Oxford); fluorimetric methods to monitor changes in mitochondrial function within single cells (M Duchen, London); the measurement of changes in NADH and mitochondrial membrane potential in cardiac myocytes (R A Chapman, Bristol); as well as demonstrations and practical sessions on both days.

Some limited low-cost student accommodation is available on a first come, first served basis. A list of local hotels is also available. There is no registration fee but those wishing to attend are asked to contact Dr C D Richards, Dept of Physiology, Royal Free Hospital School of Medicine, London NW3 2PF, tel (071) 794 0500 ext 4315, fax (071) 433 1921.

Chris Richards

Physiological Society symposium for final year BSc students

University of Leeds, Friday 11 December 1992

This one day symposium will consist of a series of brief review lectures covering aspects of cellular physiology (lectures from Bernard Rossier, Gerhard Giebisch and Roger Thomas), integrative physiology (Charles Michel and John Widdicombe) and neuroscience (Pat Wall and Richard Morris). The lectures will be of interest to physiology, pharmacology and neuroscience students. Each lecture will last for 25 minutes and be followed by 10 minutes for questions. The aim is to give students an opportunity to hear review lectures covering aspects of physiology given by leading academics from a range of other institutions and to allow students from different universities to meet their peers.Full details of the symposium will appear in the next Magazine but anyone wishing to obtain further information should contact Kwabena Appenteng (University of Leeds).

Physiological limitations to human high intensity exercise

A Physiological Society Teaching Symposium

With so much attention focused on the athletic prowess at the Barcelona Olympics, it is appropriate to have a meeting devoted to the physiological factors which limit human physical performance.

A great deal is known about individual physiological systems such as the lungs, heart and skeletal muscle but it is often difficult to extrapolate from experimental situations to whole body exercise, especially exercise pushed to the limits of performance. In the past there has been a tendency to see the systems as working independently and for one to be the weak link which limits exercise capacity. However, in recent years there has been a greater awareness of the complexity of whole body exercise, especially of the control processes linking ventilation and cardiac output to the demands of muscular exercise.

In this Teaching Symposium, a number of specialists from various fields of exercise physiology will be brought together to review current ideas in their own specialities and also to discuss the implications for high intensity human performance. Topics to be covered will include: skeletal muscle function (A J Sargeant, Amsterdam); metabolic strategies in skeletal muscle (D L Turner, London and M Nevill, Loughborough); muscle fatigue (D A Jones, London); muscle aerobic capacity and capillarity (H Hoppeler, Bern); cardiovascular function and oxygen delivery (J Bangsbo, Copenhagen); lung function in athletes (B J Whipp, London); and, finally, an overview of the factors limiting performance (B Saltin, Stockholm).

The symposium is open (and free) to all Physiological Society Members. Non-Members who are interested in attending should contact Dr D L Turner or Dr D A Jones, Dept of Physiology, University College London, Gower Street, London WC1E 6BT, tel (071) 387 7050 ext 3218, fax (071) 383 7005. Full details of this symposium will appear in the Programme for the Queen Mary & Westfield College Meeting.

IUPS Congress, Glasgow, 1-6 August 1993

A personal address from the Chairman of the Organising Committee

As Chairman of the Organising Committee for the IUPS Congress at Glasgow next year I should like to share with my colleagues in The Physiological Society some of the excitement with which the plans for the meeting have been received all over the world. Wherever I have been, whether in East Asia, the Americas, Europe or elsewhere, the response has been enthusiastic, particularly to our plans to incorporate the former satellites into the Congress itself and our intention to respond to the intellectual challenge of Physiology today in the form of a special Congress book.

In this article I would like to give you some background history of the IUPS Congress which has been prepared by David Whitteridge (who chaired the preliminary Organising Committee that prepared our successful bid for the Congress at the Vancouver Assembly in 1986 and who wrote the history for the Centenary Congress in Helsinki in 1989) before explaining the aims and organisation of the 1993 Congress.

History of the UK Involvement in the IUPS Congresses

There were International Medical Congresses from 1867, but their physiological sections were unsatisfactory and in 1887 the Committee of the Physiological Society, then eleven years old, canvassed the desirability of starting a congress of physiologists and, after enthusiastic replies, the first Congress was held in Basel in 1889. The prime movers in England were Sir Michael Foster and W H Gaskell, both of Cambridge. Sir Michael Foster's influence resulted in informality of scientific meetings and the absence of grand dinners and receptions. At the third Congress he was made Perpetual Honorary President, a unique distinction which he held till his death in 1907.

From the beginning, each major language had its own secretary. C S Sherrington became Secretary for the English language in 1892, and continued until 1907.

The Fourth Congress was held in Cambridge in 1898 and was remarkable for the first appearance of printed abstracts of communications. Previously it had been agreed that congresses should not compete with established journals and that no record should be published. By superhuman efforts of the local secretaries and the University Press, abstracts were collected, printed and corrected through the night, and were available next morning.

The next Meeting in the UK was 25 years later, held in Edinburgh in 1923. This was the first officially recognised meeting since the 1914-18 war, since only physiologists from ex-allied countries were invited to the Paris meeting in 1920. Sharpey-Schafer made it very clear that Germans and Austrians would be invited, whether others liked it or not, and it was a very successful Meeting. The discovery of insulin was described by Macleod and by Banting; Richards and Wearn described the cannulation of Bowman's capsule in the frog kidney; Erlanger and Gasser showed action potentials recorded with a CRO; and Krogh, Roughton, Wiggers, Barcroft and Magnus also spoke.

The next Meeting in the UK was 25 years later and oddly was also held in the aftermath of a world war. At Oxford in 1947 living conditions were austere and travel difficult, but a thousand members gathered for a meeting still without set lectures and based on communications and demonstrations. Hodgkin and Huxley made an unscripted announcement of their discovery of the movements of sodium and potassium ions during the nerve impulse, a rare instance of the first announcement of an important discovery at a Congress.

E D Adrian steered the legislation which set up IUPS past the scrutiny of the International Council of Scientific Unions in 1952, at a time when he was Foreign Secretary of the Physiological Society and a Member of the Permanent Committee which had run the Congresses since 1935.

In 1979 an initiative from the Physiological Society Committee led to the setting up of the Pappenheimer Committee whose report produced an international programme committee, with emphasis on posters and general modernisation of the organisation of congresses.

The Physiological Society can take credit for "ringing the bell which called the wits together" for the first Congress and for useful innovation and constructive criticism during the first hundred years. It is therefore highly appropriate that we should be given the challenge of opening the second hundred.

Physiology and the Future

It is a major challenge, for the end of the 20th century sees physiological science benefiting from an unprecedented wealth of information at the cellular and molecular levels. The "black boxes" discovered by cell biophysics (ion conductances, pumps, carriers) have been opened up by molecular biological techniques, while intracellular events are probed in great detail by fluorescent and other indicators. The great intellectual challenge now is to start to re-integrate this information into an understanding of whole tissues, organs and organisms.

"The progressive triumph of physiology over molecular biology" is how Sir James Black (Nobel laureate, 1988) recently envisaged the prospect for the forthcoming decades. This characteristically provocative remark was not, of course, meant to distance physiology from the use of molecular biology. On the contrary, we need its wealth of techniques and information. Sir James (who with his fellow British Nobel laureates, Sir Bernard Katz, Sir Alan Hodgkin, Sir Andrew Huxley and Sir John Vane, will be Honorary Presidents of the Congress) meant rather to remind us that the integration of this information into an understanding of whole tissues, whole organs and whole organisms is essential. Without that integration, the molecular information could become a confusing cataloguing of structure and mechanism.

Integrative physiology will, therefore, return to the forefront of the scientific agenda since organisation and integration are at least as important as mechanisms, if not more so. This is a fact that our East Asian colleagues are continually reminded of. Those who use Chinese characters in their written languages actually use three characters for our single word "physiology". The translation of the three characters in their Chinese sequence is "Life-logic-study". We have used this as our inspiration for the title of the Congress Book *The Logic of Life*, which will be distributed as part of the registration package.

In the 1993 Congress we intend to address these issues at all levels from the genetic code right through to human cognition. Glasgow 1993 will therefore be a date with the future of physiology.

It will also be an occasion at which the eyes of the world will be on the state of physiology in the United Kingdom. Like the Centenary meeting in 1976, the occasion will be of great importance to the way in which British Physiology is perceived by the rest of the world. It goes without saying, therefore, that this requires a large attendance by the Members of our Society.

Integrating the Satellites into the Congress

We are seeking to reflect these ideas both in the organisation of the Congress itself and in the intellectual challenge we hope it will deliver. Integration will be embedded deep into the organisation since we are inviting those who might otherwise have organised innumerable separate satellite symposia on ever smaller areas of the subject to bring their skills and eminence instead to bear on organising the Congress symposia themselves. Imagine 100 satellites becoming the Congress itself and you have a fair idea of what we are planning. Quite apart from the intellectual challenge of bringing the subject together, the practical advantages are immense, particularly for physiologists from poorer countries and for those who find it difficult to arrange travel to several different – and often very distant – locations. In the past, people found to their disappointment that the Congress itself was no longer where the action was, but the 1993 Congress will be different. A single registration at Glasgow will give the right to attend any selection of symposia you wish. This arrangement also enables us to allow individual areas to overlap with common symposia within their own overall themes.

No-one, of course, doubts the value of the old-style satellite with its secluded location and the chance to show off the organisers' home base. But we now have plenty of such smaller specialist meetings, occurring at increasing frequency. The Congress, if it is to serve any purpose at all, must be different. And Glasgow 1993 will be.

The Symposia

From over 300 suggestions received from all over the world, the International Programme Committee has identified the topics and organisers of around 90 Symposia. These Symposia constitute one major part of the scientific programme. The Symposia are linked into 25 parallel themes with some Symposia common to more than one theme. Individual Symposia vary in length from half a day to five days and the speakers and content of each

Symposium have been determined by the Symposium Organisers as in small specialist meetings. There will be a small number of Informal Symposia or Workshops which will be based on abstracts submitted as Posters and it is hoped that they will incorporate the most recent material. A small number have already been identified and these have been listed in the Final Announcement.

Whilst most of the Congress will consist of Symposia, Posters and a small number of Workshops concerned with special aspects of physiological science, each morning session will begin with a Plenary Lecture given by a distinguished international biological scientist.

Posters

The Posters will form a central feature of the Congress, in much the same way as they are featured at meetings like American Neuroscience. The prime space on the Conference Centre site will be allocated to the Posters (the display area of each poster consisting of two boards, each 1 metre wide and 1.1 metres high at an internal angle of 140 degrees), with ample facilities nearby for informal discussion (whiteboards, discussion tables, coffee etc). Some Posters will also be incorporated into the Programme of Symposia. We have asked everyone who submits a Poster to say to which Symposium their Poster is relevant. In addition to the Symposia you will find listed in the Final Announcement, we also intend to organise some more Informal Symposia or Workshops once the Poster abstracts have been received. These Informal Symposia or Workshops will attempt to highlight some of the growing points which no Programme Committee can fully anticipate. Poster discussion sessions have been incorporated into some previous Congresses but this is the first time that whole symposia will be planned after the Poster abstracts have been received. If you want your field to feature, it is in your interests to submit a Poster, even if you do not think that it falls strictly within the field of an advertised Symposium. For the first time, therefore, the Posters will in part determine the Symposia Programme.

The Exhibition

There will be a Trade Exhibition at the SECC situated close to the Poster and Coffee areas which will feature the makers and distributors of "State of the Art" apparatus, software, books etc, and we are also hoping to attract some local companies.

The Venue

The Congress is being staged at two major sites, less than one mile apart, within the City of Glasgow: the Scottish Exhibition and Conference Centre (SECC) and adjacent Moat House International Hotel and the University of Glasgow. A regular bus service between the two sites will be provided free of charge. The Scientific Programme will start on the morning of Sunday 1 August and the Opening Ceremony will take place that evening at the SECC. The Dinner-Gala evening will be held in the magnificent surroundings of the Bute Hall at Glasgow University on Thursday 5 August. There will be a wide variety of tours available and social events each evening to suit all tastes. Glasgow offers a wide range of accommodation from the cheaper halls of residence to the more expensive five star hotels, most being within two miles of the venue itself and all linked by an extensive and frequent public transport network. For those who wish to explore, Glasgow offers art galleries, public parks and gardens, theatres, cinemas, shops, many restaurants and, of course, a wealth of hostelries.

Organising the Event

As you can well imagine, the organisation of an event on this massive scale requires the co-operation of a very large number of people. These include the various committees (both directly concerned with organisation and those such as the Physiological Society Committee and IUPS Council and Executive), symposium organisers, secretaries of worldwide physiological and related societies, the Conference Organisers, the University of Glasgow and various advisers. The Congress will therefore be the result of co-ordinating the work of about 500 people and I would like to take this opportunity to thank them all for their continued support, without which the Congress could not proceed.

For many reasons, therefore, this will therefore be a unique event, both for world physiology and for the UK. DON'T MISS IT.

I and my fellow organisers look forward to welcoming you all on 1 August 1993. In the meantime, any queries, comments or suggestions should be sent to Su Walton, IUPS Office, Room F43, The Hicks Building, University of Sheffield, Hounsfield Road, Sheffield S3 7RG, tel/fax (0742) 758688.

Denis Noble

Notices

Editor's Note

From this issue onwards, no Notice will be carried for more than three successive editions and Notices will be starred so that readers will be able to see at a glance whether this is the first (one star) or final (three stars) appearance of the Notice.

A Workshop on

MICROELECTRODE TECHNIQUES FOR CELL PHYSIOLOGY

9-23 September 1992

Marine Biological Laboratories, Plymouth

Further information from: David Ogden, Division of Neurophysiology & Neuropharmacology, National Institute for Medical Research, The Ridgeway, Mill Hill, London NW7 1AA, tel (081) 959 3666. ★★★

XXV NATIONAL CONGRESS

of the Spanish Society of Physiological Sciences

13-17 September 1992

Cordoba, Spain

Further information from: Dolores Vaticon, Facultad de Medicina, Ciudad Universitaria, 28040, Madrid, Spain. ★★★

Joint Meeting of the Italian Societies of Physiology, Nutrition and Experimental Biology

23-26 September 1992

Rome, Italy

Further information from: Professor A Fidanza, Istituto Fisiologia Generale, Universita "La Sapienza", Piazza A Moro 5, 00185 Roma, Italy, or Professor C Di Benedetta, Secretary General, Societa Italiana di Fisiologia, Istituto Policattedra di Fisiologia Umana, Piazza G Cesare (Policlinico), 70124 Bari, Italy, fax (80) 278416. ★★★

FLUORESCENCE TECHNIQUES IN BIOLOGY

26-29 September 1992

Royal Free Hospital School of Medicine, Rowland Hill Street, London

A two-day workshop and symposium. Invited speakers include C C Ashley, S Bolsover, R A Chapman, P Cobbold, M Duchen, D A Eisner, R Jacob, P A McNaughton and R D Vaughan-Jones. Further information from: Dr C D Richards, Dept of Physiology, Royal Free Hospital School of Medicine, tel (071) 794 0500, or Dr J I Gillespie, Dept of Physiological Sciences, The Medical School, Newcastle upon Tyne NE2 4HH, tel (091) 222 6988. ★★★

See also the Events section of this Magazine.

Institute of Biology

ETHICAL ISSUES IN BIOMEDICAL SCIENCES – ANIMALS IN RESEARCH & EDUCATION

28 October 1992

This one day symposium aims to present the choices that are available with respect to the use of animals in research and education. Further information from: the Symposium Organiser, Institute of Biology, 20 Queensberry Place, London SW7 2DZ, tel (071) 581 8333. ★★★

FRONTIERS IN CELLULAR AND MOLECULAR PHYSIOLOGY

29 October 1992

Physiological Laboratory, Liverpool

Full programme obtainable from: Mrs B Fairfoull, The Physiological Laboratory, University of Liverpool, PO Box 147, Crown St, Liverpool L69 3BX, tel (051) 794 5322, fax (051) 794 5327. ★

See the Events section of this Magazine for further details

First Asian and Oceanic Congress of Andrology

SYMPOSIUM ON EPIDIDYMUS AND MALE FERTILITY

7 November 1992

Hong Kong

Further information from: Professor P Y D Wong, Dept of Physiology, The Chinese University of Hong Kong, Shatin, New Territories, Hong Kong, tel (010 852) 609 6883, fax (010 852) 603 5022. ★

RSM: Pain & Nociception Group and Section of Measurement

MEETING ON THE MEASUREMENT OF PAIN

9 November 1992

Royal Society of Medicine, London

Further information from: Miss N Lewis, Sections Office, Royal Society of Medicine, 1 Wimpole Street, London W1M 8AE, tel (071) 408 2119, fax (071) 355 3196. ★

Clinical Autonomic Research Society

10TH ANNUAL MEETING

13 November 1992

National Hospital for Neurology & Neurosurgery, Queen Square, London

The meeting will consist of free communications, a poster session and a guest lecture. The Society has an international membership and, although clinically based, aims to attract participants from all disciplines who have an interest in any aspect of the autonomic nervous system. Further information from the Honorary Secretary: Dr David Jordan, Dept of Physiology, Royal Free Hospital Medical School, Rowland Hill Street, London NW3 2PF, tel (071) 794 0500 ext 4304. ★

IMMUNOELECTRON MICROSCOPY CRYOTECHNIQUES

25 November 1992

Royal Veterinary College, London

This meeting covers labelling aspects of cryosectioning, freeze-substitution, freeze-fracture cytochemistry, and freeze-drying for both sectioning and scanning electron microscopy. Further information from: Georgina Godwin, International Mycological Institute, Ferry Lane, Kew, Surrey TW9 3AF, tel (081) 940 4086, fax (081) 332 1171. ★★★

8th Annual Symposium on Biotechnology

CYTOKINES IN HEALTH AND DISEASE

10-11 December 1992

This symposium aims to offer a view of the cytokine network in general and the principles of its action and then to focus on individual cytokine/receptor systems of particular interest and future advances in cytokine biology and clinical applications. Further information from: Mrs B Cavilla, Institute of Biology, 20 Queensberry Place, London SW7 2DZ. ★★

PHYSIOLOGICAL SOCIETY SYMPOSIUM FOR FINAL YEAR BSc STUDENTS

11 December 1992

University of Leeds

Invited speakers include Bernard Rossier, Gerhard Giebisch, Roger Thomas, Charles Michel, John Widdicombe, Pat Wall and Richard Morris. Further details can be obtained from: Kwabena Appenteng, Dept of Physiology, University of Leeds, Leeds LS2 9JT, tel (0532) 334249, fax (0532) 334381. ★

The Physiological Society and The Biochemical Society

NEW DIRECTIONS FOR BIOCHEMISTRY AND PHYSIOLOGY TEACHING

A Teaching Forum on the Future of Basic Medical Science

16 December 1992

Further information from: Dr J A Patterson, Dept of Physiology, Basic Medical Sciences, Queen Mary & Westfield College, Mile End Road, London E1 4NS, tel (071) 982 6378, fax (071) 975 5500 or Dr M D Yudkin, Biochemistry Dept, South Parks Road, Oxford OX1 3QU, tel (0865) 275302, fax (0865) 275297. ★★

A Physiological Society Teaching Symposium

PHYSIOLOGICAL LIMITATIONS TO HUMAN HIGH INTENSITY PERFORMANCE

16 December 1992

The symposium is open (and free) to all Physiological Society Members. Full details of this symposium will appear in the Programme for the Queen Mary & Westfield College Meeting. Non-Members who are interested in attending should contact Dr D L Turner or Dr D A Jones, Dept of Physiology, University College London, Gower Street, London WC1E 6BT, tel (071) 387 7050 ext 3218, fax (071) 373 7005. ★

See the Events section of this Magazine for further details

The Pain Society and the Scandinavian Society for the Study of Pain

COMBINED SCIENTIFIC MEETING

1-3 April 1993

University of Edinburgh

Submission of abstracts for free paper or poster is invited. Further information from: Dr G L M Carmichael, Western General Hospital, Edinburgh EH4 2XU, tel (031) 332 2525, fax (031) 332 5150. ★

New York Academy of Sciences

SLOW INFECTIONS OF THE CENTRAL NERVOUS SYSTEM: THE LEGACY OF DR BJORN SIGURDSSON

2-5 June 1993

Haskolabio Conference & Cultural Centre, Reykjavik, Iceland

Deadline for submission of poster abstracts: 15 February 1993. Further information from: Conference Dept, New York Academy of Sciences, 2 East 63rd Street, New York, NY 10021, USA, tel (010 1 212) 838 0230, fax (010 1 212) 888 2894. ★

New York Academy of Sciences

3RD INTERNATIONAL MEETING ON PLATELETS AND VASCULAR OCCLUSION

6-9 June 1993

Santa Fe, New Mexico

Deadline for submission of poster abstracts: 30 March 1993. Further information from: Conference Dept, New York Academy of Sciences, 2 East 63rd Street, New York, NY 10021, USA, tel (010 1 212) 838 0230, fax (010 1 212) 888 2894. ★

New York Academy of Sciences

HUMAN GENE THERAPY

26-30 June 1993

Washington DC, USA

Deadline for submission of poster abstracts: 15 March 1993. Further information from: Conference Dept, New York Academy of Sciences, 2 East 63rd Street, New York, NY 10021, USA, tel (010 1 212) 838 0230, fax (010 1 212) 888 2894. ★

International Union of Pure and Applied Biophysics

11TH INTERNATIONAL CONGRESS OF BIOPHYSICS

25-30 July 1993

Budapest, Hungary

Further information from: L I Hovath, Institute of Biophysics, Biological Research Centre, H-6701 Szeged, PO Box 521, Hungary, tel (36-62) 23-022, fax (36-62) 13-726. ★★

IUPS CONGRESS
1-6 AUGUST 1993

Correspondence for the Organising Committee should be sent to: IUPS Congress Office, CEP Consultants Ltd, 26-28 Albany Street, Edinburgh EH1 3QH

Telephone calls to: (0742) 758688, fax (0742) 758688.

For further information, see the Events section of this Magazine. ★★

7TH WORLD CONGRESS ON PAIN
22-27 August 1993
Paris, France

Further information from: International Association for the Study of Pain, 909 NE 43rd Street, Suite 306, Seattle, WA 98105, USA, tel (206) 547 6409, fax (206) 547 1703. ★★

3RD INTERNATIONAL CONGRESS ON AMINO ACIDS, PEPTIDES AND ANALOGUES
23-27 August 1993
Crete, Greece

Further information from: Professor Dr G Lubec, University of Vienna, Dept of Paediatrics, Whringer Gurtel 18, A1090 Vienna, Austria, fax (43) 1 40400 3238. ★★

PHARMACOLOGY OF THERMOREGULATION
9th International Symposium
8-12 August 1994
Giessen, Germany

Preliminary registration deadline: 31 December 1992. Further information from Professor Dr E Zeisberger, Physiologisches Institut, Klinikum der Justus Liebig Universitat, Aulweg 129, D-6300 Giessen, Germany, tel (010 641) 702 4550/4553, fax (010 641) 702 4575. ★

2ND INTERNATIONAL CONGRESS FOR PATHOPHYSIOLOGY
20-25 November 1994
Kyoto International Conference Hall, Kyoto, Japan

Further information from: Dr Toshiic Sakata, First Department of Internal Medicine, Ooita Medical University, 1-1 Idaigaoka Hazamacho, Ooita-gun, Ooita, 879-55, Japan, tel (81) 975 49 4411, fax (81) 975 49 4217 or Dr Vladimir Shinkarenko, International Society for Pathophysiology, Baltiyskaya str 8, Moscow 125315, Russia, fax +7 (095) 151 9540, E-mail: ISP@BIOMED.MSK.SU ★★

Membership of the Institute of Biology
Special Introductory Offer

Following the Society's affiliation to the Institute of Biology *(reported in the May 1992 edition of the Newsletter)*, the IOB is now offering individual Members of the Society membership of the IOB at reduced rates. The reductions offered are: (i) a waiving of the £10 application fee for those applying for the Associate, Graduate or Member grade; and (ii) a reduction of 10% in the first annual subscription for those applicants for any grade who agree to join the IOB's direct debit scheme. The General Secretary has given the following example: an applicant for Member grade, paying by direct debit, would be eligible during the first year to a reduction of £14.70 (ie from £10 + £47 = £57 to £0 + £42.30 = £42.30) - approximately 25%.

If you are interested in becoming a member of the IOB, please write to the Membership Dept, Institute of Biology, Freepost, 20 Queensberry Place, London SW7 2ZY.

University of Leicester
Department of Physiology
Lecturer in Neurophysiology

Applications are invited for a newly-created Lectureship (Grade A or B) in Neurophysiology in the Department of Physiology, available from 1 October 1992. The person appointed will be expected to make a significant contribution to research, will be encouraged to collaborate with one of the research groups of the Department and will teach both medical and science students.

Initial salary, dependent on qualifications and experience, will be on the Lecturer Grade B scale – £18,572 to £23,739 – or the Lecturer Grade A scale – £12,860 to £17,827 (scales under review).

Informal enquiries should be directed to Professor PR Stanfield, tel (0533) 523088, fax (0533) 523013.

Application forms and further particulars are available from the Staffing Office (Academic Appointments), University of Leicester, University Road, Leicester LE1 7RH, tel (0533) 522439.

Closing date for applications is 11 September 1992.

Educational Physiological Films

A Russian physiologist, recently retired, has organised an association which produces educational physiological films and would like to make contact with other similar groups. If you have a similar interest or experience (or, possibly, redundant equipment!) and would be interested in establishing contact with him, please contact the Administration Office.

LABORATORY ANIMALS
NEW INITIATIVES FOR 1992

Research workers are frequently criticised by animal welfare groups for having an apparent lack of concern for the animals which comprise their experimental subjects. In some instances, this criticism occurs because descriptions of experimental methodology in specialist journals are extremely brief. A more extensive description of the experimental techniques would enable emphasis to be given to those aspects of the work which result in a reduction of the overall number of animals that need to be used or which lead to a reduction in any pain, suffering or distress that might arise during the experiments. Such extended reports of improved methodology would also benefit other research workers who use or contemplate using similar animal models.

The Editorial Board of *Laboratory Animals* is particularly interested in publishing papers of this type, describing work which involves a reduction in the number of animals that need to be used or which replaces animal models with *in vitro* alternatives or which represents a significant refinement in methodology leading to improvements in the welfare or wellbeing of the animals used.

Aside from encouraging a change in the types of papers published, the Editorial Board also wishes to increase the value of the journal as an information resource for research workers who use laboratory animals. During 1992, the journal will commence publishing a series of review articles on topics which are of current interest to users of laboratory animals. Review articles are normally commissioned, but unsolicited contributions will also be considered. Members of The Physiological Society who may have proposals for a review are encouraged to contact the Chairman of the Editorial Board (c/o Editorial Manager at address below). In addition to review material, the journal will publish a series of reports of working parties and expert committees which are of interest and relevance to many of those who use animals in biomedical research. Forthcoming topics include the reports of the RSPCA Working Parties on research methodology, the Federation of Laboratory Animal Science Association's Working Party report on health status of laboratory animals, and the Laboratory Animal Breeders Association guidelines on the transport of laboratory animals.

The journal has an international circulation and is the official journal of the British, German, Dutch and Swiss Laboratory Animal Science Associations. Papers are subject to peer review, and any experimental procedures must conform with the principles and practice of the Animals (Scientific Procedures) Act, 1986.

Manuscripts (in triplicate) should be sent to Editorial Manager, Laboratory Animals Ltd, Publications Dept, Royal Society of Medicine Services Ltd, 1 Wimpole Street, London W1M 8AE, UK, tel (071) 408 2119 ext 292, fax (071) 355 3198. The journal has no page charges and is indexed/abstracted in the following: Index Medicus, ISI/BIOMED, Excerpta Medica (EMBASE), Current Contents, CABS (Current Awareness in Biological Sciences), Chemical Abstracts.

Paul Flecknell

For Office use:		
A	R	L

CONFIDENTIAL
THE PHYSIOLOGICAL SOCIETY
APPLICATION FORM FOR AFFILIATION

Photograph of Candidate

Name ..... Date of Birth .....

Qualifications (with name of awarding Institute) .....

.....

Date and Subject of First Degree. .....

Present Course .....

Special Scientific Interest .....

..... Code (see reverse) ..... / ..... / .....

Special Interest Groups with which you would like to be associated Code (see reverse) .....

Address .....

.....

Tel ..... Fax .....

Electronic mail address .....

Please delete as applicable:

*I wish to receive Notices, Programmes & Newsletters only and enclose a cheque for £5 payable to The Physiological Society

*I wish to receive precirculated Abstracts as well as the above items and enclose a cheque for £10 payable to The Physiological Society

I confirm that the information given above is accurate and up to date and that I hereby authorise The Physiological Society to hold this, and such other personal information as is supplied to the Society by me or my authorised agents or representatives in future, in machine-readable form for use for the purposes registered under the Data Protection Act 1984.

Signed ..... Date .....

Members of The Physiological Society who are proposing Candidates should read the Guidelines overleaf and sign the following statement.

I hereby confirm that the Candidate:

(a) resides in the United Kingdom or Republic of Ireland, and
(b) is either a post-doctoral worker or registered for a higher degree in Physiology or a cognate subject, and
(c) is a person suitable for admission to Society Meetings.

Signature of Proposer ..... Date .....

Name (in capitals) .....

Tel ..... Fax .....

Address .....

.....

On completion please return this form to: The Administration & Publications Office, The Physiological Society, PO Box 506, OXFORD OX1 3XE.

GUIDELINES TO MEMBERS OF THE PHYSIOLOGICAL SOCIETY
PROPOSING CANDIDATES FOR AFFILIATION

The Committee has authorised the Committee Secretary to consider and accept or reject proposals for Affiliation to the Society as they are received throughout the year, so that these can be processed quickly. The Committee Secretary regards himself as free to withdraw a proposal and return the papers to the Proposer.

Affiliation is for a term of five years in the first instance. Affiliation must be renewed by payment of the appropriate fee at the start of each year (which, for this purpose is the academic year, ie October to September). For administrative convenience, Affiliates registered after October will have to pay for the full year. The fee is determined from time to time by the Treasurer; it is currently £5 for receipt of Notices and Programmes of Scientific Meetings and Newsletters OR £10 for precirculated Abstracts as well as the above.

Affiliates can attend Meetings in their own right but must be introduced by a Member of the Society when giving a Communication or Demonstration. Affiliates are not Members of the Society and do not have a right to vote at its General Meetings.

Field of Interest:

01 Anaesthesia
02 Anatomy & Embryology
03 Biochemistry
04 Biophysics
05 Biomedical Engineering
06 Blood
07 Cardiovascular
08 Cellular & Tissue
09 Comparative Physiology
10 Electrolyte & Water Balance
11 Endocrines
12 Energy Metabolism & Temperature Regulation
13 Environmental
14 Enzymes
15 Gastrointestinal
16 General Physiology
17 Immunology
18 Liver & Bile
19 Lipids & Steroids
20 Microbiology
21 Minerals, Bone & Teeth
22 Muscle & Exercise
23 Neuroscience
24 Nutrition & Food
25 Pathology
26 Pharmacology
27 Radiation
28 Renal
29 Reproduction
30 Respiration

You may specify up to three fields of interest.

Special Interest Groups

Current Codes

AF Autonomic Function
BB Blood-Brain Barrier
CC Cardiovascular Control
CI Comparative & Invertebrate Neuroscience
CP Comparative Physiology
CS CNS: Somatosensory Physiology
DP Developmental Physiology
EM Epithelia & Membrane Transport
GI Gastrointestinal Tract
HC Heart and Cardiac Muscle
HI History of Physiology
HP Human Physiology
IC Ionic Channels
MI Microvascular & Endothelial Physiology
MC Muscle Contraction
NB Neurobiology
NE Neuroendocrinology
PP Placental & Perinatal Physiology
RP Renal Physiology
RE Respiratory Physiology
SO Somatosensory & Motor Physiology
SM Smooth Muscle

THE PHYSIOLOGICAL SOCIETY

32nd International Congress of Physiological Sciences

GLASGOW, 1-6 AUGUST 1993

GRANT APPLICATION

Preference will be given to Members (Ordinary and Honorary) and Affiliates of the Physiological Society and to members of UK and Irish academic departments of Physiology or related sciences (including postgraduate and undergraduate students, postdoctoral workers and visitors), though other categories of applicant may be assisted if funds permit. Applicants (with the exception of students) must submit an abstract to the Congress. The Physiological Society hopes to meet a substantial proportion (about half) of the registration fee of eligible applicants and all of the reduced registration fee for students.

The following form, typed or clearly printed, should be returned to the Society's Administration Office, PO Box 506, Oxford OX1 3XE (tel 0865 798498, fax 0865 798092) **no later than 31 January 1993**

Applicants must register separately for the Congress and must pay the appropriate registration fee. Grant cheques will be sent out in March 1993.

Name (in capitals) ..... **Date of Birth** .....

Work Address .....

.....

.....

Work Tel No ..... **Fax No** .....

Present Appointment/Status .....

Present Employer/Funding Body .....

Details of employment or status
Please tick one box

Member of UK/Irish department of Physiology or related sciences:

- undergraduate student ☐
- graduate student ☐
- postdoctoral worker ☐
- academic staff member ☐
- technical staff member ☐
- visitor ☐

*NHS clinician not part of a Medical School ☐

*Member of MRC/SERC/AFRC research institute or equivalent ☐

*Employee in pharmaceutical or other industry ☐

*Other *(please give details below)* ☐

.....

.....

Relationship with the Society
Please tick one box

Ordinary Member ☐

Affiliate ☐

Candidate for Ordinary Membership ☐

Other ☐

(Please specify) .....

.....

NOTE: if you have ticked an asterisked box, please supply a covering note explaining why you need assistance from the Society.

Title of abstract (not necessary for student applicants): .....

.....

.....

Amount of registration fee already paid: £ .....

Signed ..... Dated .....

Signature of Head of Department confirming eligibility if not Member or Affiliate:

Signed ..... Name .....

Date: For office use:

To: The Administrator
The Physiological Society
Administration & Publications Office
PO Box 506
OXFORD OX1 3XE UK

p/i

DD:

EXPERIMENTAL PHYSIOLOGY – MEMBER'S COPY – 1993

Please accept my application for a subscription to *Experimental Physiology* for 1993 at the special individual rate available to Members of The Physiological Society.

☐ I enclose a cheque for £31, payable to The Physiological Society.

☐ Please charge £31 to my Visa/Access/Mastercard* account:

Account No .. .. Expiry date _ _/_ _

Address registered with credit card company (if different from Grey Book)

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☐ Please **collect the £31 due for my 1993 subscription** to *Experimental Physiology* **by direct debit** from the UK bank account in respect of which I have given my bank a variable amount instruction in favour of The Physiological Society. I understand that the Society will give me at least 14 days' notice prior to the date on which the amount is debited.

☐ I wish to place **a standing order** for *Experimental Physiology* **for 1993 and subsequent years until further notice**. Please collect the amounts due for my subscriptions to *Experimental Physiology* **by direct debit** from the UK bank account in respect of which I have given my bank a variable amount instruction in favour of The Physiological Society. I understand that the Society will give me at least 14 days' notice of the date and amount each year before my account is debited.

I undertake not to sell nor to dispose of nor deal with any copy received by me as a Member of the Society in any way which might be deemed by the Committee to be likely to prejudice commercial sales of the journal nor to deposit any copy in any departmental, university or other library until at least five years after its date of publication.

(Signature) ..... *(Membership Number)* .....

(Full name in capitals) .....

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* *Delete as applicable.*

The Physiological Society, Administration and Publications Office, PO Box 506, Oxford, OX1 3XE

This publication is also known as The Physiological Society Newsletter