

PHARMACOLOGY PmMATTERS

BPS

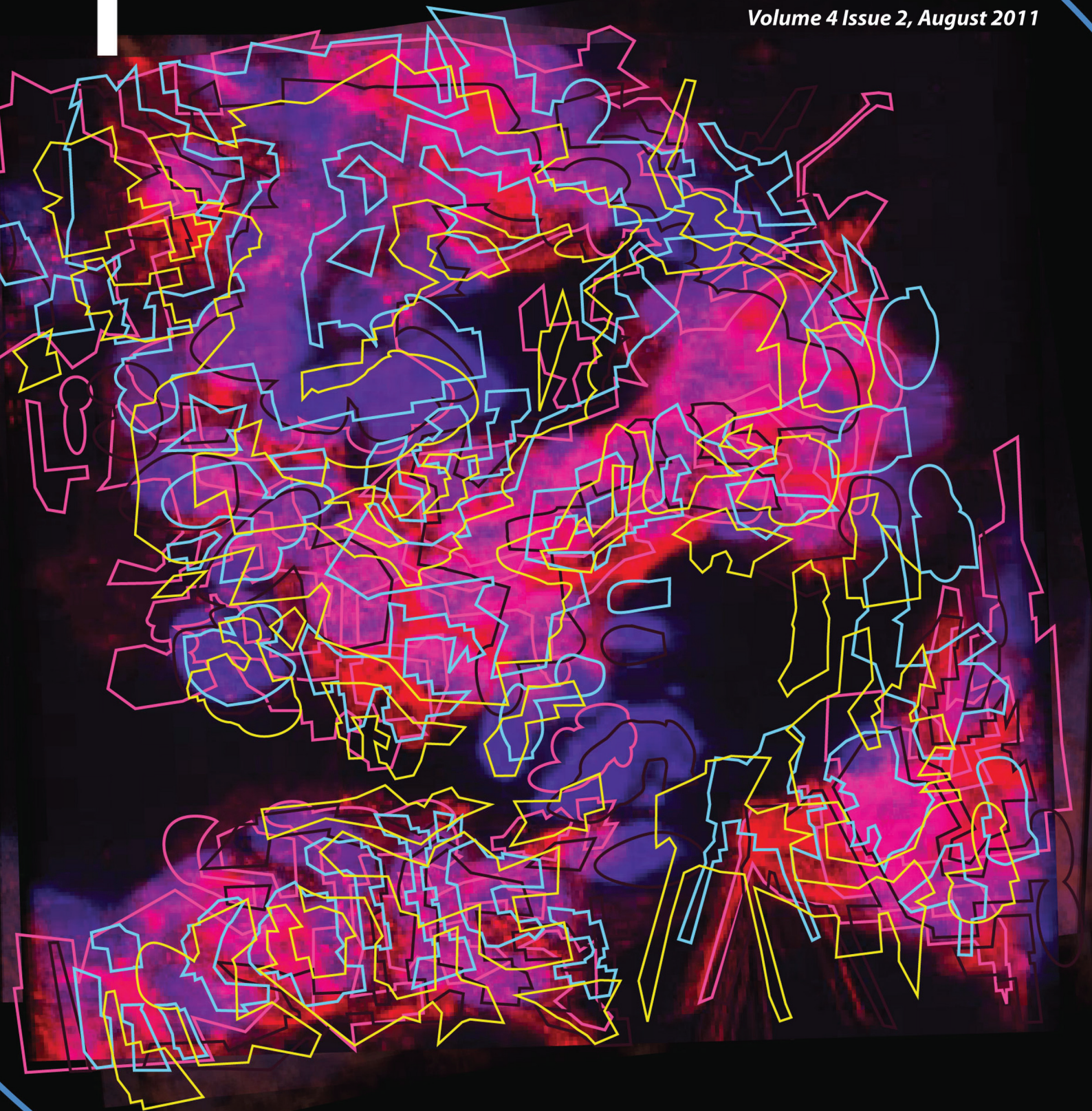
BRITISH
PHARMACOLOGICAL
SOCIETY

Today's science, tomorrow's medicines

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The Newsletter of the British Pharmacological Society

Volume 4 Issue 2, August 2011



A pharmacological education

safeguarding the PhD | medical education | mapping maths | careers | murder mystery



Prescribing without Evidence

A joint conference organized by the
British Pharmacological Society and the
Faculty of Pharmaceutical Medicine



Programme

Chairs: Baroness Finlay & Dr Evan Harris

INTRODUCTION (09:45 - 10:00)

Introductions and today's agenda

Baroness Finlay (Cardiff University School of Medicine)

SESSION 1 (10:00 - 11:00) - **Title TBC**

Towards Better Informed Prescribing

Prof Phil Routledge (President-elect of the BPS)

Implications in an increasingly litigious world

Prof Mark Mildred (Nottingham Law School)

Economic implications in cost constrained environments

Prof Dyfrig Hughes (Bangor University)

Q&A Session

SESSION 2 (11:20 - 12:40) - **Where are the major evidence gaps?**

The ageing population

Prof Steve Jackson (King's College London)

Pregnancy

Prof Simon Thomas (Medical School, Newcastle University)

Managing the inherent risks when prescribing without evidence:

Prof Carol Seymour (Medicolegal Adviser, MPS)

Q&A Session

LUNCH BREAK (12:40 - 13:40)

SESSION 3 (13:40 - 15:20) - **Breakout groups for Deep Dive into the Topics and Issues from Morning Sessions**

(A) What don't we get from standard phase 2/3/4 Clinical Trials and how do we plug those gaps: 'naturalistic' studies?

Prof Dyfrig Hughes (Bangor University) & David Scanlon (AstraZeneca)

(B) How does the Law, ethics and regulations help and hinder - what needs to change?

Prof Mark Mildred

(C) How much does the healthcare 'customer' understand the 'evidence', how can they help academia, industry regulators meet their needs better?

Mary Baker (President of the European Brain Council and the European Federation of Neurological Associations), and

Baroness Finlay (Cardiff University School of Medicine)

(D) Data-poor groups and how do we plug the evidence gaps?

Peter Brock (Consultant Pharmaceutical Physician) and Dr William Van't Hoff (Co-Director Medicines for Children Research Network)

SESSION 4 (15:40 - 16:40) - **Feedback from breakout groups and panel discussion**

Chair: Evan Harris

To register please go to: www.bps.ac.uk

Or email meetings@bps.ac.uk

Editorial

The BPS is committed to providing lifelong learning support for not only pharmacologists and aspiring pharmacologists, but to anyone for whom an understanding of pharmacology would be useful. In order to provide this support, and encourage a first-rate learning environment, we are building resources to meet the demands and evolving needs of educators and students. This issue, an Education special, highlights not only what BPS offers in the way of educational resources, but it also presents an insight into the future of a pharmacological education.

Dr Eva Sharpe's article a Degree of Choice details the development of the Degree Accreditation Programme. The programme, developed by the Society of Biology in conjunction with several other Learned Societies including the BPS, is scheduled to launch in the *in vivo* sciences and Biochemistry in the spring of 2012 and could profoundly affect the way bioscience degrees are taught and validated in the coming years.

On page 7, Professors Michael Mulvany and Nick Goulding discuss the outcomes of a recent BPS workshop on PhD Standardization. Safeguarding our PhD looks at the work ORPHEUS is undertaking, to improve and regulate PhD standards around Europe.

The need to improve and regulate standards is echoed throughout this issue, particularly by our President Emeritus, Jeff Aronson, and Professor Simon Maxwell, who both discuss how the BPS is improving, and will continue to improve the pharmacological knowledge of medical students.

We also hope this issue can inspire students to consider a degree in pharmacology. We have career profiles from a Principal Industry Scientist, a Reader in Clinical Pharmacology, and a Senior Lecturer in Neuroscience and Ethics, which demonstrate the diversity of pathways open to those who choose to study our discipline.

Our President-elect, Professor Phil Routledge, has penned a poisonous piece: Murder, Mystery, Medicine and their Practitioners details how medicines like Arsenic and Cyanide became the drug of choice for those with murderous intentions.

Finally, as well as our regular updates from the Young Pharmacologists and the View from Angel Gate, we have an update from our Vice-President Meetings, Robin Hiley, outlining changes to the way we will review meeting abstracts in the future. This new protocol comes into effect immediately and I would recommend familiarizing yourself with the changes in time for the Winter Meeting 2011.

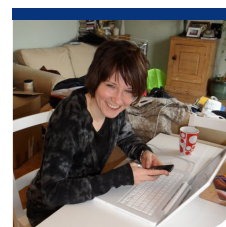
Enjoy

Cover image credit

Jo Berry "Hijacking Natural Systems" funded by the Wellcome Trust and Arts Council England. The exhibition opens on 23 July and runs until 30 October, with the main exhibition at Derby Museum & Art Gallery, The Strand, Derby plus a whole range of exciting strands of this diverse project can be seen in public places in Derby. <http://www.joberry.co.uk> <http://wellcometrust.wordpress.com/2011/07/20/hijacking-natural-systems/> - More details on page 26.

Disclaimer

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Hazel O'Mullan
Managing Editor
BPS

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View from Angel Gate



Kate Baillie
Chief Executive
BPS

BPS, like many other learned Societies is heavily dependent on the generation of revenue from its journals to enable the development and execution of a comprehensive programme of activities for its members and other stakeholders. I attended a CEO forum for Learned Societies from across Europe, organized by Wiley Blackwell in February in Brussels. The Forum provided an excellent opportunity to look at the strategic opportunities and challenges facing society publishing, using a scenario planning approach. Following this meeting, the group worked on developing a joint consensus statement on mandated Open Access which was presented to a Round Table meeting of the Department for Business, Innovation & Skills (BIS). It is also anticipated that this group will be used to lobby key officials within the EU Information and Research Directorate Generals, on Open Access issues. A further meeting of the CEO Forum, on Shaping Public Policy Issues that Affect Scholarly Publishing will be held at the end of June.

BPS arranged an exhibition stand at the Experimental Biology (EB) conference in Washington DC, April 9-13 2011, the first time the Society has exhibited at EB since the ASPET Centenary in 2008. Our stand was located adjacent to Wiley Blackwell, and in close proximity to both The Physiological Society and ASPET. We used this opportunity to promote the Society and its activities to the audience of international scientists and scientific organizations. We received over 40 expressions of interest in BPS membership, generated over 70 sponsorship and exhibition leads and have already begun discussion with one potential new exhibitor for the BPS Winter Meeting, London 2011.

During the meeting, BPS representatives met with counterparts from ASPET to further discussions about a joint BPS/ASPET meeting during EB 2013, to be held in Boston, April 20-24. We will be seeking proposals for joint symposia for this meeting from the Membership in the near future, so look out for the announcement.

2013 may seem far away, but in addition to our planned joint meeting with ASPET, we are also in discussion with the British Neuroscience Association (BNA) about convening symposia with a pharmacological flavour at the Festival of British Neuroscience 7-10 April 2013 to be held at The Barbican Centre, London. This promises to be an exciting meeting and a chance for us to work closely with counterparts from 11 other scientific Societies.

Closer at hand are the 12th International Conference on Endothelin, ET-12, and the 1st conference organized by the Industry Committee – the James Black Conference on Biologics for the New Millennium. The Industry Committee has continued its activities in support of those affected by the Pfizer site closure with 23 existing members and 29 new members taking up the option of a one-year free membership of BPS. We are also working closely with the Faculty of Pharmaceutical Medicine to develop a joint meeting Prescribing Without Evidence, to tackle the complex issues surrounding prescribing in the absence of adequate data, particularly in data-poor groups such as pregnant women and children.

We are pleased to report that work on the Prescribing Skills Assessment which BPS is developing in conjunction with the Medical Schools Council is progressing, and that we have now been able to recruit two external consultants, John Mucklow, Associate Director, Medicine and Lynne Bollington, Associate Director, Pharmacy, to assist Simon Maxwell and members of the Steering Group with development of the project.

Following extensive consultation, the Education and Training Committee and the Outreach Group agreed to work with the company New Future Graphic on our new careers resources which will comprise two leaflets: What is Pharmacology? designed to explain our discipline to members of the public, young and old, and a new Careers in Pharmacology leaflet, intended for Year 12 school students and above, who might be considering a pharmacology course at University. We are also investigating the possibility of building a small careers website associated with the leaflets.

You are probably aware that there have been some staff changes at Angel Gate. Sadly, Amalie Brown, Meetings Manager and Annie Geraghty, Education Manager have now left the Society to pursue new opportunities. We wish both of them well in their future careers, Amalie has returned to Quintiles as Senior Project Manager, Medical Communications, and Annie has taken up a post of Analyst at marketing consultancy firm, Accenture.

To replace the roles formerly occupied by Amalie and Annie, we have created a Head of Meetings and Events, and Head of Education post, with administrative support provided by an Events and Education Officer. Jess Strangwood will join us as Head of Education from 15 August, and we were pleased to welcome Becky Hughes as Events and Education Officer on 4 July. We hope that they will have a long and successful career at BPS.

I am delighted to report that Karen Schlaegel, our former Secretariat Services Manager has now been appointed to the position of Head of Meetings and Events. In her new role, Karen will be responsible for project management and administration of all BPS Scientific meetings, Education workshops and other events, working closely with staff and officers across the Society.

In order to cover Karen's previous role, Ruth Meyer joined us on 25 July to take on the new role of Committee Officer. We have also introduced some internal changes, Hazel O'Mullan, Marketing and Communications Manager, will now be responsible for coordinating and developing the work of the Women in Pharmacology Group, Young Pharmacologists Committee and Clinical Section. Paul Tizard, Membership and Awards Officer, will be taking over coordination of all BPS Prizes and Awards.



Education Update



Dr Annie Geraghty
Education Manager
BPS 2010 - 2011

Introduction

(By Nick Goulding VP - Academic Development)

A key objective of the Society is to develop educational and training activities which support and empower pharmacologists at every stage of their career. In this section, Annie Geraghty gives an update of progress in the many areas where we are working to fulfill this aim. In the period of just over a year that Annie has been with us she has achieved a huge amount and has particularly been responsible for ensuring the smooth running of workshops and the Diploma course. I am grateful for her enthusiastic support and wish her well in her future career.

Workshops

The Integrative Pharmacology workshop, held at the University of Bristol (4 April), covered a range of topics from integrative approaches to respiratory pharmacology and inflammation, diabetes and HIV to a session on 'working with *in vivo* models: law ethics and 3Rs'. I'd like to take this opportunity to thank all of the speakers and organizers for their contribution to a very successful day!

On 21-22 July 2011 we ran the ever-popular General and Advanced Receptor Theory workshop and on 19 October 2011, Enzymes as Drug Targets will take place at King's College, London. In 2012, a Statistics workshop will be held on 11 April at King's College, London and we will be announcing more workshops shortly.

Diploma

We would like to extend our congratulations to Juan Antonio Gilabert and Oladipupo Adeyemi who have completed their Diplomas and will be graduating at the BPS Winter Meeting 2011.

Careers Leaflets

Work has begun on our new 'Careers' and 'What is pharmacology' leaflets. We will use these leaflets to show the public, and particularly students, why pharmacology is so important, and the range of careers options available to people who study it. We don't want to give too much away at this point but we are working with a company called New Future Graphic, if you take a look at their website (www.newfuturegraphic.co.uk) you'll get a sneak peek at the kind of thing we're planning!

PhD standards in pharmacology

On 15 April, the BPS hosted a workshop to consult pharmacologists across the UK on the views around PhD standards within the UK, and across Europe. A presentation from Professor Michael Mulvany and Professor Zdravko Lackovi of ORPHEUS (Organization for PhD Education in Biomedicine and Health Sciences in the European System, www.orpheus-med.org) on the work they are doing around PhD standards in Europe set the scene for delegates representing universities across the UK. An in depth discussion followed, in which the similarities, and differences, between PhDs across Europe were discussed. See pg 7 for an article on this workshop.

Promoting Women's Careers

The Women in Pharmacology committee is working with a trainer to create a seminar on Managing Your Career Break. Scheduled for Saturday 8 October this seminar will be led by Sam Pringle, who has over 10 years management experience in pharmaceuticals. Working through her company Beeleaf Consulting, Sam works alongside the corporate and public sectors to promote ways to create an improved Work/Family Balance.

Goodbye

Finally, I'd like to say goodbye as, at the time of press, I will have left the BPS to begin a new job at Accenture. I've had a brilliant time and learnt an awful lot working with the office staff at Angel Gate, and with many BPS members on a number of different projects. I'd like to wish the BPS, and the new Head of Education, every success for the future.

Hello

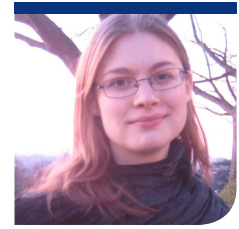
I'm very excited about joining the BPS team at Angel Gate and meeting members over the coming months.

My previous role at Understanding Animal Research has given me insight into the importance of *in vivo* skills, not only to ensure continuing pharmacological advances but to also really understand the complexity of biological systems.

I'm really looking forward to hearing from members about workshops they would like to see on the calendar, or any other educational ideas - please get in touch!

Jess Stangwood - js@bps.ac.uk 
BPS Head Of Education from 15 August 2011

A Degree of Choice



Dr Eva Sharpe
Higher Education Policy Officer
Science of Biology

The Society of Biology is a single unified voice for biology: advising Government and influencing policy; advancing education and professional development; supporting our members, and engaging and encouraging public interest in the life sciences. The Society represents a diverse membership of over 80,000 – including: students, practising scientists and interested non-professionals - as individuals, or through learned societies and other organizations.

The Society of Biology is committed to promoting biology as a subject of choice to students in schools, colleges and universities. They support and recognize excellence in biology teaching; champion a biology curriculum that challenges students and encourages their passion for biology; supports young scientists through higher education, and provide career guidance at all levels. They offer a range of tools to assist members working in education in their professional development, and respond to education policy consultations, contribute to curriculum development and course accreditation. Through partnership with other leading science organizations, they aim to increase their influence over the advancement of biology education.

Students choosing courses in chemistry, physics and engineering can opt for degrees that are accredited by the relevant professional body. With the exception of biomedical science courses, students who are choosing biological science degrees don't currently have that option.

With a more market based approach to university finance, students are likely to become increasingly demanding in return for the investment they make in their education. Among other things, their interest in employability will grow. The Society of Biology is keen to enable students to make informed choices and to be more certain of the future employment prospects they can expect from their university education. This has been one of the contributing factors to the development of the Society of Biology's Degree Accreditation Programme for the biosciences.

With a strong emphasis on academic rigor and research experience, the Society's Accreditation Programme is specific in its aims:

- to highlight degrees that provide graduates with the skills and experience required to progress to employment in academic or industrial research
- to ensure a pipeline of skilled graduates into areas of particular national need and international importance

To achieve these aims the accreditation criteria places a strong emphasis on academic excellence, research experience and critically, time spent in an active research environment, focusing on four year undergraduate degrees with substantial research placements either in academic or industrial research groups. This academically rigorous assessment procedure will recognize outstanding courses across the UK that focus not only on core knowledge but also on experimental and analytical skills.

This scheme will not only benefit students - A survey carried out by the Society of Biology last year indicated that employers ranked 'lack of work experience' as the main reason for not employing a graduate with a BSc or MSc qualification. The Accreditation Programme will enable employers in both industry and academia to better identify graduates with the required research experience, skills and interest. The Accreditation Programme also benefits employers by targeting bioscience disciplines where reports^{1, 2} have highlighted national graduate skills gaps. In June 2011, the Society launched a pilot Accreditation Programme, initially focusing on two key areas of graduate skill shortages - biochemistry and in vivo science. This will help ensure that skills demands are better met in both academia and industry, and supports the Government's recommendations for a growth agenda. The project has the backing of the Department for Business, Innovation and Skills (BIS) and the Biotechnology and Biological Sciences Research Council (BBSRC), and was highlighted in HM Treasury's 'Plan for Growth'³ as a key strategy for growth of UK industry.

The Society of Biology has consulted a full range of stakeholders in the biosciences, including academics and universities, industry, learned societies, funding bodies, sector skills councils and students. We have been working closely with relevant learned societies such as the BPS to provide the discipline specific expertise needed. During the development of the pilot, the BPS was asked to nominate members to help draft the in vivo specific assessment criteria and to act as assessors during the pilot.

Since the early stages of development of the Programme, we have received much interest from higher education institutes (HEIs) and through this we have selected a manageable number of degree courses to enter the pilot. We have been keen to include a variety of institutions and a mixture of course types in order to thoroughly test the process. Following a successful outcome from the pilot, we will open the scheme to all UK higher education institutions.

The Accreditation process is not prescriptive; we will not be dictating to universities how they should teach a subject or the particular topics they should cover. Instead we focus on the learning outcomes we expect from degree programmes. Through the Accreditation Programme we hope to highlight and share best practice. We recognize that Accreditation has the potential to drive up the already high standards of teaching and learning in biology higher education, cementing the UK's position as a leader in life science training and research.

In-built flexibility ensures that the Accreditation Programme also remains inclusive of a range of the bioscience disciplines, and we aim to expand the Accreditation Programme into a wider range of strategically important research disciplines with identified skill shortages in the future. Accreditation will not be appropriate for all courses and, as with other subjects, many students will continue to take excellent non-accredited degrees, especially if aiming for non-research careers.

The Society of Biology operates a mailing list for updates on the Accreditation Programme as well as a list of institutes interested in applying for Accreditation in the future. For more information please contact Dr Eva Sharpe, Higher Education Policy Officer at the Society of Biology, at evasharpe@societyofbiology.org or visit

www.societyofbiology.org/education/hei/accreditation.

We look forward to celebrating the announcement of the first *in vivo* science and biochemistry courses to be awarded Accreditation by the Society of Biology in Spring 2012.

¹ ABPI – Skills needs for biomedical research <http://www.abpi.org.uk/our-work/library/industry/Pages/skills-biomedical-research.aspx>

² Semta, Cogent – Life Sciences and Pharmaceuticals: A Future Skills Review with Recommendations to Sustain Growth in Emerging Technologies (2010) <http://www.cogent-ssc.com/research/Publications/LSPReport.pdf>

³ HM Treasury 'Plan for Growth' 2011 - http://cdn.hm-treasury.gov.uk/2011budget_growth.pdf

Safeguarding the PhD

Professor Michael J. Mulvany

Vice-President, ORPHEUS
Professor, Department of Pharmacology,
Aarhus University, Aarhus, Denmark



Professor Nick Goulding

BPS Vice-President - Academic
Development, William Harvey
Research Institute, London



Nick's BSc and PhD degrees were awarded from the University of Southampton. Following 10 years in the School of Pharmacy & Pharmacology at the University of Bath, Nick has worked at Barts & the London since 1992. His interests include the mechanism of action of the glucocorticosteroids, pharmacology education and medical ethics.

Michael graduated in 1962 from Oxford in Mathematics and Engineering Science. PhD (1978) and Doctor of Medical Sciences (1983), Aarhus University. Since 1997, he has been Professor of Cardiovascular Pharmacology Aarhus University. Head, Aarhus Graduate School of Health Sciences (2002-2011). His interests are structure and function of small arteries and their role in the development of high blood pressure (hypertension).

Following its introduction first at the Humboldt university, and subsequently the US, the PhD was introduced in UK almost 100 years ago as a degree recognizing the recipient as a trained scientist, who had performed a quality research project under supervision. Since then this concept has spread across the entire World, and the PhD is now perhaps the most internationally recognized degree. However, the actual standard expected is not clear, and indeed varies widely. Furthermore the purpose of the degree is currently under discussion¹ since only a small minority of those receiving PhD degrees continue in academic/research careers, with large numbers ending up in non-academic positions. The relevance of the PhD degree is therefore being questioned, and in this article we discuss moves that are being made to safeguard its future.

Specific objectives include:

- Ensuring that the PhD remains a research degree
- Maintaining and raising quality despite increased quantity
- Providing a secure basis for mobility of PhD graduates
- Providing governments with information about the content of PhD programmes and their contribution in the development of knowledge societies
- Safeguarding the reputation of the PhD and strengthening career opportunities for those with PhD degrees

To address these questions the BPS held a workshop on PhD standards (on 15 April 2011), with invited pharmacologists and physiologists from UK universities together with representatives of the Organization for PhD Education for Biomedicine and Health Sciences in the European System (ORPHEUS²) who presented the PhD standards that ORPHEUS has developed³. The latest ORPHEUS conference attracted over 300 delegates, from 40 countries. The current ORPHEUS standards are described in a position paper from its 2009 conference held in Aarhus, Denmark⁴. This document was prepared following extensive consultation with all participants prior to, during and after the conference. The document describes the general status of PhD education and points of consensus and makes a number of recommendations concerning the general standard expected for the award of a PhD degree and the content of the PhD programme.

The standards described in the position paper are largely based on the PhD programmes found in Continental Europe that follow the Bologna process (3 years bachelor, 2 years Masters' and 3 years PhD). However, in general it is not prescriptive, and is written to allow for national variations in PhD programmes, including those currently offered by higher education institutions (HEI) in the UK.

The position paper was discussed in detail at the BPS workshop and similarities and differences with UK procedures were identified. Points of agreement were many, and include:

- That the PhD is a research degree to be distinguished from "professional doctorates"
- That a PhD also prepares generic skills
- That a PhD will normally last about 3 years
- That the conditions for a successful PhD include a vibrant research environment, stimulating supervision, demanding but fair standards and that the student has responsibility for his/her own learning
- That PhD degrees in principle are not graded
- That assessment of the PhD thesis should be performed by an independent committee not including the supervisor
- That award of a PhD is based on the student demonstrating deep knowledge and understanding of the field of study and originality of thought, either in the creation of new knowledge or the novel application of existing knowledge.
- That a clinical PhD should have the same standard as any other PhD.
- That it is possible to fail the final PhD defence

Points of differences in emphasis include

- Coursework, where ORPHEUS recommends that PhD programmes should include courses amounting to 6 months (30 ECTS) that are relevant to the student's research or provide generic skills. In the UK this is usually optional.

Differences include

- *Admission requirements.* ORPHEUS follows the Bologna principle (as reflected in Continental practice) as stated above with undergraduate studies consisting of 3 years bachelor followed by 2 years Master's. Admission to the 3-year PhD requires either completion of Master's or that the PhD programme includes Master's studies. The total time from entering bachelor to completing the PhD is thus normally eight years. Typically, those admitted to European PhD programmes will be slightly older than in the UK system, and will have a somewhat stronger theoretical background, including completion of a Master's thesis or a medical degree. It is recognized that UK PhD programmes are often integrated 1-year Master's and 3-year PhD, but nevertheless the overall time from entering bachelor to completion of a PhD is less in the UK than in the European (Continental) system.
- *Form of the thesis.* ORPHEUS recommends that a PhD thesis should normally be based on published articles or manuscripts together with a full review of the literature relevant to the themes in the papers, and a full account of the research aims, methods, results, discussion and conclusion. This differs from the classic UK monograph. However, it is our impression that some UK universities now offer more flexibility in the format for submission.

- *Form of the examination.* ORPHEUS recommends the classic European approach where the thesis is first evaluated in writing by the assessment committee and when it, or a revised version is accepted, the thesis is finally defended publically. This differs substantially from the UK procedure, with a single in depth oral examination of the thesis, possibly "line-by-line".

The BPS workshop provided an admirable forum for discussing the advantages and disadvantages of these differences.

- Regarding admission and completion, the UK system is clearly quicker, however ORPHEUS believes that in general having eight years from starting bachelor to completing PhD is needed to secure quality of the PhD. The difference would, however, be eliminated if the UK PhD was extended to four years, with entry to PhD after 1-year Master's. This however would have significant economic implications. Comparative studies of the outcome of the two systems with respect to e.g. thesis and subsequent employment are not available.
- Concerning the inclusion of manuscripts/articles, the UK system has the advantage that the monograph produced by the student is entirely his or her own work. However, the ORPHEUS system is based on the belief that publishing is an important part of the research process, and thus something that should be included in the assessment of the thesis. Furthermore published work makes an immediate contribution to the output of the supervisor and his or her faculty, and thus provides added value to the PhD. This should not preclude careful assessment of the other items in the thesis as detailed above.
- With regard to assessment of the PhD thesis, the rigour of the UK examination has a clear advantage as regards evaluation of the student's wider understanding and experimental abilities. However, the ORPHEUS system has the advantage that it tests the ability to present one's results publically, an ability that is a critical part of the research process. Discussion at the workshop indicated that there could be advantages in combining the two approaches.

The ORPHEUS standards are developed on the basis of consensus among its members and representatives of other universities present at ORPEHUS conferences. However until now the UK and a few other European countries with a substantial research base have not played major roles in this work. It would therefore be advantageous for securing future development of PhD standards if all countries were to participate and influence this development. In this respect it is most encouraging that the BPS has recently agreed to become an associate member of ORPHEUS, and we would strongly encourage UK universities to follow this lead and become members.

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¹ Taylor MC, Reform the PhD system or close it down. *Nature* 472, 261 (2011); Editorial: Fix the PhD. *Nature* 472, 259-260 (2011)

² see <http://www.orpheus-med.org>

³ The organization now has almost 100 institutions and faculties as members covering most European countries.

⁴ see <http://www.orpheus2009.org>

Enhancing the exposure of UK undergraduate medical students to Clinical Pharmacology and Therapeutics: a proposed UK-wide Special Study Module



Dr. Jeff Aronson
President Emeritus
BPS

Charlotte Barker
Oxford University
Clinical Academic Graduate School

Although there has been an upturn in the fortunes of clinical pharmacology in the last few years [1], there is still some way to go. Figure 1 summarizes the problems and proposes some solutions, some of which are already in place.

There is evidence that the amount of teaching in clinical pharmacology and practical prescribing that medical students get is unsatisfactory, and that the risks of medication errors are high [2] and rising [3]. The students themselves say that although the quality of clinical pharmacology teaching is good [4], they are not satisfied with either the quantity of teaching or how their prescribing abilities are assessed. Furthermore, they and their senior colleagues believe that new graduates are not well prepared to prescribe. Some of the evidence comes from studies by clinical pharmacologists [5, 6, 7], some from independent investigators [8, 9, 10].

In response to concerns about prescribing, the GMC, in the 2009 edition of *Tomorrow's Doctors* [11], outlined details of the knowledge and skills that the Council expects medical students to acquire before qualification. As part of the effort to deliver the necessary education, the British Pharmacological Society (BPS), after initial collaboration with the Department of Health, is developing an e-learning programme, *Prescribe*, which will be freely available to all UK medical students and other health professionals who may prescribe [12]; Professor Simon Maxwell describes this project in more details on pg 12. However, e-learning packages need to be reinforced by teaching from skilled practitioners [13], i.e. clinical pharmacologists, whose numbers have declined to the point where they can no longer provide all the required teaching [14]. New training posts in clinical pharmacology have therefore been created by funding from sources such as the Wellcome Trust and the Medical Research Council [1], but more consultant posts are needed, in both universities and the NHS.

Table 1. The aims, objectives, and possible elements of a proposed national special study module in clinical pharmacology and therapeutics

Aim	To promote experience in Clinical Pharmacology for UK medical students by the development of a nationwide CPT special study module	
Time frame	2–4 weeks, probably during the final year	
Student learning objectives	<ul style="list-style-type: none"> To study and consolidate knowledge of the core principles of clinical pharmacology To gain insight into the nature of a career in the speciality To develop familiarity with current research areas To select a specific areas of focus during the module, to form the topic of a laboratory or literature-based research project, or an extended essay To gain increased awareness of different educational methods used in teaching clinical pharmacology and prescribing, particularly the development of e-learning as an educational tool in therapeutics 	
Activities that could be included	<ul style="list-style-type: none"> Attendance at a Clinical Research Facility, to learn about the conduct and execution of clinical trials Attendance at local or regional meetings relating to medicines and therapeutics Experience with regulatory agencies, e.g. MHRA Attendance at relevant national meetings when possible, e.g. NICE Technology Appraisal Committee meeting Acute general medical take and ward round(s) with a Consultant Clinical Pharmacologist, to highlight the importance of CPT understanding in diagnostics and clinical decision making Case presentations based on CPT-related clinical encounters Relevant out-patient clinics, e.g. refractory hypertension; drug allergy clinics; vaccine clinics Procedures (e.g. laboratory skills) Research project work 	
Topics that could provide a focus for these modules	<ul style="list-style-type: none"> Safe prescribing Pharmacokinetics/pharmacodynamics Pharmacoeconomics Clinical trials Toxicology Medicines policy 	<ul style="list-style-type: none"> Adverse drug reactions Pharmacoepidemiology Pharmacovigilance Drug discovery and drug development The licensing of medicines Pharmaceutical companies

A proposal

Among possible solutions to the problem of educating medical students, we here propose the institution of a national special study module scheme, which could be co-ordinated by the BPS and run in major centres in the UK. In this way, the efforts of clinical pharmacologists could be concentrated. The details are outlined in Table 1.

After taking part in the module students would be encouraged to develop their experience further, for example by attendance at regional clinical pharmacology meetings (e.g. the Clinical Pharmacology Colloquium), and/or national and international conferences (e.g. the BPS winter meeting and EACPT). Ideally, research project work completed as an outcome of the module would be presented at these meetings.

A special study module should give students insight into the complex, multifaceted nature of the specialty of Clinical Pharmacology. It should provide opportunities to receive expert guidance regarding research and career paths in the field. It could also give those with an interest in medical education opportunities to design e-learning modules that could be disseminated for wider use, for example by the BPS, subject to review and approval.

For students who wanted to further their experience, such modules could provide the inspiration or practical experience necessary to plan final-year medical electives, dedicated to CPT either in the UK or abroad.

Location

For students in universities where there is a sizeable clinical pharmacology presence, special study modules could be organized where they are. Indeed, we recognize that some centres may already organize such modules, which could take part in and be afforded by a national scheme.

Students in places where demand is too limited for local organization, or where there are no clinical pharmacologists, could instead be hosted in a major centre within a reasonable distance.

Organization

Medical students would need to identify a mentor to oversee the organization of their special study module. University teaching hospitals with active Clinical Pharmacologists would need to be approached to determine whether they would be able to host students in this scheme. Experts in subspecialties (e.g. pharmacoepidemiology, pharmacoconomics, pharmacovigilance) could also act as mentors. Students would be expected to devise their own timetable, with advice from their mentor. Support from relevant national bodies (e.g. NICE, BNF, MHRA) would be helpful, to allow students to attend appropriate events to understand the roles of these organizations.

Sponsorship

For students attending local units, sponsorship may not be required. For those visiting CPT units elsewhere in the UK, it would need to be decided whether any form of sponsorship/bursaries would be available, and if so, how much funding would be allocated and how these awards would be distributed.

Publicity

UK Medical Schools would need to receive adequate publicity in advance to inform them of plans for CPT modules, to allow them to disseminate the information to undergraduate students planning special study modules.

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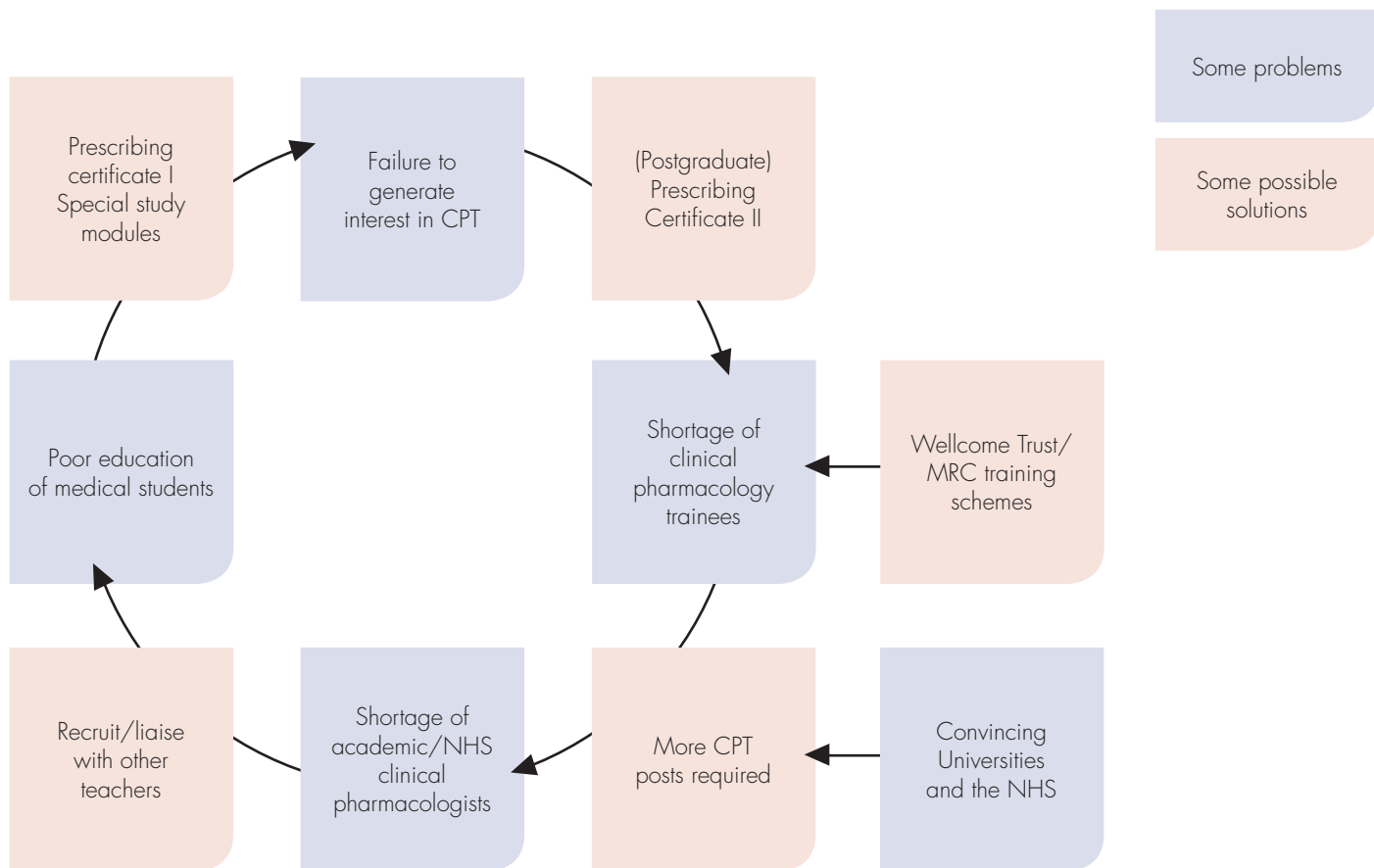


Figure 1. Problems and solutions in clinical pharmacology and therapeutics training: breaking the vicious cycle.

Prescribe e-Learning



Professor Simon Maxwell
Clinical Lead, Prescribe

Simon Maxwell is Professor of Student Learning/Clinical Pharmacology and Director of Pharmacology & Therapeutics teaching at the University of Edinburgh, where he has been active in developing e-Learning strategies to support education in this area. His clinical responsibilities include supervision of acute medical admissions and the management of outpatients at increased cardiovascular risk. He is Chair of the BPS Prescribing Committee and was lead author of the core curriculum for CPT teaching in UK medical schools. He is Chair of the European Association of CPT Education Committee and Secretary of the International Union of Pharmacology and Clinical Pharmacology (IUPHAR) Education Section. He has recently been a member of the NICE drug appraisals committee, is currently a member of the Scottish Medicines Consortium, the Medicine and Healthcare products Regulatory Agency's (MHRA) Pharmacovigilance Expert Advisory Committee and is Medical Director of the Scottish Centre for Adverse Reactions to Drugs (CARDS). He was formerly Vice-President of the BPS and is a fellow of the Royal Colleges of Physicians in London and Edinburgh and of the Higher Education Academy. Since 2008 he has been the Clinical lead for the Prescribe project, a joint collaboration between the Department of Health, Medical Schools Council (MSC) and BPS to deliver a national eLearning solution to develop safe and effective prescribing amongst UK medical students. He is also leading a BPS-MSC group tasked with developing a national Prescribing Skills Assessment for all UK medical students. He is also part of an international group developing an electronic Summary of Product Characteristics (European Medicine's Agency) and a UK group tasked to develop unified prescribing documentation (Academy of Medical Royal Colleges).

Prescribe is a repository of e-learning materials to help medical students (and students of other healthcare professions) to develop a firm grounding in the principles of basic and clinical pharmacology, which underpin safe and effective prescribing in the NHS. Prescribe has been designed to offer support in achieving the relevant knowledge and skills outcomes identified by the General Medical Council in its recent recommendations on undergraduate medical education (Tomorrow's Doctors 2009). This is likely to be an area of increasing interest as medical students will, in future, be expected to pass the Prescribing Skills Assessment (see pg 13) before being allowed to prescribe as Foundation doctors.

Prescribe will contain interactive learning sessions and information covering the pharmacology, clinical pharmacology and therapeutics that a student might expect to encounter within a standard medical curriculum. It will also contain a number of other learning opportunities. The Student Formulary will allow learners to build up their own formulary of important drugs as they progress through their studies. Prescribe will also provide opportunities for practising key skills such as prescribing and dose calculations using online simulators. There will also be self-assessment exercises, a library of important publications, a glossary and links

to other resources. The materials are intended to complement existing teaching initiatives and will be available free of charge to students registered with UK universities. (See screenshots).

Ten learning sessions covering key learning objectives in pharmacodynamics and pharmacokinetics were launched earlier in the year and are currently being trialled in two UK Universities. Another 15 are expected to become available prior to the start of the next academic year.

The editors are grateful to all the authors who have already submitted materials and welcome further contributions in the form of new learning sessions, editing, and self-assessment questions from BPS members. We believe that, with your support, Prescribe can become a major educational portal for medical students and others who are facing the challenge of learning about medicines.

Why do drug doses need to be repeated?

The kinetics of accumulation during repeated intermittent doses, given by injection or by mouth are the same as during an intravenous infusion. Fig 6 shows the rise and fall of plasma concentration after **intermittent oral doses** given at intervals equivalent to the drug's half-life (12 hours). The trough concentration (the plasma concentration immediately before each successive dose) rises progressively to reach a plateau at steady state. As for continuous administration, the rate of rise is determined only by the half-life with the concentration having reached **around 97% of steady state after five half-lives**.

The fact that it is half-life and **not dose interval** that matters is clearly demonstrated by considering a drug given at the same dose interval but with a much shorter half-life (2 hours) (Fig 7). In this example, almost all of the first dose is eliminated by the time of the second dose meaning that steady state is already established.

At steady state after regular oral dosing, the plasma concentration will oscillate between a maximum and a minimum but these will not change from dose to dose. The rate of elimination equals the rate at which drug is entering the body (the rate of administration), which depends not only on the dose and the dose interval, but also on the drug's **bioavailability**. The average plasma drug concentration at steady state (C_{ss}) is given by the equation:

$$C_{ss} = \frac{\text{Rate of administration/Clearance (Cl)}}{= (F \cdot \text{Dose}) / Cl}$$

where F is the bioavailability (a proportion between 0 and 1) and τ is the dose interval.

Drug accumulation kinetics - Repeated drug doses

$t_{1/2} = 12$ hours

Dose Interval = 12 hours

Plasma drug concentration

Time (d)

Fig 6 Rise of plasma drug concentration after successive oral doses of a drug given at intervals equivalent to the drug's half-life (12 hours). Each successive dose is administered at a time when there is still drug present in the body. The peak, average and trough concentration steadily increase as drug accumulates in the body. Steady state is reached when the concentration of drug in the body is sufficient to mean that the rate of elimination (the product of concentration and clearance) is equal to the rate of drug absorption (the product of rate of administration and bioavailability).

Prescribing Skills Assessment

Professor Simon Maxwell
(Medical Director, Prescribing Skills Assessment)

Dr Lynne Bollington
(Associate Director - Pharmacy)

Dr John Mucklow
(Associate Director - Medicine)

The Prescribing Skills Assessment (PSA) is being developed by the British Pharmacological Society (BPS) in collaboration with the Medical Schools Council (MSC). The PSA will be a summative assessment of knowledge, judgment and skills related to prescribing medicines in the NHS. It is intended primarily for medical students at or near the end of their training and is based on the competencies identified by the General Medical Council (GMC) (Tomorrow's Doctors 2009). These competencies include writing new prescriptions, reviewing existing prescriptions, calculating drug doses, identifying and avoiding both adverse drug reactions and medication errors and amending prescribing to suit individual patient circumstances (Figure 1). The initial piloting of this assessment has been undertaken in paper format but the intention is to deliver the assessment online.

The development of the PSA is being driven by a cross-sector Steering Group that includes representation not only from BPS and MSC but also from other key stakeholders such as the Department of Health, GMC, Postgraduate Deans and, of course, medical students. Progress has been rapid from the first meeting in February 2010. We were able to organize paper-based pilot assessments in 11 medical schools during the summer of 2010, involving over 1300 medical students. All were given the opportunity to feedback on their experience. The overwhelming majority felt that the pilot assessment was an appropriate test of the prescribing skills expected of a final year medical student and supported the

fact that the British National Formulary was available throughout the process. Moreover, many commented that they appreciated the focus that such an assessment would place on preparation for prescribing.

The development of the PSA was given a significant boost by financial support from the Department of Health and the recent appointments of Dr John Mucklow and Dr Lynne Bollington as senior assessment officers. The challenge now will be to write and quality-assure enough question items to support the next round of pilot assessments planned for November and a subsequent national pilot in summer 2012.

We are grateful to those members of the BPS who have already been kind enough to submit question items and attend quality assurance events at Angel Gate. We will soon be sending out further requests for question items, which can be written into simple user-friendly PowerPoint Templates. We plan to invite more members to question writing training events in the autumn and a two-day quality assurance event in spring next year.

We believe that the introduction of the PSA has the potential to provide a major boost to the teaching of clinical pharmacology and prescribing in UK medical schools and we hope that all members will feel that this is a project worth supporting.



Figure 1.

The mathematical education of pharmacologists through school and undergraduate study



Dr Jenny Koenig
Lucy Cavendish College,
University of Cambridge

Dr Jenny Koenig combines her science education and communication consultancy work (www.sci-etc.co.uk) with her role as Dean and supervisor in pharmacology and maths for biologists at Lucy Cavendish College, University of Cambridge. Jenny gives lectures and seminars on all areas of pharmacology for the general public, schools and specialist audiences. She particularly likes the mathematical aspects, pharmacokinetics and receptor theory (she is an instructor on the BPS General and Advanced Receptor Theory Course) and is constantly looking for new ways to approach teaching and learning, both face-to-face and online.

Pharmacology has, historically, been a relatively quantitative subject. Consider the following data:

The pEC₅₀ for Drug X stimulating inositol phosphate production was 8.1 ± 0.1 and in parallel experiments using adenosine as an agonist, the pEC₅₀ was 5.5 ± 0.2 and the maximal response was $51 \pm 3\%$ of the DrugX stimulated maximum.

There are several mathematical concepts required to make sense of this (Box 1) and there is accumulating evidence that many younger pharmacologists are likely to have missed out several key mathematical concepts in their education. Furthermore many established academics are unlikely to be aware of the changes in school mathematics curricula and what that means in practice.

Bioscience as a whole is becoming much more reliant upon mathematics at two levels. There is the need for increasing sophistication in data analysis as greater amounts of data can be generated. Along with this increased data generation, the development of analysis software means that many pharmacologists can avoid knowing or understanding what the software is doing for them. At a more advanced level, the increased ability to generate data leads to a greater need for mathematical and computational models to make sense of the data and bring together an holistic picture. Both the Association of the British Pharmaceutical Industry (ABPI report 2008¹) and the BBSRC (Strategic Plan²) recognize the need to address the mathematical education of bioscientists at both basic and more advanced levels.

In this article I will use some of these key mathematical skills and concepts that I've mentioned (summarized in box 1) to look at how well prepared pharmacologists become in mathematics through both their schooling and university studies.

Box 1.	Mathematical concept
"pEC ₅₀ "	logarithms
"EC ₅₀ "	scientific notation, prefixes and units of measurement
" ± 0.1 "	measures of dispersion, eg standard deviation, standard error of the mean
"EC ₅₀ " and "maximum response"	at a conceptual level you need to understand that there is a mathematical model that underlies the action of an agonist at a receptor that allows us to interpret the meanings of these terms non-linear regression to obtain parameter estimates from data

How well does our current schooling prepare undergraduate bioscientists in maths?

A level mathematics would be the ideal preparation for a bioscience degree however, according to the Royal Society's Feb 2011 report,³ only approximately half of those who took one or more core sciences also took A level maths. If you look at those students who studied A level biology (either alone or with another science) only 40% also took A level maths⁴. A recent survey⁵ of UK bioscience teaching staff suggests a slightly smaller proportion of undergraduate bioscience students, approximately 20%, have the full A level maths and a further 16% have AS maths (equivalent to half of the full A level). However this is an average across 24 higher education institutions and hides a very large variation between universities.

What does this mean in terms of what maths these students will be able to do? Logarithms, manipulation of exponential equations and calculus are introduced at AS level maths so this means that roughly 60% of bioscience undergraduates will not have covered logarithms or calculus. You could argue that these students are likely to have taken A level Biology or A level Chemistry so they must have covered logarithmic scales in relation to bacterial growth or pH. Much of this teaching however appears superficial, concentrating on the process to get the answer rather than a deep understanding of what logs are. There is good evidence for this, for example in the beautifully-titled paper⁶ "Student understanding of pH - "I don't know what the log actually is, I only know where the button is on my calculator.""

The lack of understanding of calculus means, in practice, little concept of the ideas of rates of change and no concept of a model reflected in a differential equation. Furthermore, the basic idea of integration as the area under the curve has not been touched upon and this is particularly significant for pharmacokinetics calculations.

Of the students whose highest maths qualification is GCSE it is the grade they achieve that is the key indicator. A survey of UK bioscience degree teaching staff⁵ revealed that almost 40% of institutions accepted GCSE grades from A* to C, a further 40% accepted predominantly B and C grades whilst a significant minority, 16%, accepted less than grade C at GCSE Maths. The way in which GCSE's are awarded is explained very clearly in a report published by the Higher Education Academy⁷ and I won't go into further detail here except to explain what this means for bioscience undergraduate students.

A grade of C or lower at GCSE means there are likely to be real problems with basic numeracy, for example an inability to calculate percentages or to use the concepts of ratio and proportion.

Students with a B or C at GCSE Maths are likely to have an incomplete understanding of negative and fractional powers and are likely to be hesitant with the use of scientific notation. Whilst they might be fairly confident in estimating the answer to a calculation such as:

$$5.1 \times 6.2 \sim 30$$

they will immediately reach for a calculator to do:

$$5.1 \times 10^3 \times 6.2 \times 10^4 \sim 30 \times 10^{-1} \sim 3$$

They are likely to be unable to rearrange the equation of a straight line, for example, and will be unfamiliar in working with quantities which vary in direct or inverse proportion. In a pharmacological context, if you were to ask a student to rearrange the equation for receptor occupancy (P_A) to make the drug concentration ($[A]$) the subject of the equation you are likely to be met with a blank, somewhat panicked, response.

$$P_A = \frac{[A]}{1 + [A]/K_A}$$

Student attitudes to maths/ quantitative analysis

Whilst it is important to consider what material students are likely to have previously covered, it is equally important to consider their attitudes to maths and quantitative analysis. Many students arrive at university with a fear of maths and a sense that it is esoteric and arcane. Furthermore many students have an expectation that you don't need any maths for studying biology, perhaps with the exception of a little statistics.⁸ A survey of 16 year-olds' attitudes to the study of maths, rather dramatically entitled "I would rather die": reasons given by 16-year-olds for not continuing their study of mathematics.⁹ concludes that students don't see the relevance of maths during their schooling rather they see it largely as a set of abstract tasks.

Potential solutions

A key difference in the way maths for bioscientists is taught at University compared with the way it is taught at school is in the context. Although many of the concepts are the same, it is the biological context that provides authenticity and hence motivation. There is much anecdotal evidence that at school, students often follow a very procedural approach and focus on simply passing the exam. In comparison at University the approach must be to use the maths to solve relevant problems and much of the effort of those teaching first year students has to be to break the students away from the mindset of procedural thinking.

Another key difference in the way maths is taught is that at University class sizes are very much larger than at school. This combined with the wide variation in mathematics qualifications at entry makes it very difficult for universities to design courses to meet the needs of all students. In recent years there has been a move away from lectures towards a combination of workshops, e-learning, workbooks and the use of diagnostic testing to help students see where they need help and to target support at those who need it most⁸.

There are now an increasing number of open educational resources and open online content directed at improving mathematical capability of undergraduates. The UK Centre for Bioscience Orbital Project has been collecting and curating these resources: check out the website http://hebiowiki.leeds.ac.uk/orbital/index.php/Main_Page. Do make suggestions for inclusion of any resources you think may be useful and not yet included.

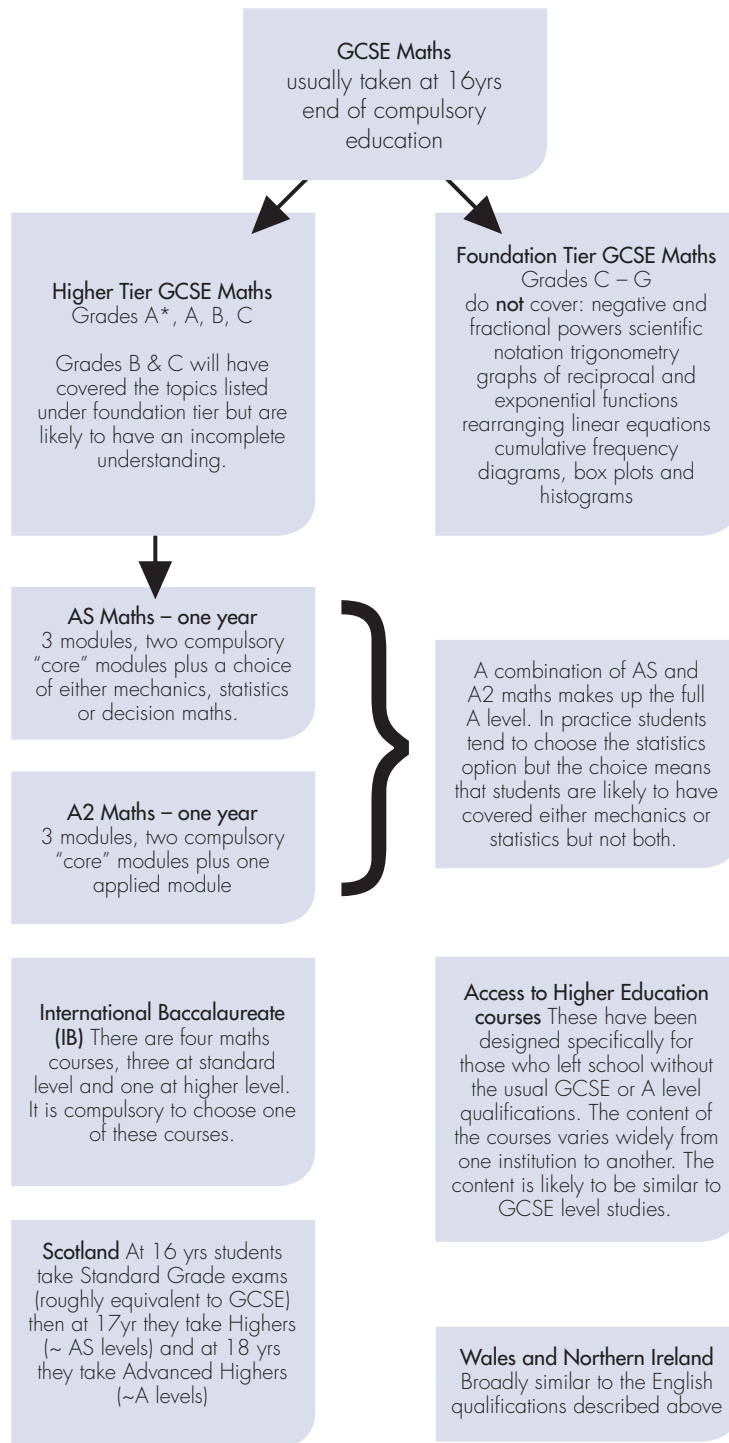
Whilst there has been a lot of support for basic maths teaching there has been less discussion and less support for the teaching of more advanced maths. A survey of teaching staff in undergraduate bioscience courses¹⁰ revealed that only a small minority of undergraduate bioscience programmes provide any maths education beyond the level of GCSE and AS maths concepts. In contrast, the BIO2010 project in the USA has funded work towards developing a curriculum that includes:

"The concepts of rate of change, modeling, equilibria and stability, structure of a system, interactions among components, data and measurement, visualizing, and algorithms are among those most important to the curriculum."

There are two distinct issues here relating to the provision of education in more advanced mathematical concepts: one is to consider how to help bioscience students to understand the general principles and the other is how to ensure that we train enough bioscience students to be able to take an active part in bioscience research that includes the more quantitative approaches. It is possible to teach mathematical modelling without making students endure the tedium of differentiating and integrating endless equations but this isn't a trivial task and it will require funding to develop new teaching materials, much as has been done in the US BIO2010 project¹¹. As John Seely Brown said:

"Instead of pouring knowledge into peoples' heads, we need to help them grind a new set of glasses so they can see the world in a new way."

A Map of UK Maths Education



Legend.

“Understanding the UK Mathematics Curriculum Pre-Higher Education – a guide for Academic Members of Staff by S Lee, R Browne, S Dudzic and C Stripp, 2010 Published by the Higher Education Engineering Subject Centre.

¹ <http://www.abpi.org.uk/our-work/library/industry/Pages/skills-biomedical-research.aspx>

² <http://www.bbsrc.ac.uk/publications/planning/strategy/theme-knowledge.aspx>

³ <http://royalsociety.org/State-Nation-Increasing-Size-Pool/>

⁴ These figures refer to students in England and similar patterns are seen in Wales and Northern Ireland. Interestingly in Scotland students are much more likely to have taken maths alongside science in Scottish Highers.

⁵ JA Koenig (2011) A survey of the mathematics landscape within bioscience undergraduate and postgraduate UK higher education http://www.bioscience.heacademy.ac.uk/ftp/reports/biomaths_landscape.pdf

⁶ Watters DJ and Watters JJ (2006) Biochemistry and Molecular Biology Education, 34, 278 - 284

⁷ Lee, S, Browne, R, Dudzic, S, and Stripp, C (2010) “Understanding the UK Mathematics Curriculum Pre-Higher Education” Published by the Higher Education Academy Engineering Subject Centre.

Accessed via <http://www.engsc.ac.uk/downloads/scholarart/pre-university-maths-guide.pdf> (18th March 2011).

⁸ http://www.bioscience.heacademy.ac.uk/ftp/reports/biomaths_landscape.pdf

⁹ Brown M, Brown P and Bibby T (2008) “I would rather die”: reasons given by 16-year-olds for not continuing their study of mathematics. *Research in Mathematics Education* 10(1), 3 – 18.

¹⁰ http://www.bioscience.heacademy.ac.uk/ftp/reports/biomaths_landscape.pdf

¹¹ See “BIO2010: Transforming Undergraduate Education for Future Research Biologists” Committee on Undergraduate Biology Education to Prepare Research Scientists for the 21st Century, National Research Council, 2003. Accessed via <http://www.nap.edu/catalog/10497.html> (20th Mar 2011). and Marsteller P (2010) Beyond BIO2010: Integrating Biology and Mathematics: Collaborations, Challenges, and Opportunities. *CBE—Life Sciences Education*, 9, 141–142.

Career Profile

Dr Sidath Katugampola



Dr Sidath Katugampola
Principal Scientist, Pfizer
December 2001 - August 2011

What did you study at University?

My degree title was pharmacology and physiology, a BSc (Hons) degree and during my degree I opted to take a year out to do an industrial trainee placement at Pfizer, which turned out to be one of the best decisions I have made in my career. The lab experience, contacts and knowledge I gained during this year was hugely valuable as it paved the way for my first presentation at a BPS meeting. I also met my future PhD supervisor, built contacts enabling me to return on two further separate occasions, obtained sponsorship for my PhD, breezed through my final year project, and presented findings at another BPS meeting.

Why pharmacology?

Curiosity drove me to study pharmacology and 16 years after starting my degree I still love the subject. In my opinion, it's the key foundation of making a new medicine for a given disease. There is such an unmet medical need for a range of diseases and having the opportunity to make a difference through the work I do to help treat patients is extremely rewarding. We all know someone who may suffer from various diseases and ailments, from back pain to cancer and heart disease. Knowing what I do on a day to day and how that may lead to helping someone feel better or increase their life expectancy is one of the most rewarding things about my job.

After Graduation

After obtaining a first in my degree I returned to Pfizer for a summer placement to further enhance my knowledge, skills and contacts. By this time I had numerous offers for PhD placements, but chose to study at the Clinical Pharmacology Unit at Cambridge University. This was a great time academically and in my personal life where I met lots of people from diverse backgrounds and had a supervisor who encouraged my development and growth and supported me in my initiatives. After completing my PhD in three years, I knew I wanted to work within the pharmaceutical industry and decided to go back to Pfizer. Within Pfizer, I have moved across different departments and worked in platform groups supporting multiple projects with different technologies, an aspect I enjoy very much in my day to day job.

Why were you attracted to the job?

I have always been keen on pharmacology and how medicines work. I believe the pharmaceutical industry is a great place to understand not only mechanism of drug action but also how to take an idea and make it in to a novel therapeutic to treat disease. I learnt this when I was working as an industrial placement student and I knew straight away that the pharmaceutical industry was the place for me. In particular the varied work patterns, the challenges that are faced and overcome, the decisions that have to be made, and the interactions with people and science are some key components that attracted me to my job.

What are the main duties involved?

It's very diverse, there is no repetition for the work I do and a lot of it has to do with working as part of a team to deliver a medicine; that is the key goal. There is an element of lab work, preparing for meetings and presentations, communicating findings and having brain-storming sessions, working with other groups within the company and outside collaborators.

What skills are needed other than scientific knowledge in order to do the job?

Communication, influencing, team work, networking, and project and time management skills are a few skills that are very important in my day to day job to effectively execute my goals for a given time period. I learnt most of the soft skills whilst doing my PhD and subsequently these skills grew during my time in the pharmaceutical industry. In addition, an ability to communicate scientific findings effectively, decision making and not being afraid of change are important attributes associated with my job.

What are the benefits of the job?

You get to work in cutting edge science at a world class leading laboratory identifying novel medicines to treat disease, that's one of the biggest benefits of my job. I love working with people from diverse disciplines and networking with a range of scientific experts from academic institutions, contract research organizations to other pharmaceutical companies. I have made many new friends in my time here both through work and out of work and this makes it all the more special to do what I do.

What are the downsides to your job?

There are processes and policies that one needs to adhere to and this can take time and is often frustrating as it gets in the way of actual science. Layers and hurdles that need to be gone through to get approval for a piece of work add to the frustration, but it is something that is getting better.

What are the next steps from your current role?

There are opportunities to potentially take on more responsibility and work my way up the career ladder within the organization. Alternatively, a career path can be chosen to move away from basic research into clinical research. Furthermore, having an understanding of pharmacology can open the doors to areas such as clinical study managers, scientific advisory roles, medical affairs, medical and scientific communications, scientific writing, drug safety and toxicology, or even scientific consultancy.

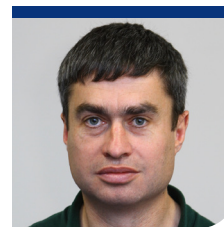
Do you have any advice for someone wishing to enter your career area?

It's a great and rewarding career path. Talk to someone who has chosen such a career path to find out more details about their role, the potential for growth and learning. Ask yourself what you can bring to the chosen career and not what the career can bring to you!

Career Profile

Dr Dave Lewis

Dr Dave Lewis
Senior Lecturer in Neuroscience & Scientific Ethics
University of Leeds



Career time line

1982-1985 BSc (Hons) Pharmacology, University of Leeds.
Graduated 2i,

1985-1988 – PhD students, Dept of Physiology, University of Birmingham. “Chemical transmission in the sympathetic nuclei of the rat spinal cord”

1988-1994 Research Fellow, PhD Dept of Physiology, University of Birmingham

1994-1998 Lecturer, Dept of Physiology, University of Birmingham

1999- present- Lecturer then Senior Lecturer, School of Biomedical Sciences (with restructuring, now Institute of Membrane & Systems Biology) Faculty of Biological Sciences, University of Leeds

2006 - onwards Senior Lecturer, Interdisciplinary Ethics Applied Centre of Excellence in Teaching & Learning (IDEA CETL, part time, 0.1 FTE)

Why Pharmacology?

At school I loved chemistry but didn't want to study it at University so my careers teacher suggested Pharmacology, the study of drugs and their interactions with the body. I was offered a place at the University of Leeds, and once there, found pharmacology was more biology than chemistry but I really enjoyed it, particularly the practical sessions. Like many students, entering my final year, I hadn't a clue about what career I wanted to go into when I graduated. However, help was at hand. After Christmas, we all had to undertake a nine week experimental project with one of the research groups within the Department of Pharmacology. My project was to use electrophysiological techniques, making recordings of the electrical activity or firing rate of individual neurones in the hindbrain of the rat, to investigate how spermine and spermidine, two polyamines thought to be involved in cell metabolism, altered the firing rate of these neurones. By the end of my project, I was hooked on a career in science research.

After graduation

Leaving Leeds, I was offered a postgraduate studentship in the Department of Physiology at the University of Birmingham to study for a science doctorate or PhD (Doctor of Philosophy). My PhD project involved using the same electrophysiological techniques as I had used in my undergraduate research project to record from sympathetic preganglionic neurones, neurones in the spinal cord which control blood pressure and heart rate. The aim of the project was to characterise, pharmacologically, the receptors on these sympathetic preganglionic neurones for two neurotransmitters, 5-Hydroxytryptamine and Angiotension II, which are released in their vicinity from neurones which project down the spinal cord from higher regions of the brain. My PhD project was successful and I was awarded my PhD in 1989.

Post-PhD, I stayed on in Birmingham, continuing with my research into the brains pathways controlling blood pressure and heart rate, eventually setting up my own research group. However, by this stage,

more and more scientific experiments were being undertaken using animal tissues or cultures of cells rather than studies in anaesthetised animals. In line with this, I switched from recording from neurones in whole animals to recording from neurones in slices of brain tissue. The aim of my research at this point was to determine whether the decrease in resting heart rate you see after long-term exercise training is due to changes in the neural pathways within the hindbrain which control heart rate.

Returning to Leeds

With my research now focused on exercise and the brain, in 1999 I returned to Leeds to take up a Lectureship in Exercise Physiology in the School of Biomedical Sciences (a recent amalgamation of the Departments of Physiology, Pharmacology and Anatomy). My working day also changed. I had always undertaken some teaching as a researcher but now the balance shifted, the time I spent in the lab decreased and I became responsible for teaching the control of the cardiovascular and respiratory systems, and exercise physiology to both science and medical students.

I have always been interested in scientific ethics. However, over time, this interest has gradually developed and evolved. After a few years at Leeds, I became the Neuroscience Programme Manager, responsible for running the BSc Neuroscience degree programme. In practical classes, my students were using animal tissues or undertaking experiments using their colleagues as subjects, yet they hadn't really thought about the ethical issues surrounding the use of humans and animals in scientific research so I introduced ethics sessions into the curricula. When the University was awarded a grant to establish a Centre of Excellence in ethics, the Interdisciplinary Ethics Applied Centre of Excellence in Teaching and Learning (IDEA CETL), I was invited to join. I now teach ethics to all students across the Faculty, from biochemists to sports scientists, spending 10% of my time in the Centre developing innovative and engaging ways of teaching ethics to scientists.

A switch towards a more teaching-focused career

Whilst I still run a small research group, the focus of my work has shifted towards teaching, in particular, the development and delivery of new and innovative ways of teaching experimental techniques and scientific ethics to students. With a shift over the last 20 years towards the use of more reductionist techniques (modelling, cell cultures, isolated organs and tissues) in scientific research, there is now a global shortage of scientists who have the necessary skills and expertise to undertake research using intact animals. Whilst the scientific community is actively developing more and more alternatives to the use of animals in research, at present, there is no alternative to their use if we want to increase our knowledge and understanding of how entire body systems work or to develop new medicines. I am involved, both nationally and internationally, in the development of new ways to provide training for scientists in the use of animals in research, which minimise the use of animals, yet still enable these scientists to develop the necessary skills and technical expertise.

Many of the current advances in science are controversial, for example genetic modification of both plants and animals or the use of stem cells. I believe it is essential, not only that scientists consider the ethical issues surrounding their research but also debate these with the general public, particularly young people. In addition to providing training in scientific ethics for both students and staff at the University of Leeds, I also regularly go out into local schools to debate ethical issues in science, particularly the use of animal in research. Discussing ethical issues with young people is a challenge but something I find particularly rewarding, enjoyable and want to share. I now take my students who are interested in science communication and ethics into schools where they create and deliver ethics-based teaching sessions as their final year research projects.

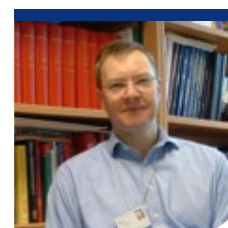
My career path in a nutshell

Since graduating with my BSc Pharmacology degree all those years ago, my career path has slowly shifted from research into teaching. With the recent re-structuring of the Faculty, my job title is now a Senior Lecturer in Neuroscience and Scientific Ethics but I'm still a pharmacologist at heart, applying the knowledge and skills I acquired during my degree in both my research and teaching, focusing on the neuropharmacology and neurophysiology of the cardiovascular, respiratory and gastrointestinal systems.

Over the years my interests have also expanded to now include scientific ethics and science communication.

Career Profile

Dr Ian Wilkinson



Dr Ian Wilkinson
Reader in Clinical Pharmacology,
University of Cambridge

Ian Wilkinson is a Reader in Clinical Pharmacology at the University of Cambridge and honorary Consultant Physician at Addenbrooke's Hospital. He currently holds the VVE Parke's British Heart Foundation Senior Clinical Fellowship. He trained in General Medicine and Clinical Pharmacology initially at Oxford, and then the University of Edinburgh, before taking up his current appointment in 2000. His research is clinically orientated and centres on the physiology and pharmacology of the cardiovascular system, and particularly the large arteries and endothelial function. Current research projects include investigating the effect of ageing on the cardiovascular system, and the link between inflammation and arterial function. He is involved in a number of large collaborative studies including CLEARST Study, the Caerphilly Heart Study, and ENIGMA Study. He has published over 140 original articles and reviews, and has written several books, including the Oxford Handbook of Clinical Medicine. He is Secretary of the ARTERY Society, and Treasurer of the British Hypertension Society.

My current job combines a number of roles – researcher, teacher and physician. In a way that's what interested me in clinical pharmacology in the first place – the academic nature of the discipline, but also the wide variety of roles that clinical pharmacologists play. I work for the University of Cambridge – as something called a Reader, which is an academic post like a lecturer. Currently, I am also one of a handful of Senior Clinical Research Fellows funded by the British Heart Foundation in the UK. Effectively, I am funded by a major UK charity to undertake research into cardiovascular disease, which still kills more people worldwide than any other condition. The main focus of my own research is the origins of hypertension in older people, and potential new treatments. My research is almost exclusively patient-based, with very little time spent in the laboratory. We are actively exploring the mechanisms responsible for stiffening of the large arteries, focusing on calcification and inflammation using new imaging techniques and genetic studies. I currently have a team of eight people who help me with my research, including other doctors, nurses and scientists.

I grew up and went to local schools in Frodsham, a village in Cheshire. Although my schools were not particularly academic, I was fortunate to have very supportive teachers and family. I am still in contact with a few of my former teachers, who I guess were actually early mentors and are responsible for shaping my interest in science and choice of career. From a very early age I had a passion for science. I loved learning about how things worked, taking things to pieces and trying to put them back together again, and conducting experiments. I had an enormous chemistry set and supplemented it with a range of other things from around the house, garage and pharmacies. Throughout Secondary School my ambition was to be a chemist. However, recognizing my potential and the declining state of the UK chemical industry (and at that time of the teaching profession) my mentors pushed me to try for medicine at Oxford. I have to say looking back I am glad they did, but at the time it is something I went along with rather than was passionate about. Nevertheless, I sat and passed the entrance exam and interview and duly was the first person from my school to go to Oxford.

From the beginning of my medical training, it was the science and research opportunities that interested me most. Fortunately, Oxford was full of both, and I had two wonderful tutors who were both pharmacologists, from whom I learned a great deal. It is interesting, on reflection, that I ended up in clinical pharmacology, and I am sure that they and the excellent lecture series laid on by the University had a hand in shaping my career pathway, although it was not so apparent at the time. Despite my academic interests, the clinical (patient) side of medicine always interested me too, probably because I worked with some great physicians but also because I liked the challenge of making a diagnosis – and still do. My clinical mentors taught me a great deal, and also helped guide my choice of junior doctor jobs. I worked in Oxford, Nottingham and Edinburgh before finally moving to Cambridge in 2000. For many years my chosen speciality was chest medicine, perhaps partly because that's what I had been exposed to during my school days when I spent time with family friends who were doctors, but also because I enjoyed

the physiological aspects of the lung. However, while training as a Registrar in Respiratory Medicine in Nottingham I happened to work for a clinical pharmacologist. He was a great mentor and enthusiastically took the time to show me what his research was about and arranged for me to spend time with other researchers elsewhere. This reminded me how much I had enjoyed my pharmacology teaching in Oxford and led to a career change. He also encouraged me to take an academic training route and to combine clinical medicine with patient-centred research. Consequently I went to academic jobs in Oxford and Edinburgh and six years later, emerged as a fully fledged Clinical Pharmacologist.

Although small, clinical pharmacology is a very diverse speciality and encompasses a wide range of interests – from toxicology, through prescribing and drug development, to hypertension and epilepsy. However, it is exactly this flexibility, and the fact that most clinical pharmacologists are academics who do research, that attracted me to clinical pharmacology in the first place. I enjoy the combination of being able to work as a doctor with researching important health-related questions.

Overall, research takes up about half my working week. The rest is split between working as a Consultant Physician on the ward and in outpatients, teaching, and directing the Clinical Trial Unit. Seeing patients is something I still very much enjoy, and I think is important for clinical researchers, like me, as patients are often our inspiration. I teach medical students at Trinity Hall and at the hospital, and junior doctors on the ward. Educating and mentoring young people is a vital part of being a researcher and doctor. It provides a unique opportunity to influence the next generation, and is something I still find incredibly rewarding. As you can imagine all of that takes up far more than the standard 40 hours per week, more like 50 or 60, but I still enjoy it. I like the mix of roles and the fact that I can decide what I want to focus on. I also get the opportunity to travel a fair amount – visiting other researchers around the world to share ideas and learn new techniques, and also to present the results of my own research at conferences. Although getting stuck in Singapore due to the ash clouds, when your wife is 32 weeks pregnant does have its downside!

About the BPS

With almost 2,700 members, the British Pharmacological Society (BPS) is the primary learned society in the UK concerned with research into drugs and the way they work. Its members teach and carry out research in higher education, the pharmaceutical and biotechnology industries, hospitals, and health services. Many members play a key role in teaching medical students the principles of pharmacology, which underpin safe and effective prescribing in the NHS. Others are responsible for the clinical trials that translate new medicines from molecule to society.

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If you are interested in networking with our members and strengthening our community, you should identify which of the individual categories you are eligible to apply for:

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Benefits

- free attendance to BPS scientific meetings including the Winter Meeting to be held in London in December
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- become eligible for bursaries and travel grants to attend meetings in the UK and overseas
- apply for prestigious study awards and prizes such as the A J Clark Studentships and GSK Prize for Young Investigators
- receive regular editions of Pharmacology Matters, the BPS newsletter
- opportunities to contribute to furthering pharmacology, across a range of activities, through the Society's committees, special interest groups and working parties

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'Translating Science into Medicine', Cambridge Science Festival 2011



Dr Anthony Davenport & Dr Lowell Ling
Clinical Pharmacology Unit, University of Cambridge

The annual Cambridge Science Festival took place over two weeks from 14-27 March 2011. It is the largest free exhibition of science in the UK, with over 35000 visitors. This year a number of clinical and basic science students who are studying for PhD or Masters degrees as part of the Translational Medicine and Therapeutics course (<http://tmat.medschl.cam.ac.uk/>) hosted by the Clinical Pharmacology Unit at the University of Cambridge presented an exhibition 'Translating Science into Medicine' on Saturday 26 March.

The objective was to design a 'hands-on' exhibition describing the process of drug discovery from the laboratory to the clinic that would appeal to members of the public of all ages. The challenge as always was to devise activities that were exciting but conformed to health and safety requirements. The exhibition was designed to take visitors through a journey of drug discovery and development, starting with an introduction demonstrating a number of clinical problems and their treatments. This was followed by hands on laboratory demonstrations where visitors were invited to stain and view cheek cells under the microscope, carry out chromatography on Skittles (multicoloured sweets) and grow cells in culture (in Playdoh) but using real Gilson pipettes. Next, the visitors were guided to a series of innovations and drugs that came from translational research, including blood pressure monitors, cholesterol testing packs and finally a display of common drugs. The exhibition ended with a giant puzzle summarizing the phases and cycle of drug development.

The venue was held at St Catharine's College in the centre of the city and adjacent to other exhibitions in the science and engineering departments as well as events aimed at school children. The students included members of the BPS who took the opportunity to display a stand 'What is Pharmacology' together with *Pharmacology Matters* and BPS leaflets on careers.

The event was surprisingly popular with queues forming before the official opening at 10am and continuing throughout the day, with all ages represented. It was hard work but all agreed it was an invaluable experience in communicating science in general and pharmacology in particular, to the public. The highly positive public response has inspired us to be even more ambitious for the Cambridge Science Festival next year.



IUPHAR and BPS Collaborate on Guide to Pharmacology – Online Portal to Launch Autumn 2011



Jonathan Brüün
Director of Communications & Business Development
BPS

The British Pharmacological Society (BPS) and the International Union of Basic and Clinical Pharmacology (IUPHAR) have agreed a collaboration to bring core sets of pharmacological data together online, for the first time.

The collaboration centres on the provision of cross-referenced data from the BPS Guide to Receptors and Channels (GRAC), and the NC-IUPHAR database (IUPHAR-DB) which features classes of drug targets and their ligands. A new, single BPS-IUPHAR online portal will give access to dynamically updated, searchable versions of GRAC (www.brjpharmacol.org/view/0/GRAC.html) and IUPHAR-DB (www.iuphar-db.org), which will be extensively hyperlinked to each other and to other online resources including suppliers' websites.

It is intended that the creation of two complementary resources, consistent in content but different in focus, each carrying the authoritative backing of both IUPHAR and BPS, will be an immensely valuable tool to assist research in pharmacology and drug discovery, educate the next generation of biomedical and clinical scientists and provide the general public with accurate information on how drugs work.

Development work on the project is being undertaken by the IUPHAR-DB team at The Queen's Medical Research Institute, University of Edinburgh, and an online portal – <http://www.guidetopharmacology.org> – will be available in the Autumn of 2011.

There are already plans for further development, as Dr Sam Enna, Secretary-General of IUPHAR explains: "In subsequent years, we would like to expand the coverage of GRAC and IUPHAR-DB through a unified single network of experts, with GRAC encompassing a rapidly expanding, wider range of drug targets and IUPHAR-DB providing more in-depth information and rigorous guidelines for pharmacological evaluations."

Professor Ray Hill, President of the BPS takes up the case for future collaboration: "GRAC and NC-IUPHAR could work together to identify, for each drug target, a small 'gold standard' set of recommended pharmacological tools such as licensed drugs, commercially available experimental compounds, radioligands and so on. Based initially on compounds in GRAC and IUPHAR-DB, this resource could be progressively refined using evidence gathered from the literature and from other online databases to select compounds that have the best profile of 'off-target' actions, effectiveness across commonly used experimental species and proven efficacy both *in vitro* and *in vivo*."

More information on the development will be made available to BPS and IUPHAR members in the coming months.

This article is published jointly in the IUPHAR publication *Pharmacology International* [June 2011], and in BPS magazine *Pharmacology Matters* [August 2011].

BJP British Journal of Pharmacology

Guide to Receptors and Channels (GRAC)

4th Edition
SPH Alexander, A Mathie, JA Peters

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November 2009
www.brjpharmacol.org

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Today's science, tomorrow's medicines

Murder, Mystery, Medicine and their Practitioners



Professor Phil Routledge
President-elect
BPS

The term Pharmacology is said to be derived from the Greek word "pharmakon" (φάρμακον) which means "poison in classic Greek and "drug or medicine" in modern Greek. The following incidents illustrate the relationship between medicines and poisons. The friends of Dr Henry William Lovell Clark, a doctor in the Indian Subordinate Medical Service based in Agra in 1911, might well have had good reason to consider him a most unfortunate man indeed. First he lost his friend Edward Fullam to heatstroke, despite Clark having made the diagnosis and used all his medical skills to try to save his friend's life. Then, 13 months later, Clark's wife was hacked to death by a gang of men in her own bed. It was only when Clark was noted to have been seen frequently in the company of Fullam's grieving widow that the police were alerted and obtained incriminating evidence that Clark had poisoned Edward Fullam using arsenic (the features of acute arsenic poisoning are similar to those of heatstroke), and had arranged the contract killing of Mrs Clark for 100 rupees.

Clark was found guilty of the murder of Edward Fullam and Mrs Clark, and hanged in 1912. Augusta Fullam, who was in on the plot but turned Queen's evidence, was jailed for life. She gave birth in prison to a child of whom Clark was the father, but died in jail just over a year later ("heatstroke" was the recorded cause of death, the same cause Clark had written on Augusta's late husband's death certificate).

Arsenic is a heavy metal that was first used as a medicine more than 2,400 years ago. Its serious side effects meant that it was largely abandoned as a medicine in the 20th century. However reports from China of its beneficial effects in a rare form of leukaemia (acute promyelocytic leukaemia) led to pharmacological research that resulted in arsenic trioxide being approved in the USA by the Food and Drugs Administration (FDA) in 2000 for use in patients with the relapsed or refractory (resistant to other treatments) form of this condition. The 16th century Swiss doctor, Paracelsus stated that "all substances are poisons" and explained that it was often only the dose which distinguishes a remedy from a poison (Figure 1). Pharmacology concerns itself with exploring the relationship between drug dose and effects so that the dose that produces maximum benefit (efficacy) and minimum risk of side effects (toxicity) can be used clinically. In this way, substances like arsenic that were deemed too toxic and abandoned can sometimes be used for the benefit of patients.

The official's business card clearly stated his identity, Dr Jiro Yamaguchi of the Tokyo Metropolitan Disinfectant Corps. It was 1945 and he announced that he had come to the Shiniimachi branch of the Tokyo National Bank to protect the staff against an outbreak of dysentery. The staff obediently swallowed the medicine proffered to them and minutes later, 10 were dead (two others died later) of cyanide poisoning, enabling the doctor to leave the bank with more than 180,000 yen in cash and cheques. There had been two similar episodes earlier at other Tokyo banks, although no-one had been harmed on either occasion. During the first incident a few months earlier, the visiting doctor's business card stated that he

was Dr Shigeru Matsui. In fact that card had been used by mistake, since it belonged to the actual Dr Shigeru Matsui, who, when he heard of this handed the business cards he had received from other people in exchange for his to the police. By a process of exclusion, they identified the likely culprit from one of these cards as Sadamichi Hirasawa, a little known artist and painter, and recovered damning evidence from his home. He was found guilty of murder and sentenced to be hanged. However this sentence was commuted to life imprisonment and he died in prison in 1987.



Figure 1.

Paracelsus (1493-1541) who noted that "All substances are poisons; there is none which is not a poison. The right dose differentiates a poison from a remedy."

Cyanide is a metabolic breakdown product of the anticancer treatment laetrile, which was first advocated for use in 1950 as a treatment for cancer. No controlled clinical trials (trials that compare patients who receive the new medicine to those who do not) of laetrile have been reported, and it was never approved by the FDA who have described it as "a highly toxic product that has not shown any effect on treating cancer." Nevertheless it was estimated that by 1978, more than 70,000 people in the United States had been treated with laetrile (or products containing the same substance - amygdalin which can be obtained from crushed apricot kernels),

and serious adverse effects, including death have been associated with cyanide-containing remedies.

Approval for marketing of a conventional medicine (a "marketing authorisation") is dependent on demonstrating that it works, and that it is acceptably safe and pure. Pharmacologists are involved in the process of identifying safe and effective doses of medicines in man, from the very first administration in healthy volunteers (phase 1 clinical trials) right through to the approval process and then the monitoring of that medicine's safety in patients when marketed (post-marketing surveillance). Such scrutiny of a medicine's safety must continue for its life as a therapeutic treatment, since some rare, delayed or chronic adverse effects may not be discovered until some years after the drug is first marketed.

In 1863, Dr Edmond de la Pommerais was practicing medicine in Paris, and struggling financially, despite receiving significant funds from his wife that he had soon managed to fritter away. He and his mistress, Seraphine de Pawr concocted a plan that de Pawr would be insured for a half a million francs, then feign illness and thus persuade the insurance company to pay out in part as the price for cancelling de Pawr's policy completely. However shortly afterwards Madame de Pawr developed cholera and died after being cared for by de Pommerais. The insurance company were suspicious and her exhumed body was found to contain massive concentrations of the drug digitalis (the bacterial infection, cholera and digitalis poisoning both cause profound diarrhoea). De la Pommerais was tried for the double murder of his mother in law (whom he was also attending just before she died) and of his wife, but found guilty only of the latter. He went to the guillotine in 1864.

A century earlier Dr William Withering used his knowledge of botany and pharmacology to discover that it was the extract of the purple Foxglove (*Digitalis purpurea*) - not the other 20 or more constituent herbs - that produced the therapeutic benefits associated with "Mrs Hutton's remedy", a traditional medicine then used in Shropshire for heart failure. He found that if the leaves were collected when the plant was in flower, he could achieve maximum efficacy and he also developed new methods of preparation to standardize the content of active constituent (subsequently identified as predominantly digoxin). Digoxin in its pure form is still widely used in the treatment of certain forms of irregular heartbeat, although less often now in heart failure. However digoxin can be extremely toxic, and can cause other more serious forms of irregular heart beat that may sometimes be fatal. Therefore its use in patients has to be carefully monitored.

Because the medical practitioner has been seen by society as someone to trust, it is all the more shocking when a doctor is found guilty of murder or even sometimes multiple murders. Two of the convicted murderers I have mentioned (Clark and de Pommerais) practiced medicine and the third (Hirasawa) pretended to be a doctor to gain the trust of a victim. In Conan Doyle's *Adventure of the Speckled Band*, Sherlock Holmes comments that "When a doctor does go wrong, he is the first of criminals. He has nerve and he has knowledge ..." (Figure 2). That knowledge may consist of an understanding of the pharmacological and toxicological effects of medicines. Medicines are also more readily available to a doctor, and since their effects may be similar to those of natural disease, a murder could be concealed (e.g. by writing an alternative cause of death on the death certificate). However rarely it may occur, it is reprehensible whenever that knowledge and position of privilege is abused by a health professional to deliberately do harm rather than to benefit patients. However, the overwhelming majority of doctors over the centuries have continued to earn society's trust by using their

humanity and skill (including their knowledge of pharmacology and therapeutics) "to cure sometimes, to relieve often, and to comfort always".

Pharmacologists are also vital contributors to the process of drug discovery and thus make an enormous positive contribution to health. The pioneering pharmacological research in the UK of Sir James Black, who died only last year, led to two major discoveries. Cimetidine was the first highly effective medicine to treat stomach and duodenal ulcer and propranolol was the first "beta-blocker" drug for use in high blood pressure and several types of heart disease. In 1988, he was awarded the Nobel Prize for Medicine in recognition of these contributions, which have benefited many millions of people worldwide over several decades.

All who will prescribe medicines (doctors, dentists and increasingly some pharmacists and nurses) need an understanding of pharmacology and therapeutics so that they can safely and effectively use medicines and monitor their effects. Pharmacologists are the scientists who teach pharmacological and therapeutic principles to those who will prescribe medicines. They also conduct research to obtain a better understanding of how existing medicines can be used even more safely and effectively. Some help develop public health policies to that same end. Others are also closely involved in the search for new and hopefully even safer and more effective medicines. Pharmacology is about ensuring that today's science is used to deliver tomorrow's medicines, and not tomorrow's poisons.

Acknowledgements

This article is condensed and adapted from the lecture, "Murderous Medics and Mysterious Mayhem" given to the History of Medicine Society of Wales in September 2006. The three episodes described were adapted from "The New Murderers Who's Who" by JHH Gaute and Robin Odell (2nd Edition, Headline Book Publishing PLC, London 1989).

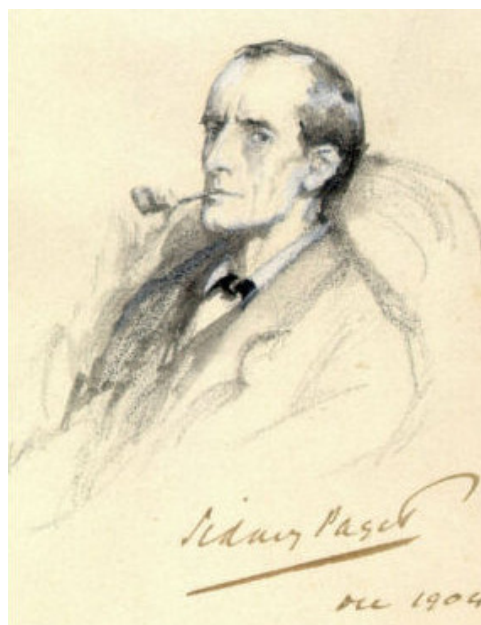
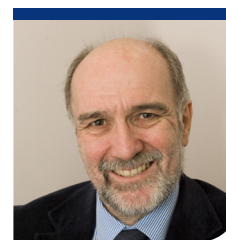


Figure 2.

When a doctor does go wrong, he is the first of criminals. He has nerve and he has knowledge ..." Sherlock Holmes in Arthur Conan Doyle's "Adventure of the Speckled Band".

BPS Winter Meeting, London 2011 - All change for abstracts



Dr Robin Hiley
Vice President - Meetings
BPS

The Winter Meeting - the Society's flagship meeting of the year - will be once again held at the QEII Conference Centre in London, though hopefully without the supporting cast of riot police officers that accompanied last year. We have an exciting programme in the usual format; three cutting edge symposia on each morning followed by plenary lectures at lunchtime - grab-bags will be provided so that you can enjoy nutritional as well as mental sustenance simultaneously. The big change this year affects free communications. This change is not in the poster and oral presentation sessions, which will take place as usual throughout the meeting, but in the way we deal with abstracts.

We will be calling for your abstracts in the summer but they will be refereed before the meeting allowing more time in the scientific sessions for discussing the results and ideas presented, rather than if the commas are in the right place and wondering about the exact composition of the buffer. Once the final submission date is passed, the abstracts will be checked to see that they are appropriate for presentation in a meeting of the BPS (though in my time as Meetings Vice President, only one has been deemed unsuitable) and then placed into the programme. You should still hear within a month when your presentation will take place during the meeting. As before, acceptance of a presentation for the meeting does not guarantee publication in our online journal, pA2online.

When the programme is complete abstracts will be sent to referees as usual, but now the referees will use the abstracts IT system to review the contents, and insert their concerns and comments before the meeting. When the refereeing is complete, you will receive an email inviting you to re-enter the abstract system to view your feedback. Once the system is re-opened, you will have two weeks to revise the abstract to meet the concerns of the referee, **there will be no further opportunity to make changes**. In principal there is no change in the purpose of the review: any changes requested will be to make sure that the abstract is in a form, and has suitable content, to appear in pA2online. If the changes you make meet the requirements of the referee, then your abstract will appear in pA2online shortly after the meeting.

If you choose not to change the abstract, or the modifications do not answer the points raised by the referee, then it will not be published in pA2online, but your poster or communication will still be a part of the meeting. The pre-meeting abstract scrutiny simply replaces the formal visit of the referee during the meeting, and the voting on acceptability - it is not about whether or not your data can be presented to members and their guests in the scientific sessions.

Either way you will now be able to spend your time with the referees, talking about your ideas. Poster presenters will not have to wait for the revisions suggested by the referee to be discussed in a large and mainly empty hall, and those giving oral communications will only discuss the science with the chairman and audience.

The Meetings Committee hope and expect that presenters will have a more uniform experience with regard to refereeing, and will come to the Winter Meeting knowing that their abstract is acceptable for publication (or not if they choose not to modify it fully or at all). All the abstracts (accepted for publication or not) will be available to those attending the meeting, as before, so everyone will be able to read about your work before and during the event.

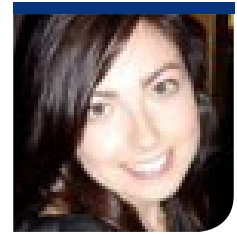
This system is similar to that which has been used with success for several of our other, smaller, meetings, and so we expect it to work well and hope that it will increase the enjoyment and value of the meeting for all those coming to Westminster.

Look at the preliminary programme now, start writing your abstract, and plan your Winter Meeting experience!



News from the Young Pharmacologists

Hannah Watson
Young Pharmacologists Representative
BPS



As always the Young Pharmacologists' Committee is working hard to make 2011 one of our best years to date. We have welcomed several new members to the committee who represent various areas from around the United Kingdom, which opens up our ability to collaborate with further academic institutions. For the remainder of 2011, we have a great deal planned to inspire and guide all the Young Pharmacologists out there. Hopefully, we will see you at one or perhaps more of the upcoming events.

The Twelfth International Conference on Endothelin 2011

The event will this year be held at Clare College, Cambridge on Monday 12 September. There are speakers in attendance from across the globe and there will be discussion on the most up-to-date research in the area of endothelin and endothelin receptor antagonist research. In true BPS style there will of course be a networking event held after the meeting that will be organized by members of the Young Pharmacologists' Committee, so watch this space for more details!

Undergraduate Bursaries for the BPS Winter Meeting 2011

In December we look forward to presenting the Scientific Symposium inspired by "Stem cells: Pharmacology and Therapeutics". It is proving to be an exciting event with some renowned speakers already confirmed and further details being released within the next few months.

As is tradition the BPS will be offering a number of bursaries for undergraduate scientists to present their work at this year's meeting. In past events the standard of research has been exceptionally high and this remains an excellent opportunity to present work at an international conference and gain professional feedback. The poster presentations will be held on the afternoon of Wednesday 14 December.

Podcast Library

The latest online case reports were launched on Friday 13 May featuring the renowned Professors Simon Maxwell and John Westwick. The interviews are biographical and extremely interesting. Keep checking the website for our regularly updated interviews!

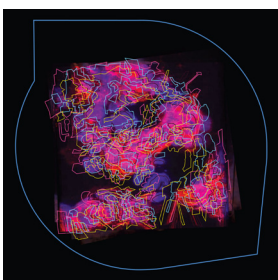
"I love pharmacology" T-shirts

These T-shirts have been circulating since 2010 and proved particularly popular at WorldPharma 2010 held in Copenhagen. All proceeds from their sale will go towards bursaries to enable African scientists to attend the IUPHAR 2014 congress that will be held in South Africa. Please support this great cause by donating just £5 per T-shirt. T-shirts will be available at all BPS events, or contact the BPS office if you would like to order one.

If there are any queries on events or bursaries please don't hesitate to contact [Hazel O'Mullan](mailto:hom@bps.ac.uk) at hom@bps.ac.uk.

Jo Berry

Jo's work started out as little more than a concept to fusing art and science. She is now looking upon a room full of lightboxes, vinyl drawings and digital animations inspired from six months' research at the Queen's Medical Centre, Nottingham. Hijacking Natural Systems is all about understanding natural systems in the human body and ultimately how we might hijack those systems to turn hunger on and off with drugs, and the artwork having its roots in microscope images of human cells.



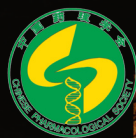
The scientists Jo worked with study how a 'hunger' hormone stimulates the body's cells, potentially paving the way for new drug treatments for obesity and diabetes by 'turning hunger on and off'. She interpreted and manipulated their microscope images to create the images on display.

Ghrelin Internalization: the hunger hormone ghrelin was added and the reaction filmed for 10 minutes. Using the laboratory's Zeiss software to create a stereo vision of the cells, she took stills from

the stereo movie and used each image to create a layered digital drawing, which will form part of the light box. The overall shape of the lightbox was created to form a capsule to house this beautiful organic amorphous image.

You can view Jo's diverse project in Derby on:

1. BBC Big Screen Market Place Derby
2. Royal Derby Hospital - level 5 near Café, Derby Healthcare PLC, Derby City General Hospital, Uttoxeter Road, Derby DE22 3HJ
3. Billboard Art Board at Burton Road near Argyle Street (from 1 -14 August)
4. Adshell Bus Stop on Normanton Road near Grove Street
5. Outreach & Learning Projects - Participants Artwork on Adshell Bus Stops (from 1st -14 August): Duffield Road, off Church Walk; Kedleston Road, opposite Technical College; Burton Road, Manor Road (To City); Uttoxeter Road, opposite hospital; St. Peters O/S 6 + 63 Town centre; Derby Road (opp 100 Spondon) Nr Asda Supermarket DE21 7L
6. Vinyl Artwork on: Derby Museum & Art Gallery Shop window; 3 windows adjacent to the Museum on Cheap side; Optimum Gifts Ltd., 38/40 The Strand; The Wonky Table, 32-33 Sadler Gate.



Registration now open!

Tuesday 13 December

08:00 – 10:00 Registration
10:00 – 13:00 Symposia:

Therapeutic potential of family B G protein-coupled receptors. Organizers: Dr Debbie Hay, University of Auckland and Dr David Poyner, Aston University

Pharmacology in drug development and regulation. A joint symposium with the AHPPI. Organizers: Professor David Webb, University of Edinburgh and Dr Martin Todd, AstraZeneca

Medical cannabidiol – is there anything it can't do? Organizers: Dr Karen Wright, Lancaster University, Dr Saoirse O'Sullivan, University of Nottingham and Professor Roger Pertwee, University of Aberdeen

13:00 – 14:00 GSK Prize Lecture for Research in Clinical Pharmacology - Dr Ian Wilkinson, University of Cambridge
14:00 – 15:00 ASCEPT Lecture – 'Ageing: a new frontier for drug discovery' - Professor David Le Couteur, University of Sydney, Australia
14:00 – 15:00 AstraZeneca Women in Pharmacology Lecture and Reception – Professor Maria Belvisi, Imperial College London
14:00 – 16:30 SpR Session
15:00 – 17:30 Oral communications – Basic Pharmacology I+II
17:30 – 18:30 Poster session – Basic Pharmacology
18:30 – 19:30 Gaddum Prize Lecture – 'The birth and postnatal development of purinergic signalling' - Professor Geoff Burnstock, University College London
19:45 Informal networking event organized by the Young Pharmacologists Committee – Tattershall Castle

Wednesday 14 December

08:00 – 09:00 Registration
09:00 – 12:00 Symposia:

Working towards the understanding of TRPA1. Organizers: Professor Sue Brain, King's College London and Professor Maria Belvisi, Imperial College London

*Clinical pharmacology of drug development and clinical research in China. Organizers: Chinese Pharmacological Society

Stem cells – pharmacology and therapeutics. Organizers: Young Pharmacologists Committee

12:00 – 13:00 J R Vane Prize Lecture - 'Adrenoceptors - Black Boxes to black boxes over my lifetime' - Professor Ian McGrath, University of Glasgow

13:00 – 14:30 President's lecture
14:00 – 16:00 Oral Communications – Clinical Pharmacology I+II
14:30 – 16:00 Oral Communications – Basic Pharmacology
16:30 – 17:00 Clinical Section Annual Meeting
16:00 – 17:00 Poster Session – Basic Pharmacology (including undergraduate bursary posters)
17:00 – 18:00 Paton Lecture – Professor Rod Flower, Barts and The London/ William Harvey Research Institute
19:15 BPS Prize Reception
20:00 BPS Annual Dinner & Prize Giving

Thursday 15 December

08:00 – 09:00 Registration
09:00 – 12:00 Symposia:

Gasotransmitters as physiological mediators and therapeutic agents: the challenges ahead. Organizers: Professor Andreas Papapetropoulos, University of Patras and Dr Adrian Hobbs, University College London

Targeting the resolution of inflammation: opportunities for innovative drug discovery programmes. Organizers: Professors Rod Flower and Mauro Perretti, Barts and The London, William Harvey Research Institute

The cannabinoid system as a target for cardiovascular disease. Organizer: Professor Cherry Wainwright, Robert Gordon University

12:00 – 13:00 MSD Prize Lecture – 'Translational Neuropharmacology: The use of human isolated gastrointestinal tissues' - Professor Gareth Sanger, Queen Mary University of London
13:00 – 14:00 Gary Price Memorial Lecture – 'Voltage-gated calcium channel alpha2delta subunits and the elusive mechanism of action of gabapentin' Professor Annette Dolphin, University College London
14:00 – 15:00 Annual General Meeting
15:00 – 16:00 Poster Session – Basic Pharmacology
16:00 – 17:30 Oral Communications – Basic Pharmacology I+II
18:00 Meeting concludes

Publish or Perish

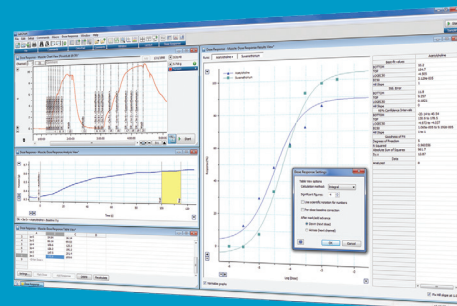
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