Pharmacology International

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In This *Anniversary* Issue

50 YEARS OF SUCCESS

By Sue Piper Duckles
IUPHAR President on behalf of the 2006-2010 IUPHAR officers
Irvine, California, USA

During eight years of participation in the leadership of IUPHAR, first as Secretary-General and then as President, I have been asked more than once, "Why does Pharmacology need an organization like IUPHAR?" The implication is that, in this modern age of easier global communication and travel, and increasing internationalization of science, perhaps IUPHAR is no longer relevant. So, what exactly does IUPHAR contribute to the discipline of pharmacology that can't be done by others? Many IUPHAR successes are reviewed in other articles in this issue. Below, a few examples of IUPHAR contributions are briefly reviewed, as illustrations of the way in which IUPHAR, with limited financial resources but a wealth of intellectual capital has been able to leverage international connections to make significant contributions to our discipline.

World Congresses. For many, IUPHAR is synonymous with periodic World Congresses. In contrast to the situation 50 years ago, however, many of us now travel frequently internationally to scientific meetings, and even some "national meetings" have become international in character. So, the argument goes, why continue the World Congresses of Pharmacology? First of all, for many of our colleagues and their students in emerging countries, the World Congresses of Pharmacology represent a rare and, for some, unique opportunity to interact with scientists from around the world. Secondly, our congresses provide an international forum for exploration of the changing nature of our discipline, with the 2010 Congress exemplifying this opportunity. Finally, the Congresses offer those involved in teaching the additional benefit of learning about current and future developments in areas of their interest.

WorldPharma2010 July 17-23 Copenhagen, Denmark
Bridging Basic and Clinical Pharmacology

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50 YEARS OF SUCCESS (continued)

Pharmacology has always been a basic science with a very direct connection to therapeutic advances and medical practice which is, of course, part of its appeal to many. The recent decision to change the name of the society to the International Union of Basic and Clinical Pharmacology and to combine in one venue the World Congress of Pharmacology with the Congress of Clinical Pharmacology and Therapeutics reflects this fundamental feature. The Danish Pharmacological Society has taken on this mandate with gusto. Kim Brøsen, Michael Mulvany and their colleagues have created a novel programmatic format designed to effectively cover a broad range of topics. Participants will have the opportunity to select from a diverse menu of offerings. One can concentrate on a few focused conferences and explore certain topics in depth or, alternatively, sample a larger variety by attending symposia covering a range of topics.

Evidence supporting the continued popularity of the congresses is provided by the fact that several IUPHAR member societies continue to be enthusiastic about the opportunity to host them. For the 2014 Congress, five bids were presented and the winners, the South Africans, have already begun planning the program. With many excellent bids submitted for the 2018 Congress, it seems the IUPHAR World Congress will continue well into the future to play an important role in promulgating the advances in our discipline.

IUPHAR Nomenclature Committee (NC-IUPHAR) and Receptor Database. A major contribution of IUPHAR over the last two decades has been the work of NC IUPHAR (www.iuphar-db.org). As described by Colin Dollery in this issue, NC-IUPHAR was initially developed in the 1980's as a

Some members and guests of the NC-IUPHAR Committee
Back row (L→R): Colin Dollery, Baljit Khakh, Joe Lynch, Rick Neubig, Eliot Ohlstein, Anthony Davenport, David Lodge
Middle row (L→R): Mike Jarvis, Graham Collingridge, Neil Millar, Richard Olsen, Tom Bonner, Bill Catterall, Tony Harmar
Front row (L→R): John Peters, Michael Spedding, Sam Enna, Joanna Sharman, Valerie Hale

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50 YEARS OF SUCCESS (continued)

response to confusion about receptor nomenclature as more sites were being discovered using the tools of the molecular biologist. Since then, literally, hundreds of international experts have worked together with the goal of synthesizing information about receptor structure and function as well as prototype drug action and selectivity arising from disparate scientific approaches. Starting with publication of compendia distributed at the World Congresses of Pharmacology, and the subsequent growth of the Internet, the focus has now shifted to construction of comprehensive databases which can continuously provide up-to-date information as the science evolves (see article by Michael Spedding and Tony Harmar in this issue).

Such an effort is well beyond the financial capability of IUPHAR. However, with loyal support from corporate and member benefactors, and constant fund-raising efforts, substantial amounts of funding have been raised over the years to underwrite this program. The work of NC-IUPHAR is a perfect example of combining the fund-raising ability of an international organization such as IUPHAR with the dedication and hard work of a strong cadre of scientists. This combination has allowed NC-IUPHAR to continue to make significant contributions to strengthening our discipline.

Some members of the Clinical Pharmacology Division Board
Back row (L→R): Patrick du Souich, Kalle Hoppu, Guilherme Suarez-Kurtz, Lars Gustafsson, Darrell Abernethy, Emilio Sanz, Ingolf Cascorbi, Mahmoud Khayyal
Front row (L→R): Wei Wei, Gilberto Castañeda-Hernandez, Petra Thürmann, Wim du Plooy, Hyung-Keun Roh, and David Webb
(www.iuphar.org/clin_officers.html)

Clinical Pharmacology. For many years the Clinical Pharmacology Division has worked diligently to reinforce relationships with the World Health Organization (WHO) to develop a partnership for strengthening the rational use of medicines around the world (see Sjöqvist and Smith, and Hoppu articles in this issue). An example of a recent success is the role played by the Clinical Division in encouraging WHO to develop an initiative to improve the use of medicines in the pediatric population: “Make Medicines Child Size”. With the moral support of IUPHAR, and a relatively small amount of seed money, Kalle Hoppu has played an important

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50 YEARS OF SUCCESS (continued)

role in convincing WHO to launch this effort. As a consequence, WHO received a multimillion dollar grant from the Gates Foundation. The IUPHAR Clinical Pharmacology Division, under the leadership of Patrick du Souich, is now working with WHO to move this initiative, as well as others, forward. Again, this is an excellent example of how dedicated and determined individuals can work with IUPHAR to advance pharmacology internationally.

Integrative and Organ Systems Pharmacology (IOSP). A recent IUPHAR initiative reflects the growing recognition in many countries of the need to educate young scientists in the integrative approaches needed for pharmacologic research in addition to the more molecular techniques (see *Pharmacology International*, Dec. 2008 at www.iuphar.org/pubs_arch.html; see also Bylund article, this issue). The goal is to build on the development of courses in integrative pharmacology that have been presented in countries such

Some members and guests of the IUPHAR IOSP Initiative
(L→R): Anastasia Guantai, Gabrielle Hawksworth, Christiaan Brink, Mohamed Khayyal, Douglas Oliver, Lillian Mokoena, David Bylund

as the United States and Great Britain, and to make similar offerings available throughout the world. Initial financial support by IUPHAR and member societies convinced David Bylund and the IUPHAR Teaching Section to join the effort.

Because the 2014 World Congress of Pharmacology will be held in Cape Town, South Africa, it was decided to initially focus this effort on the African continent. A successful proposal for funding was submitted to the International Council of Science, with several training courses planned for various parts of Africa in 2009 and 2010. During the 2009 IUPHAR Executive Committee meeting in Cairo, representatives of a number of African countries came together with members of the IOSP planning committee and the IUPHAR Executive Committee to discuss needs in different regions of that continent and how these might best be addressed. This IOSP effort is

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50 YEARS OF SUCCESS (continued)

timed to integrate with the efforts of the 2014 World Congress organizers to improve Pan-African pharmacology communications through an initiative named Pharmacology for Africa (Pharf*A*: www.iuphar-africa.org).

Summary. So, why does Pharmacology need an organization like IUPHAR? The above examples reflect a few of the major initiatives of IUPHAR. Some have been ongoing for many years; others are more recent. But all of them reflect four principles: an issue that our discipline needs to address internationally, use of the limited financial resources to seed new projects, the ability of IUPHAR to facilitate international fund-raising, both from its members and from corporate and non-governmental agencies, and last, but certainly not least, the strength of the international intellectual capital that IUPHAR represents. As shown by past successes, IUPHAR can accomplish great things and will continue to do so! ●

Sue Piper Duckles
President

S. J. Enna
Secretary-General

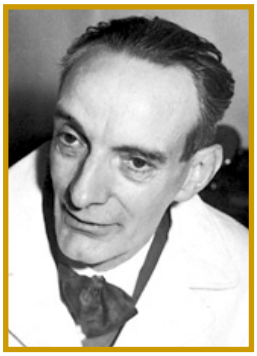
Urs T. Ruegg
Treasurer

EXCERPT
FROM PHYSIOLOGIST TO PHARMACOLOGIST: PROMOTION OR DEGRADATION?

By Börje Uvnäs
SEPHAR Secretary 1963-1966
IUPHAR President (2 terms) 1966-1972

The "Fathers" of SEPHAR: (L→R) Carl Schmidt, Börje Uvnäs, and Corneille Heymans (Source:"Börje Uvnäs and the Rise of Modern Pharmacology" by Bertil Fredholm, Trends in Pharmacological Sciences, Volume 25, Issue 4, April 2004, Pages 170-171.)

In the 1950s, beginning at the 18th congress of the International Union of Physiological Sciences (IUPS) in Copenhagen in 1950, a special pharmacology day was arranged at the end of the meetings. At these gatherings, the question of an independent international organization of pharmacologists was repeatedly put on the agenda. An international committee was set up with Corneille Heymans of Gent as chairman and Carl F. Schmidt of Philadelphia as secretary. After nearly ten years of discussions and negotiations, IUPS in 1959 agreed to the formation of an independent division for pharmacologists within the organization, the Section on Experimental Pharmacology (SEPHAR). The agreement was a typical compromise. The constitution of IUPS was revised to authorize SEPHAR to "organize international conferences, symposia and congresses and to carry on other activities provided that they do not conflict with the aims and principles of IUPS." This objection led to an agreement that SEPHAR would do its best not to compete with or otherwise weaken the triennial congresses of IUPS whenever it arranges separate international pharmacological programs." Carl Schmidt was elected the first president of SEPHAR with Daniel Bovet as secretary. The SEPHAR Council had its first meeting in Stockholm in 1961. Council loyalty to IUPS was demonstrated by its appointment of a liaison officer, E. J. Ariens, as a member of the local organizing committee for the next physiology congress in Leyden in 1962. The council also decided to continue pharmacology day at future physiology congresses.



Daniel Bovet (Source: www.NobelPrize.org)

As years passed and increasing contacts with foreign colleagues widened my horizons, I could not avoid recognizing the increasing tension between physiologists and pharmacologists, as the repeated proposals for an independent international pharmacological organization showed. The notion of holding an international meeting of pharmacologists in Stockholm was born over a drink in my home one fall evening in 1958. My friend, Tom Maren, professor of pharmacology in Gainesville, Florida, and I were discussing the unsatisfactory international position

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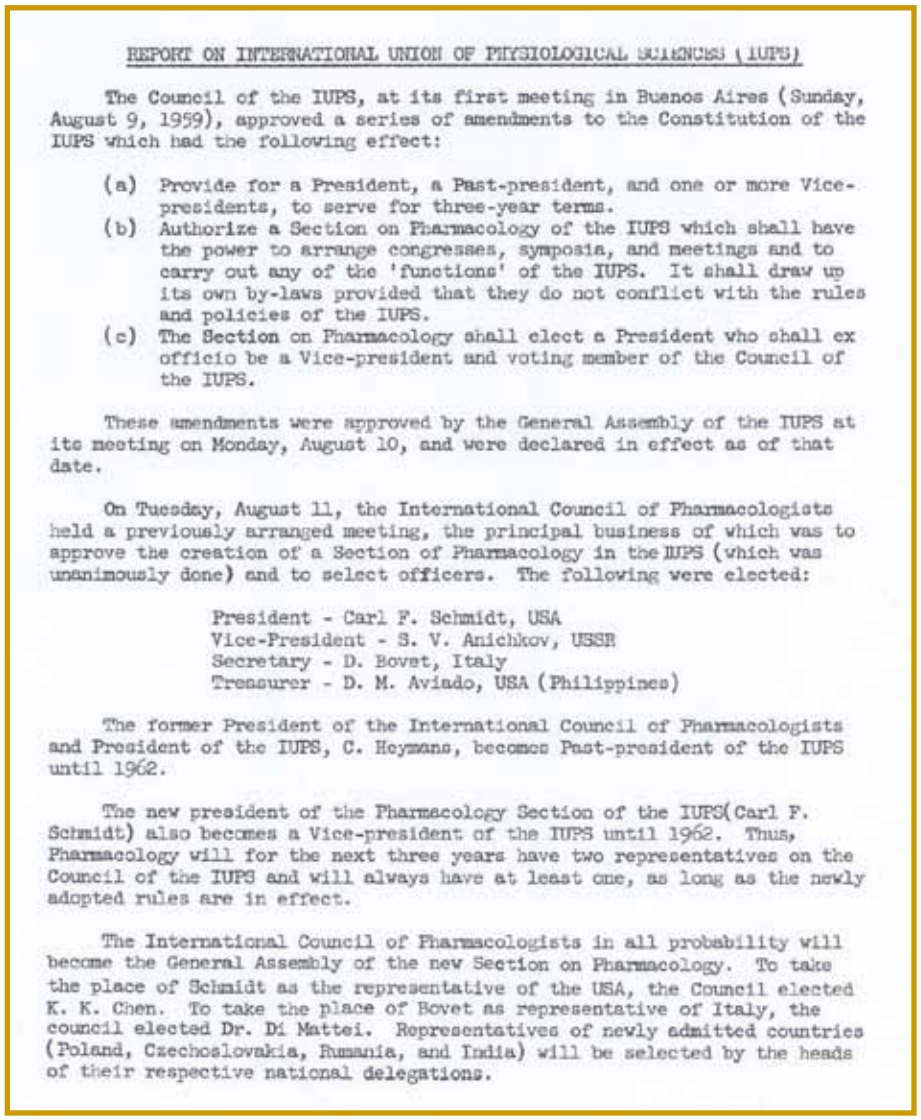
of pharmacology. True, negotiations had by then begun to form a pharmacology division within IUPS. Even so, dissatisfaction was widespread, especially among biochemically oriented pharmacologists, who felt no community with physiologists and who wanted to break loose completely to organize their own scientific programs.

Thomas H. Maren
(Source: http://vam.anest.ufl.edu/maren/thomasmaren.html)

Tom Maren belonged to the group of young non-traditional biochemical pharmacologists who pleaded for the independence of pharmacology. Tom and I decided to make inquiries on the question among prominent friends and colleagues. The correspondence in my files reveals little enthusiasm and encouragement for the formation of an independent pharmacological association. Most responses were ambiguous or passive. Some were directly negative. Most felt that to break with the physiologists was a mistake; many predicted difficulty in raising the necessary funds.

In the meantime SEPHAR was officially established -- not without opposition within the parent organization -- at the IUPS congress in Buenos Aires in 1959. As mentioned above, according to the revised IUPS statutes, the new division was authorized to organize its own international meetings.

The formation of SEPHAR paved the way for international pharmacological activities. But when we in Stockholm undertook to arrange the first international pharmacological meeting, we were well aware of the divergences of opinion, not only about what form such a meeting should assume but even about whether it should be held at all. Some pharmacologists were enthusiastic advocates of an international pharmacological congress of the conventional kind. Others favored the organization of symposia. Lastly, there were those who rejected the whole idea. In particular, I understood the apprehensions of those who felt that an international congress of pharmacologists would weaken the valuable communication between physiologists and pharmacologists long fostered by the international physiological conventions. As a physiologist by training I could well appreciate that point of view. However, like many others, I felt that the danger of a schism among the pharmacologists themselves was so great that some form of an international gathering should be arranged. A feasible compromise solution -- at least for the time being -- was



REPORT ON INTERNATIONAL UNION OF PHYSIOLOGICAL SCIENCES (IUPS)

The Council of the IUPS, at its first meeting in Buenos Aires (Sunday, August 9, 1959), approved a series of amendments to the Constitution of the IUPS which had the following effect:

(a) Provide for a President, a Past-president, and one or more Vice-presidents, to serve for three-year terms.
(b) Authorize a Section on Pharmacology of the IUPS which shall have the power to arrange congresses, symposia, and meetings and to carry out any of the 'functions' of the IUPS. It shall draw up its own by-laws provided that they do not conflict with the rules and policies of the IUPS.
(c) The Section on Pharmacology shall elect a President who shall ex officio be a Vice-president and voting member of the Council of the IUPS.

These amendments were approved by the General Assembly of the IUPS at its meeting on Monday, August 10, and were declared in effect as of that date.

On Tuesday, August 11, the International Council of Pharmacologists held a previously arranged meeting, the principal business of which was to approve the creation of a Section of Pharmacology in the IUPS (which was unanimously done) and to select officers. The following were elected:

President - Carl F. Schmidt, USA
Vice-President - S. V. Anichkov, USSR
Secretary - D. Bovet, Italy
Treasurer - D. M. Aviado, USA (Philippines)

The former President of the International Council of Pharmacologists and President of the IUPS, C. Heymans, becomes Past-president of the IUPS until 1962.

The new president of the Pharmacology Section of the IUPS(Carl F. Schmidt) also becomes a Vice-president of the IUPS until 1962. Thus, Pharmacology will for the next three years have two representatives on the Council of the IUPS and will always have at least one, as long as the newly adopted rules are in effect.

The International Council of Pharmacologists in all probability will become the General Assembly of the new Section on Pharmacology. To take the place of Schmidt as the representative of the USA, the Council elected K. K. Chen. To take the place of Bovet as representative of Italy, the council elected Dr. Di Mattei. Representatives of newly admitted countries (Poland, Czechoslovakia, Rumania, and India) will be selected by the heads of their respective national delegations.

(Source: The Physiologist)

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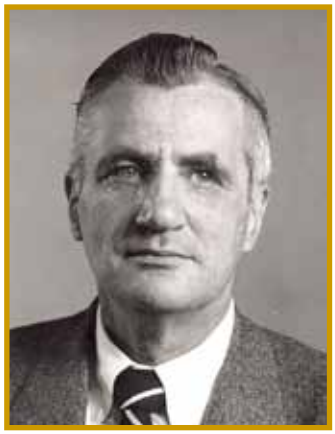
to organize pharmacological meetings that would provide satisfactory interchange between older and younger generations and offer opportunities for contact not only with physiologists but with biochemists and representatives of other allied disciplines.



Bernard B. Brodie

At a preliminary informal meeting in Washington early in the winter of 1959, I declared my willingness to arrange a pharmacological program in Stockholm. SEPHAR's agreement not to compete with the 1962 IUPS congress precluded emphasis on physiological presentations. The recent outstanding developments in biochemical pharmacology spoke in favor of a biochemical approach. We therefore decided to put together a series of symposia on the topic, "Modes of Actions of Drugs." One of the most active spokesmen for this program was Bernard B. Brodie, at that time head of the Department of Chemical Pharmacology at the National Institutes of Health in Bethesda, who gave us his enthusiastic and invaluable support from the beginning. K. K. Chen from the Lilly Company in Indianapolis was another indefatigable and influential supporter. C. Heymans of Gent and C. Schmidt of Philadelphia, who joined when we were well embarked on the adventure, also gave full and unflinching assistance. Even IUPS contributed 2,500 U.S. dollars for preliminary expenses.

Ko Kuei Chen

(Source for above two photos: www.aspet.org/public/aspet/presidents.html)

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FIRST INTERNATIONAL PHARMACOLOGICAL MEETING

At the International Physiological Congress in Buenos Aires, August 1959, an International Section on Pharmacology was formed as a subdivision of the International Union of Physiological Sciences. It has now been decided to hold the First International Pharmacological Meeting in Stockholm, August 22-25, 1961. The date has been so chosen to allow visitors to the International Congress of Biochemistry in Moscow, August 10-16, 1961, to attend the convention in Stockholm on their way back from Russia. The scientific program will be restricted to topics under the general heading of "Mode of Action of Drugs." For further information write Secretary General Dr. Arvid Wretlind, Karolinska Institutet, Stockholm 60, Sweden.

The Section on Pharmacology, International Union of Physiological Sciences (IUPS), will receive a grant from the National Institutes of Health, Dept. of Health, Education and Welfare, for the purpose of paying travel expenses for American Scientists to the First International Pharmacological Meeting in Stockholm.

Applications should be made in triplicate to Dr. Carl F. Schmidt, President of the Section on Pharmacology of the IUPS, Dept. of Pharmacology, University of Pennsylvania, School of Medicine, Philadelphia 4. Please give full name, age, address, nationality, earned degree(s), academic affiliation, membership in any biological society, field of research. Please refrain from applying if you are a holder of any government or private grant which allows travel funds. The deadline is May 1, 1961.

(Source: The Physiologist)

In spite of the efforts of the organizing committee to give the program an international character, scientifically as well as geographically, Americans clearly dominated the meetings. Five out of eight organizers and 478 out of 1483 attendees were Americans. In angry letters the Russians, French, Belgians, and others accused us of favoring or giving in to the Americans. The fact is, however, that the program committee's decision to emphasize biochemical pharmacology was more or less forced upon us by our agreement with the IUPS

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not to focus on physiology and the Americans, and to a certain extent the Germans, were the leaders in biochemical pharmacology at that time. This new branch of pharmacology was still rather undeveloped in most European countries, especially in those where the complainers came from.

The Stockholm meeting was to become not only the first in a series of successful international pharmacological congresses and a strong impetus to the development of the field. It also led to the formation of the International Union of Pharmacologists (IUPHAR). IUPHAR was officially inaugurated the General Assembly of the IUPS in Tokyo on September 2, 1965. The first ordinary meeting of the IUPHAR council was held in Sao Paulo on July 28, 1966. Since then seven IUPHAR congresses have been held, in Stockholm in 1961, headed by myself; in Prague in 1963, headed by H. Raskova; in Sao Paulo in 1966, headed by M. Rocha e Silva; in Basel in 1969, headed by K. Bucher; in San Francisco in 1972, headed by R. Featherstone; in Helsinki in 1975, headed by K. Paasonen; in Paris in 1978, headed by P. Lechat; and in Tokyo in 1981, headed by S. Ebashi.

Within IUPHAR the divisions of clinical pharmacology and of toxicology demonstrate not only the growth of pharmacology as a field, but also IUPHAR's commitment to represent all aspects of the discipline, allowing new branches independence within the framework of the parent organization. With its membership in ICSU, WHO, CIOMS, and various other international scientific organizations, IUPHAR belongs to a global network of government, academic, industrial, and other organizations through which it exerts worldwide influence on all aspects of pharmacological research and teaching as well as on drug development and pharmacotherapy.

My years as secretary of SEPHAR and then as president of IUPHAR were a very challenging and profitable time, both scientifically and personally. My understanding has widened; my circle of friends includes people from all over the world. The steady growth of IUPHAR and the success of its congresses, begun so modestly in Stockholm over 20 years ago, has given me great personal satisfaction. To be a retired professor in Sweden has its advantages. The law provides an emeritus professor a laboratory and office space for research and teaching activities, that is, if the available resources allow. I am a very lucky man to have retired from a department with such resources, so I spend my time more or less as before, in my office and in my labs, aided by kind, loyal, and experienced assistants and coworkers. My three hunting dogs accompany me to my office and home as well as hunting, and I can work undisturbed by committee meetings and the other official duties that previously were a heavy burden. I consider myself lucky to have entered pharmacology at the beginning of its rise to an independent discipline and to have witnessed its enormous national and international growth from a branch of physiology to an important discipline in the forefront of medical research. I have never regretted my desertion of physiology for pharmacology. ●

Börje Uvnäs
1913 - 2003

April 10, 2008

Sue Piper Duckles, Ph.D.
IUPHAR President
Department of Pharmacology
School of Medicine
University of California
Irvine, CA 92697 USA

Dear President,

Thank you very much for your kind congratulation of my 95th birthday, which in fact, is January 2, 1913, but was celebrated exactly on the date of your letter. I am blind, my hearing is poorer and poorer. Apparently, I am born under a lucky star as my memory and ability to answer is still, to some extent, present.

In 1947 I was able to spend some time at the Department of Pharmacology of the University at Oxford. During this period the first worldwide meeting of the physiologists took place in Oxford. The Chairman of the department was J.H. Burn. I owe a lot to this stay for my development in pharmacology as well as other matters. Quite a number of foreign students came for training. They all were accepted regardless of their country of origin, religious or other properties. The typical tea time from 11 a.m. to 4 p.m. was always kept. The Department was open 24 hours a day, the University Library until 2 a.m. The only less interesting event for a central European stomach like mine was the lunch at 1 p.m.

Fantastic was this spirit. In general, the conversation was about the description of a good experiment, why and what, not about the last football game or other sports events. The working hours were not fixed but, from time to time, each of us had meetings with the Chairman and experiments were analyzed in detail together with the plans for the next steps.

Worldwide the Nazis expatriated some outstanding physiologists, pharmacologists and others from Germany, who found opportunities to live and work in Great Britain. Among them was one of the three Nobel Prize winners for the discovery of penicillin, Blaschko, the eminent biochemist, Bülbring, working with Burn, and Feldberg, Vogt, and others.

I have the books of Committees and Celebrations and even the abstracts of the Oxford meetings. I had in my personal property a large photograph of all the members of the Congress and on the reverse side of each head was an indication who was who. In none of the official documents will you find the name of a pharmacologist. But the national societies of pharmacology existed in several countries, including the USA (since 1908 from Abel) and Great Britain. Thanks to these societies, pharmacologists were invited to the restaurant at the zoo. I remember this dinner and the extraordinary chance to sit near several internationally known pharmacologists, as well hear a short speech given by an American pharmacologist. It might have been Tainter, but I am not sure. The speaker was sorry that the voice of pharmacologists was not officially present

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at the Oxford meeting. The next World Conference of the Physiologists was entrusted for 1950 to Denmark. There started the efforts for an International Union of Pharmacology.

This is another story. I hope the steps of the Americans for the independence of pharmacology science from the Physiological Union and the formation and fantastic growth up to today are well documented in history. I promised Prof. Mulvany from Aarhus, to prepare all I have about the meeting in Denmark in 1950.

When you are young, you have the energy to try to ameliorate situations, even when it seems to be impossible. After 1948, with the Soviet power in our country, and travelling to the West, many things became extremely difficult. These actual political situations always reflected on science and, of course, affected pharmacology.

In 1961 Swedish pharmacologists in collaboration with some American pharmacologists organized the first Pharmacology World Meeting in Stockholm. Times were little better and we concentrated all our effort to get from our government authorities the necessary written documents to attend the meeting. They responded that the visas would be issued if the next Pharmacology World Meeting would be in Prague. I still almost cannot believe how hard we fought for these imposed demands. Some people were ultimately allowed to attend the 1961 World Meeting in Stockholm. But the real disaster took place about two weeks before the Stockholm meeting began. The East Germans constructed what was known as the Berlin Wall. As an aside, each National Society had one vote on where the next meeting would be. We had heard that the American delegate had received an order from the USA State Department: anywhere but not behind the Iron Curtain. There I learned what lobbying meant. We tried to persuade the delegates that if they voted for Prague then the density of the Iron Curtain would be a little looser and, if the meeting were successful, it would allow us and other nations behind the Iron Curtain, to communicate and, hopefully, travel more to western scientific institutions. Unbelievably, we succeeded. Pharmacologists throughout Czechoslovakia helped prepare for the second Pharmacology World Meeting in Prague. The meeting was, in fact, successful. All during the sixties our young people had more opportunities to stay, and for longer periods of time, in some interesting laboratories in the West and East. The success of the Prague Congress brought to me, personally, for a number of years, many responsibilities in SEPHAR, eventually IUPHAR, and other organizations. The highlight came in 1966 when 26 Czech and Slovak pharmacologists, toxicologists, and clinical pharmacologists were present at the IUPHAR World Congress in Brazil. This was a comparatively quiet but productive period.

The invasion of Czechoslovakia by five armies led by the Soviets on August 21, 1968 changed everything. For me, personally it meant spending the next 20 years working among cows and calves. But, if you are old enough and have experience in pharmacology, even this situation can bring some useful results. It was better then cleaning windows or streets. The Velvet Revolution changed all this but, of course, by then I was too old to take any responsibilities. On 15th January 2008, when my 95th birthday was celebrated, it was for me almost unbelievable how many really young people, as well as those only 20 to 30 years younger than me, gave me this unforgettable event.

It felt like old times. That you contributed to these memories as the current President of IUPHAR warmed my heart.

With kindest regards and thanks,

Helena Rašková

Helena Rašková
Czech Republic
IUPHAR Secretary-General 1969-1972
IUPHAR Vice President 1966-1969
(Edited for English by S.J. Enna)

Better Medicines through Global Education and Research

SEPHAR-IUPHAR 1959-2009

Pharmacology International

June 2009

50th Anniversary Edition

IUPHAR - WHAT NOW?

By William Bowman
Glasgow, Scotland, UK
IUPHAR Secretary-General 1994-1998
First Editor-in-Chief of Pharmacology International

By now there are few readers of *Pharmacology International* who were present at the first IUPHAR meeting in Stockholm in 1961. How enthusiastic we all were in those early days. Pharmacology had not long crept out from the umbrella of Physiology, and was still called 'Materia Medica' at many Universities. But now we had a world-wide organisation comprised of individuals who were internationally recognized as experts on drugs and medicines, how they act and interact at the molecular level, their toxicity and abuse potential, and how the body deals with them. IUPHAR, we believed, would be the world's repository of information and expertise on all aspects of drugs and medicines. As the world's ultimate, disinterested authority, it would be consulted by governments, and be authoritatively involved in giving advice on matters pertaining to teaching and research in the field.

IUPHAR has achieved hugely important innovations in our discipline and no one is more pleased and proud than I. Others will remind you of these. But can we say that governments and medicine in general make adequate use of IUPHAR's immense expertise? It is unfortunately the case that among those physicians who are not actually clinical pharmacologists, most do not know IUPHAR, and those who have heard of it generally think it is some kind of ivory tower organisation in which medical scientists mutter darkly and esoterically to one another. While they may think we are engaged in interesting projects, they believe these are totally irrelevant with regard to drug therapy and patient welfare. It is worrying to observe that, in the UK at least, university pharmacology departments are being merged into other units. Loss of the name leads to loss of teaching staff and to an apparent diminution of the subject's importance. In the UK, clinical pharmacologists are becoming a rare species despite the fact that many are elected to lead highly important national medical committees.

We are all aware that medications can be used to their maximum benefit and safety only when their mechanism of action, their propensity to interact one with another, their toxicity, and their pharmacokinetics are understood at the most basic molecular level. Many eminent pharmacologists have repeatedly warned that while physicians spend the biggest proportion of their time prescribing drugs, the time spent in their medical schools learning about how drugs work and other aspects of pharmacology is relatively small. It is not surprising then that iatrogenic damage from drugs resulting from inappropriate prescribing is increasing alarmingly. Professor David Webb and his colleagues in Edinburgh

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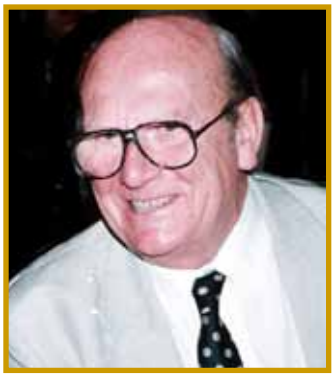
IUPHAR - WHAT NOW? (continued)

(Aronson, Henderson, Webb & Rawlins, 2006; Maxwell, Cascorbi, Orme & Webb, 2007; Heaton, Webb & Maxwell, 2008) recently conducted a detailed and thorough study of the preparation of medical students to prescribe medicines. Thousands of medical students and recent graduates were interviewed for the study. They concluded that the basic and clinical pharmacology training needed for prescribing medications is alarmingly inadequate. The results of the study are the subject of a report to the UK's General Medical Council.

Why is pharmacology training so inadequate? I believe that an important factor is that those responsible for designing the medical syllabus are unaware of the importance of the discipline. Some years ago I was involved as a defence expert witness in litigation concerned with alleged neuronal damage caused by a particular drug. The matter was a pharmacological problem. During testimony a defence lawyer asked a plaintiff's expert witness, a neurologist, whether he regarded himself as a pharmacologist. His reply was to the effect that of course he was a pharmacologist; he prescribed drugs every day. To us this is analogous to asking a motor car owner if he is a motor engineer and receiving a reply along the lines that "of course, I drive my car every day". Such comments suggest the speaker does not know the extent of his own ignorance. I believe that deans of medical schools and others responsible for designing the syllabus recall their own rather trivial experience in undergraduate pharmacology and simply perpetuate the inadequacy. Again, they don't know that they don't know. This is not, of course, because instructors lack expertise and knowledge but rather because the allocated time is insufficient to make the subject interesting and for covering all the necessary material. In my opinion, building on its huge academic successes, IUPHAR should now move further from its ivory tower into the world and publicise, indeed trumpet, its vast knowledge, while at the same time bringing to bear all the influence at its disposal to enhance the teaching of both basic and clinical pharmacology in medical schools.

As I am nearly 80 years old and not a medic, 'what do I know', I hear you say. In my defence I point out that the older I get, the more I am on the receiving end of medical care and therefore am observing first-hand the frightening inadequacy in prescribing. Indeed, I have for many years been raising concerns about the decline in pharmacology education in medical schools. Having taught many medical students and served as an external examiner for most British, Irish and old British Commonwealth medical schools, I have for decades had the opportunity to probe the depth of pharmacological knowledge retained by these graduates. Generally I am frightened at the thought of these individuals being turned loose on the world with a prescription pad. ●



William Bowman

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Better Medicines through Global Education and Research

SEPHAR-IUPHAR 1959-2009

Pharmacology International

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50th Anniversary Edition

MEMORIES AND PROSPECTS

By Theophile Godfraind
Brussels, Belgium
IUPHAR Secretary-General 1987-1994
IUPHAR President 1994-1998

This editorial is not an enumeration of various steps of IUPHAR development, but rather an evocation of events involving personalities of the pharmacological world. As a former member of IUPHAR Executive Committee, I was impressed by the dedication of many colleagues to the progress of the discipline through Union activities. This brief account is intended to pay tribute to some of them and to convince young pharmacologists that teamwork on theoretical pharmacology at the international level boosts scientific productivity at the bench. I am indebted to Börje Uvnäs (B. Fredholm, 2004) and Paul Lechat (Giroud, 2004) for convincing me to participate in IUPHAR activities. I also wish to thank my junior colleagues for their contributions during the IUPHAR period of my scientific life. The names of these individuals are enumerated in the acknowledgments of the book Calcium Channel Blockers (Godfraind, 2004).

The birth of IUPHAR

Corneel Heymans, along with Daniel Bovet, Carl Schmidt and Börje Uvnäs, played a major role in the establishment of IUPHAR in 1959 by inserting into the constitution of the International Union of Physiological Sciences (IUPS) the establishment of a section of pharmacology (SEPHAR). Some believe the decisive step for the establishment of IUPHAR was the 1961 Stockholm Conference organized by Börje Uvnäs. This gathering was attended by a large group of scientists more interested in studying drugs *per se* rather than as chemical tools for characterizing physiological processes or biochemical pathways. IUPHAR was finally established as an independent body at the 1965 IUPS Congress in Tokyo. The previous SEPHAR officers were now formally elected members of the first IUPHAR Executive Committee, with C. Heymans being the first president and B. Uvnäs the first Secretary-General. In 1966, B. Uvnäs was elected president and G. Koelle Secretary-General during the Congress in São Paulo chaired by Mauricio Rocha e Silva. During the Basel Congress in 1969, B. Uvnäs was elected for a second term as President, with Helena Rašková the Secretary-General. After considerable lobbying, IUPHAR was recognized as a scientific member of ICSU in 1972. Thereafter, the number of IUPHAR members increased thanks to the efforts of successive Executive Committees and the success and prestige of the International Congresses of Pharmacology (Rašková, 1981).

NC-IUPHAR and IUPHAR Publications

At the Sydney IUPHAR Congress in 1987, the newly elected officers (C.T. Dollery, President; T. Godfraind, Secretary-General; K.J. Netter, Treasurer) initiated discussions on the future development of the Union. It was concluded there was a need for furthering scientific activities. Among the possibilities discussed was an enhancement of the activity of the existing Committee on

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MEMORIES AND PROSPECTS (continued)

Nomenclature (NC-IUPHAR). Sir Colin Dollery believed that a complete revitalization of this committee was necessary. By two years after the Sydney Congress a new framework had been developed, with the central Nomenclature Committee linked to subcommittees that focus on particular receptor families. This arrangement necessitated the appointment as chair a distinguished pharmacologist with management skills and an excellent sense of diplomacy. Paul Vanhoutte accepted this mandate from the executive officers during a 1989 meeting at the CIBA (now Novartis) Foundation in Portland Place, London. Since 1989, three successive chairs (Paul Vanhoutte, Robert Ruffolo and Michael Spedding) have presided over NC-IUPHAR, which now consists of dozens of subcommittees. These groups have accomplished much in the intervening years, as evidenced by the list of published articles displayed on the IUPHAR web site.

It should be noted that the American Society for Pharmacology and Experimental Therapeutics (ASPET) contributed generously to the initial development of Nomenclature Committee. Thus, in 1993, the Chairman of the ASPET Board of Trustees signed a publishing arrangement with the IUPHAR Secretary-General agreeing to publish Nomenclature Committee work in *Pharmacological Reviews* at no cost to IUPHAR and without further peer review given the distinguished scientists responsible for their preparation. Furthermore, Ullrich Trendelenburg, a widely recognized and admired pharmacologist (Starke, 2007), and a member of the *Pharmacological Reviews* editorial board at that time, kindly agreed to edit the NC-IUPHAR manuscripts so they conformed with the journal style. Georges Cosmides, another member of the initial Nomenclature Committee, came from the National Library of Medicine Bethesda, bringing his expertise on classification methodology.

For the 1994 Congress in Montreal, ASPET provided the delegates with a collection of the first Nomenclature Committee articles published in *Pharmacological Reviews*. This meeting also witnessed publication of the final issue of the Newsletter, which was succeeded by *Pharmacology International*. Bill Bowman, the IUPHAR Secretary-General elected by the 1994 IUPHAR General Assembly was the first editor of *Pharmacology International*. By the time of the XIIIth World Congress of Pharmacology in Munich in 1998, the Nomenclature Committee, now named NC-IUPHAR, produced its first official compendium. The homogeneity of the various chapters of this publication was due to the use of an identical template by the various subcommittees. This volume was acclaimed in scientific journals. Since then the activities of NC-IUPHAR have expanded in a spectacular way, as illustrated by the development of an impressive site within www.IUPHAR.org .

Nature 394, 516 (6 August 1998)
doi:10.1038/28931

News in Brief

At long last: molecular pharmacology clarified

To help bring some scientific order to the mushrooming field of molecular pharmacology, the International Union of Pharmacologists last week launched its definitive Compendium of Receptor Characterization and Classification at its thirteenth international congress in Munich.

Its aim is to describe the characteristics of cloned hormone and neurotransmitter receptors at a time when more data are being generated than ever before and terminology is inconsistent and confusing. Each receptor in the compendium is allocated a receptor code, analogous to the enzyme codes introduced in the 1950s by the International Union of Biochemistry and Molecular Biology. The receptor codes convey both structural and operational information.

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MEMORIES AND PROSPECTS (continued)

A dinner was held after t the symposium to honour Sir James Black in Montreal in 1994. Sitting (L→R): Sir John Vane, Lady Black, Sir James Black. Standing (L→R): R.F. Furchgott, Mrs. Furchgott, J. Angus, T. Godfraind (Photo courtesy of J. Angus)

IUPHAR lecture in Analytical Pharmacology

Alberto Kaumann delivered the first IUPHAR lecture in Analytical Pharmacology during the 1998 Munich Congress. This lectureship was the result of a proposal made in 1994 by participants in a satellite meeting of the Montreal Congress sponsored by trainees and friends of Sir James Black. The Executive Committee of IUPHAR endorsed the idea of lectures on analytical pharmacology as being an essential part of the World Congresses in the future. David Colqhoun was the lecturer at the 2002 meeting in San Francisco and Terry Kenakin at the 2006 gathering in Beijing.

The quest for financial support

The activities of IUPHAR rely heavily on volunteer work by scientific colleagues devoted to development of the discipline. Nevertheless, financial support is necessary to cover costs associated with travel, accommodations, office items and secretarial assistance. In the early 1990's, a business plan dictated that a more reliable method of financing was required for the long-term viability of the Union. Simply raising dues was not an option, given limitations imposed by the statutes. Rather, the decision was made to search for benefactors and to make a greater effort to ensure that IUPHAR shares in revenues generated by the quadrennial congresses. Working together, Setsuro Ebashi (Godfraind, 2007) and Karl Netter identified generous donors, including the Japanese Pharmacological Society, and convinced the Canadian organizers of the Montreal Congress to return some profits to the Union. Before the 1998 Munich Congress, thanks to the efforts of Alan W. Cuthbert, the British Pharmacological Society decided to increase its financial contribution to IUPHAR and invited other national societies to a special meeting to discuss this matter. During this meeting,

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MEMORIES AND PROSPECTS (continued)

which was chaired by Alan W. Cuthbert, several national societies agreed to follow the lead of the British Pharmacology Society. Finally, the 2002 General Assembly of the San Francisco congress approved a new dues arrangement in support of the Union. As for NC-IUPHAR, and other Union initiatives, these are independently supported through separate fund raising initiatives.

Clinical Division and Sections

Over the years IUPHAR has contributed significantly to the development of clinical pharmacology (Dollery, 2008). Thanks to Sir Colin Dollery, Folke Sjöqvist, Marcus Reidenberg, Patrick du Souich and many others, the clinical section became an IUPHAR division, and the parent organization renamed the Internal Union of Basic and Clinical Pharmacology. Due to the creativity and drive of Solomon Langer, Bertil Fredholm and Bevyn Jarrott, past and current members of the IUPHAR Executive Committee, five new sections in various subdisciplines have been created since 1987.

Prospects

Despite huge investments in novel technologies and attempts to streamline the drug discovery process, the past decade has witnessed a dramatic decline in the number of novel therapeutics reaching the market. This stagnation could be reversed by the proper use of translational science at both the preclinical and clinical levels. IUPHAR should play a major role in helping to identify reasons for the decline in drug discovery and should be engaged in debates as to how to overcome obstacles to developing new therapeutics (Fredholm, Fleming, Vanhoutte, & Godfraind, 2002). While many believe that to develop novel drugs it is essential to understand a disease process at the molecular level so as to intelligently select drug targets, the complex nature of the human organism makes it difficult to attain this goal in most cases. Thus, technology-driven science cannot yet substitute entirely for serendipity in drug discovery. This makes it imperative to devote resources to the development of therapeutically relevant animal models that can be employed broadly when screening chemical leads. Thus, analytical pharmacology employing *in vitro* and *in vivo* bioassays remains an essential component of a successful drug discovery program. As IUPHAR counts among its members many with expertise in this field, the Union is well-positioned to help improve the success rate in the quest for new therapeutics. All that is needed are the financial resources to mount such an initiative. ●

Theophile Godfraind

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THE HISTORY OF NC-IUPHAR

By Colin Dollery
Brentford, Middlesex, UK
IUPHAR President 1987-1990
IUPHAR Second Vice President 1978-1981
IUPHAR Councilor 1975-1978

As Humphrey Rang put it brilliantly when he described the receptor concept as "Pharmacology's Big Idea" (Rang, H.P., 2006), it should be no surprise that one of the principal scientific activities of the International Union of Basic and Clinical Pharmacology has been concerned with the nomenclature and properties of receptors.

It was a big idea that took long years to evolve. The origins of pharmacology lay in the use by physiologists of isolated organs or tissues, and sometimes whole animals, to study the effect of natural substances (strychnine, curare, etc). With the rise of organic chemistry in the late 19th and early 20th centuries, the study of synthetic substances became increasingly important. Initially, scientific interest lay mainly in the response of the tissue, with Langley first using the term 'receptive substance' to explain the actions of nicotine and curare on skeletal muscle. This concept focussed attention on the molecules that sensed and transmitted the drug-induced signal. A.V. Hill, a student working in Langley's laboratory, was the first to express this concept mathematically by applying the law of mass action to the experimental data. The idea of receptors was not readily accepted, even by pharmacologist as distinguished as Henry Dale and A.J. Clark. Indeed, it was the study of agonist/antagonist interactions by Gaddum, Schild, Ariens and others that put the receptor concept on a firm basis. From this work came familiar tools like the Schild plot.

Because pharmacologists sought tissues that responded well to particular agonists, certain tissue preparations, such as the rat anococcygeal muscle, became popular tools for research. My own introduction to experimental pharmacology in the early 1950's involved an acetylcholine assay using frog rectus muscle, with the results recorded on a kymograph using a carefully smoked drum. The increasing availability of synthetic agonists and antagonists demonstrated that tissue responses were difficult to explain on the basis of a very small number of receptors. The excitatory and inhibitory actions of sympathetic nerve stimulation led Cannon to propose in 1935 that there were two neurotransmitters responsible for these effects, Sympathin I and Sympathin E. In 1948 Raymond Ahlquist established that a single sympathetic agonist could produce both excitatory and inhibitory responses. He went on to show that, based on the rank order of agonist potencies, these effects depended on the presence of two different receptor types. It was only with the discovery of the beta adrenergic blocking agents that Alhquist's analysis was universally accepted, and the terms alpha and beta adrenergic displaced sympathins I and E.

By the early 1980's the cloning of human receptors become a practical reality. The use of low stringency hybridization conditions revealed many new G protein coupled receptors. Pharmacology research underwent a radical change as pharmaceutical companies inserted these receptors into high throughput screens

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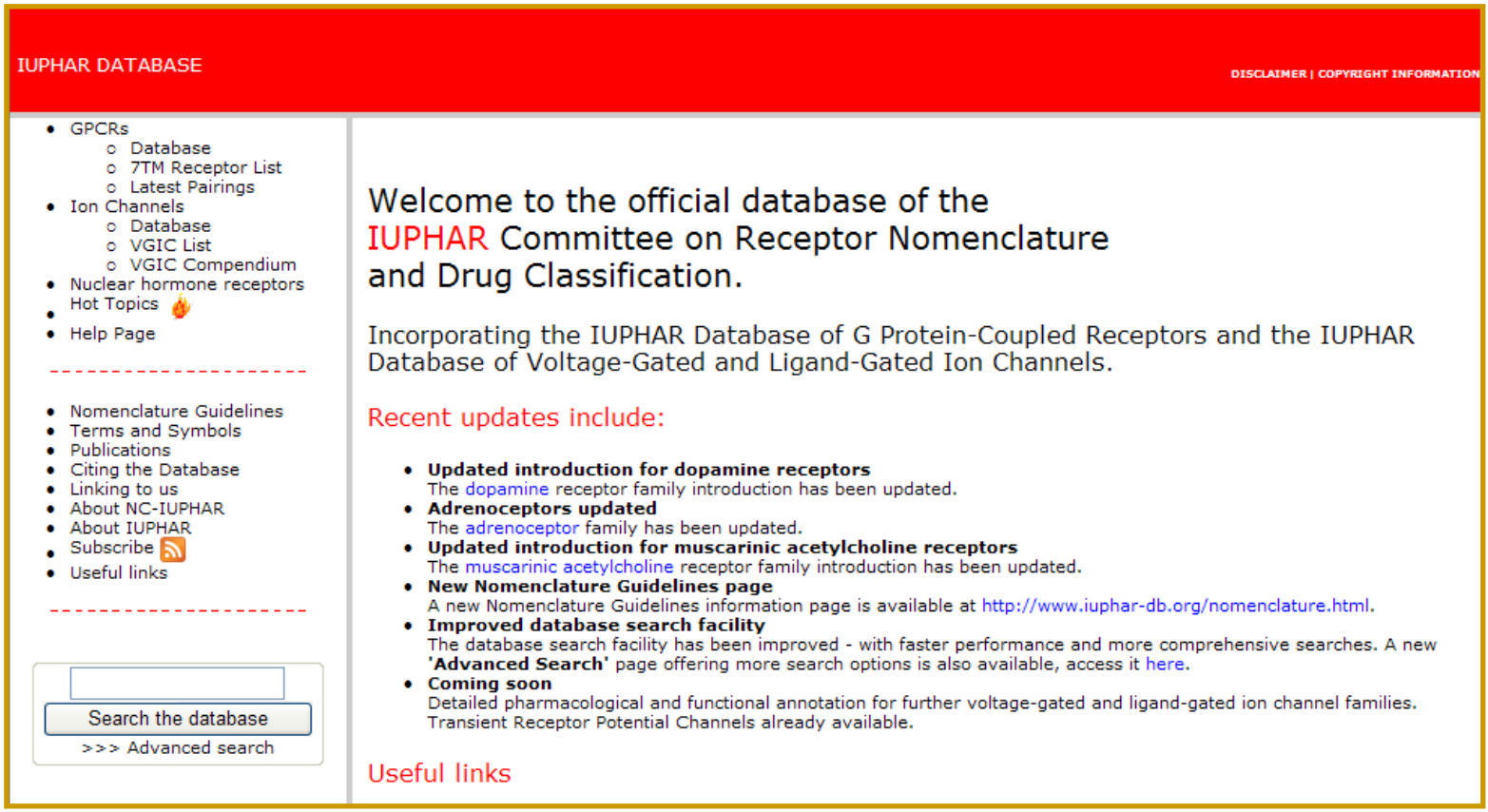
THE HISTORY OF NC-IUPHAR (continued)

to identify large numbers of new ligands. The scientists who discovered the new receptors felt they had the right to name them and as more than one team might discover the same site, several different names were applied to the same entity. Moreover, the great expansion of pharmacological research using methods as varied as over-expression of a human receptor in an oocyte to studies in isolated tissues or intact humans began to generate a high volume of data of varying quality, reliability and comparability. To avoid chaos it was critical that someone organize the evolving nomenclature and set standards for defining receptor sites. This responsibility was assumed by IUPHAR.

At the Sydney, Australia Congress in 1987, when I became President of IUPHAR, the Executive Committee decided to establish NC-IUPHAR, a committee on receptor nomenclature. My main contribution to this initiative was to twist the arm, more or less literally, of Paul Vanhoutte to become its first chair. The rapid ascent of NC-IUPHAR owed much to Paul's energy, persuasive talents, and infectious enthusiasm. At its early meetings NC-IUPHAR made a number of critical decisions. The first was that the committee embrace both classical and molecular pharmacology, at the time largely separate undertakings. The second decision was to avoid becoming a dry-as-dust body pronouncing on nomenclature by involving fully the pharmacological community through the establishment of specialised sub-committees for receptor families. At present there are 60 such groups. This meant NC-IUPHAR was not simply in the business of naming receptors but also in providing an authoritative review of the evidence published on the properties of these sites and the substances that interact with them. The third decision was to forge an agreement with the American Society of Pharmacology and Experimental Therapeutics to have sub-committee reports and nomenclature recommendations published in *Pharmacological Reviews*. The committee also decided to limit its remit to human receptors and to a few important laboratory animals. While at the time NC-IUPHAR was established progress in cloning the genes for human receptors was accelerating, no one anticipated the extra-ordinary progress of sequencing technology that eventually revealed the whole human genome.



The home page of NC-IUPHAR: www.IUPHAR-DB.org

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THE HISTORY OF NC-IUPHAR (continued)

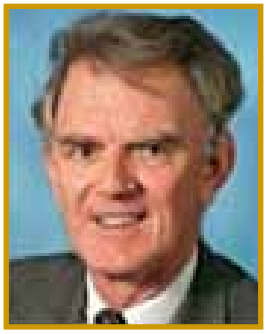
Looking back, IUPHAR was prescient in establishing NC-IUPHAR, both with regard to timing and to its mission.

One of the most important roles of an International Scientific Union like IUPHAR is to support scientists in countries with limited teaching, education, and research resources. NC-IUPHAR has addressed this issue in two ways. The first was to produce and print compendia on G-protein coupled receptors, ion channels, and nuclear receptors that were distributed to those attending IUPHAR Congresses. Although these were of a high quality, they reached only a few thousand readers. A much more ambitious endeavour was the establishment of a web database (www.IUPHAR-DB.org) that is freely accessible to all scientists throughout the world.

After a hesitant start this venture was transferred to the University of Edinburgh under the direction of Tony Harmer. Since then the database initiative has thrived and evolved into a powerful and important resource. Tony has recruited an impressive succession of young pharmacologists and IT scientists to create and update the software and he has played a major role in maintaining the quality of the output.

NC-IUPHAR has existed for some 20 years, with its work on the nomenclature of the 364 GPCRs in the human genome being nearly complete. Several years ago, the committee assumed new responsibilities for nuclear receptors and, with the enormous help of Bill Catterall, for ion channels. The work is never finished as new data emerge about existing receptors and channels, new knowledge about functional receptor polymorphisms, homo and heterodimers, alternative splicing and, perhaps in the future, about the control of receptor expression in different tissues. As a clinical pharmacologist I dream of the day when we can integrate the pre-clinical data on human receptors with data gained in intact man, just as we integrated classical and molecular pharmacology 20 years ago when creating NC-IUPHAR.

The challenge now is not the science but the constant struggle to garner funds to support this important resource. While NC-IUPHAR depends largely upon the voluntary efforts of hundreds of dedicated scientists, it needs a minimum income to support meetings and the database. As the work is so important for the advance of our discipline, I am confident that, even in straightened times, we shall find the needed support. As the only member of NC-IUPHAR who has witnessed its entire 20 years of existence I shall end by saying what an exciting opportunity it has been interacting with the range of outstanding scientists who have served on the main committee and its sub-committees, the successive chairmen Paul Vanhoutte, Bob Ruffolo and Mike Spedding and, not least, the continuing postgraduate course in pharmacology that membership provides. •



Sir Colin Dollery

Rang, H.P., The Receptor Concept: Pharmacology's Big Idea, Br J Pharmacol, 2006, 147(Suppl 1), S9-S16.

NC-IUPHAR: PRESENT AND FUTURE

By Michael Spedding and Anthony Harmar
Suresnes, France *Edinburgh, Scotland, United Kingdom*
NC-IUPHAR Chair *NC-IUPHAR Vice Chair, Database*

The mission of NC-IUPHAR is to support scientists dealing with the complexity of receptor and drug binding site interactions and their multiple functional outputs, by providing pragmatic and clear nomenclature guidelines. Key data are also provided on receptors, ion channels and drug binding sites. The guidelines are published in primary journals and in the open access database IUPHAR-DB (www.IUPHAR-DB.org).

The Challenge

Pharmacology has changed enormously since NC-IUPHAR was established approximately 20 years ago. During that time, NC-IUPHAR has adapted by enlisting the help of more than 700 pharmacologists to work on over 60 subcommittees to monitor, record and classify receptor systems as new information was forthcoming. The reports and recommendations from these groups are communicated widely to all scientists interested in understanding receptor systems and drug targets encoded by the human genome. Indeed, NC-IUPHAR collaborates with the Human Genome Nomenclature committee (HGNC) to ensure coordination and consistency between the evolving receptor nomenclature and the genes that encode them. We are now on the verge of classifying all human gene products that currently, and possibly in the future, could serve as drug targets, achieving a long-term goal set forth for NC-IUPHAR decades ago by Sir Colin Dollery. Although only a few thousand genes are considered to be “druggable”, it is unlikely that the work of NC-IUPHAR will diminish in the foreseeable future because of the need to also consider more discrete drug targets resulting from alternative splicing, messenger RNA editing, polymorphic variation, and the combinatorial nature of subunit association (Table 1). However, as a flexible organisation with good quality control, NC-IUPHAR will rise to this challenge and set out clear guidelines in these complex areas. To this end, new working groups of experts are being assembled to consider these issues and recommend standards, as was done in the past when defining criteria for the existence of G protein heterodimers (Pin et al., 2007).

Table 1. Some of the variables in drug/receptor interactions that lead to different functional outputs

1. Agonism, partial agonism, antagonism, inverse agonism
2. Onset and offset kinetics
3. Concentration of agonist
4. Site of action within the receptor (orthosteric, allosteric)
5. G protein coupling.
6. Phosphorylation, acylation, etc.
8. Receptor transactivation (e.g. GPCRs modulated by tyrosine kinase activation)
9. Presynaptic/postsynaptic control
10. Receptor heterodimers
11. Receptor accessory proteins (e.g. coupling to PDZ domains) and associated coupling complexes
12. Chronobiological modulation of accessory proteins, receptor expression, etc
13. Functional selectivity – ligand-induced differential signalling
14. Biologically important receptor polymorphisms
    - -SNPs
    - -Pseudogenes
    - -Alternative splicing
    - -mRNA editing which is locally controlled

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NC-IUPHAR: PRESENT AND FUTURE (continued)

Organization

The current membership of NC-IUPHAR is shown in Table 2.

Table 2: Membership of NC-IUPHAR, April 2009

Chairman

Michael Spedding, Institut de Recherches Servier, Suresnes, France

Vice-Chairmen

Database: Anthony Harmar, University of Edinburgh, UK
Editor: Eliot Ohlstein, Venuvics Pharmaceuticals, Glenmoore, PA, USA
Evolving Pharmacology: Anthony Davenport, University of Cambridge, UK

Members

Tom Bonner, Laboratory of Genetics, NIMH, Bethesda, MD, USA
William Catterall, University of Washington, Seattle, WA, USA
Philippe Delagrange, Institut de Recherches Servier, Suresnes, France
Sir Colin T. Dollery, GlaxoSmithKline, Harlow, UK
Steven M. Foord, GlaxoSmithKline, Stevenage, UK
Pierre Germain, Université Louis Pasteur, Illkirch, France
Vincent Laudet, Institut de Génomique Fonctionelle de Lyon, France
Graeme Milligan, University of Glasgow, UK
Rick Neubig, University of Michigan, Ann Arbor, MI, USA
John Peters, University of Dundee, UK
Jean-Philippe Pin, CNRS, Montpellier, France
David Searls, GlaxoSmithKline Pharmaceuticals, King of Prussia, PA, USA

Corresponding Members

Stephen Alexander, University of Nottingham, UK
Michel Bouvier, Université de Montréal, Canada
Moses Chao, New York University, New York, N.Y., USA
Arthur Christopoulos, Monash University, Australia
Graham Collingridge, University of Bristol, UK
Franz Hofmann, Technische Universität München, Germany
Alistair Mathie, Medway School of Pharmacy, UK
Richard Olsen, University of California, Los Angeles, USA
Michael A.Trevethick, Pfizer Global R&D, Sandwich, Kent, UK

Ex Officio

IUPHAR President: Sue Duckles, University of California Irvine, USA
IUPHAR Secretary-General: S.J. Enna, University of Kansas, Kansas City, USA
Past Chair: Robert Ruffolo, Retired from Wyeth, USA
IUPHAR Treasurer: Urs Ruegg, University of Geneva, Geneva, Switzerland
Past Chair: Paul Vanhoutte, University of Hong Kong, China
HGNC Representative: Matt Wright, EMBL-EBI, Hinxton, UK

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NC-IUPHAR: PRESENT AND FUTURE (continued)

Each member is a liaison officer with affiliated organizations or subcommittees. While nearly all of the work is performed by email, NC-IUPHAR meets every six months to hear reports and consider strategies. NC-IUPHAR subcommittees provide receptor classification for a particular family of sites by seeking a consensus amongst experts. Subcommittee chairs propose a list of experts, ratified by NC-IUPHAR, to ensure adequate representation of the field. The chairman of each subcommittee plays a critical role coordinating the effort. Postdoctoral fellows are encouraged to contribute to the work of subcommittees. Through the generosity of the American Society of Pharmacology and Experimental Therapeutics, major NC-IUPHAR nomenclature reports are published in *Pharmacological Reviews*, with other types of communications appearing in other journals. Several NC-IUPHAR-sponsored publications have become citation classics.

As NC-IUPHAR has no endowment, the work of the group is underwritten by grants, donations from the pharmaceutical industry (e.g., GlaxoSmithKline, Novartis, Servier, Wyeth, etc.) and from IUPHAR member societies. As a consequence it is not possible for NC-IUPHAR to support large meetings or large standing committees. However, the contribution of our corresponding members, who contribute by email and teleconference, and through attendance at key meetings, is very helpful and greatly valued.

IUPHAR-DB

IUPHAR-DB (the IUPHAR Receptor Database: www.iuphar-db.org) is managed by a database manager and curator at the University of Edinburgh under the direction of Tony Harmar. This fully relational database contains peer-reviewed pharmacological, chemical, genetic, functional and anatomical information on the 354 non-sensory GPCRs. It is presently being expanded (for release in summer 2009) to encompass data on voltage- and ligand-gated ion channels (see Harmar et al., 2009). IUPHAR-DB was funded initially by an educational grant from Incyte Genomics, and subsequently from support received from the International Congress of Scientific Unions (ICSU) and currently the British Pharmacological Society (BPS) and the Australasian Society of Clinical and Experimental Pharmacologists and Toxicologists (ASCEPT).

Recent Progress

Recent publications in *Pharmacological Reviews* and other journals are listed below in the reference section. In addition to these, some major initiatives have been completed over the last three years. These are:

1. Ligand-Gated ion Channels

NC-IUPHAR has proposed a complete classification/nomenclature for ligand-gated ion channels (LGICs). The classification scheme was approved and published, following a very well attended introductory conference co-hosted with the journal *Neuropharmacology* (Collingridge et al., 2009). This represents a phenomenal amount of work from Graham Collingridge and John Peters, and from Richard Olsen who revised the classification of GABA receptors (Olsen and Sieghardt, 2008, 2009). All of the ligand-gated ion channel subcommittees have been reactivated. The revised nomenclature for glutamate ionotropic receptor subunits is shown on Table 3.

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NC-IUPHAR: PRESENT AND FUTURE (continued)

Table 3. New IUPHAR nomenclature for ionotropic glutamate receptor subunits

NMDA			AMPA			Kainate		
Old	HUGO	IUPHAR	Old	HUGO	IUPHAR	Old	HUGO	IUPHAR
NR1	*GRIN1*	GluN1	GluR1	*GRIA1*	GluA1	GluR5	*GRIK1*	GluK1
			GluR2	*GRIA2*	GluA2	GluR6	*GRIK2*	GluK2
NR2A	*GRIN2A*	GluN2A	GluR3	*GRIA3*	GluA3	GluR7	*GRIK3*	GluK3
NR2B	*GRIN2B*	GluN2B	GluR4	*GRIA4*	GluA4			
NR2C	*GRIN2C*	GluN2C				KA-1	*GRIK4*	GluK4
NR2D	*GRIN2D*	GluN2D				KA-2	*GRIK5*	GluK5
NR3A	*GRIN3A*	GluN3A						
NR3B	*GRIN3B*	GluN3B						

2. Voltage-gated ion channels

Thanks to the efforts of William Catterall and his subcommittee, a classification of the voltage-gated ion channels is complete, and approved. A full issue of *Pharmacological Reviews* was devoted to the subject, and there will be complete coverage of this important class of drug targets on the IUPHAR-DB website.

3. Nuclear receptors

The classification of nuclear receptors has been completed and endorsed by NC-IUPHAR. This undertaking, and the subcommittee of experts, was directed by V. Laudet. An entire issue of *Pharmacological Reviews* was devoted to the report from this group. The database for display at IUPHAR-DB is currently under construction.

4. GPCRs

The database is a living and authoritative resource on this group of receptors, the largest family of drug targets. The hot topics and emerging pharmacology sections (A. Davenport) are cutting edge pharmacology and follows “live” the process of aligning function and designation of endogenous ligands for orphan receptors.

The Future

The multiple variables in drug-receptor interactions (Table 1) are being studied by NC-IUPHAR working groups. It is anticipated the reports of these subcommittees, which will be of great interest to working pharmacologists, will be available soon.

Future projects include characterisation of receptors linked to tyrosine kinase and drug transporters. As always, NC-IUPHAR will have to identify funding for these new undertakings, a task that has always been accomplished to date thanks to the continuing generosity of many sponsors.

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NC-IUPHAR: PRESENT AND FUTURE (continued)

Acknowledgements

We are immensely grateful for the work done by our colleagues on NC-IUPHAR and also by all the chairs and subcommittees which contribute to the organization. It is a privilege to see so much effort expended by such busy and accomplished scientists solely for the good of science. We are grateful for sponsorship by the British and Australian Pharmacological Society, GlaxoSmithKline, Servier, Novartis, Wyeth, Incyte and UNESCO.

As NC-IUPHAR continuously needs input from motivated scientists interested in receptors, please contact us with your ideas or to volunteer to serve on a subcommittee. ●

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Better Medicines through Global Education and Research

SEPHAR-IUPHAR 1959-2009

Pharmacology International

June 2009

MY TWENTY YEARS AT IUPHAR

By Paul M. Vanhoutte
Hong Kong, China
IUPHAR President 2002-2006
IUPHAR Secretary-General 1998-2002

The Li Ka Shing Faculty of Medicine of the University of Hong Kong

What seest thou else
In the dark backward and abysm of time?
William Shakespeare *(The Tempest, Act I, Scene ii)*

As I am about to write this essay, in my office overlooking the Chinese sea, I have to rely solely on my memory, as the paper traces of my interactions with IUPHAR are scattered in storage boxes on two distant continents. Thus this account is bound to be biased by emotions, some distant, some more recent. The most recent one is the joy of hearing that I have been selected to give the 50th Anniversary IUPHAR Lecture during the World Congress of Basic and Clinical Pharmacology in Copenhagen. That joy, and the resulting pride, are intense, even if they are tempered by my deep-rooted conviction that every committee is allowed one mistake. This lecture will be my "swan song", the "*point d'orgue*" as we say in French, of the last twenty years devoted to the Union. I always tell young people that to reach harmony in science it is not enough to do research and publish, and to teach and educate, but that one must also provide service to the scientific community. In my case, this has been, besides obviously contributing to the peer-review system, my commitment to IUPHAR.

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MY TWENTY YEARS AT IUPHAR (CONTINUED)

As mentioned elsewhere [see articles by Dollery and Spedding/Harmar in this issue], it all started in 1989 when I was asked by Sir Colin to chair the IUPHAR Committee on Receptor Nomenclature and Drug Classification. As I recall this proposal was made at a reception in London. Actually, during that reception, my dear wife Jacqueline overheard John Vane saying to Colin Dollery: "Why did you ask Paul?", implying a certain doubt as to my qualifications. And Sir Colin answered: "Because he never says No!", a remark which prompted Jacqueline, a gifted artist, to paint her only self-portrait where she urged me to learn not to accept too many invitations and commitments.

Self-portrait of Jacqueline Vandenberghe-Vanhoutte urging the author in sixteen different languages to refuse invitations and commitments. The author had to promise to hang it in his office. He did so, but placed it behind his back!

Actually, I had some earlier experience in nomenclature activities. First, I had participated in the efforts of a WHO committee devoted to the classification of calcium channels blockers, where I discovered the passion that scientists can display for nomenclature issues. In this case I was witness to a clash between two titans fighting for their coined term, Albrecht Fleckenstein [calcium-antagonists] and Theo Godfraind [calcium entry blockers]. Further, I was part of the early efforts of the Serotonin Club [which I founded in 1987 during the World Congress in Sydney and is still going strong] to classify the cell membrane receptors responding to 5-hydroxytryptamine. While I lost the battle for "S1" and "S2" versus "5HT1" and "5HT2" subtypes, I won the fight for "serotonergic" versus 5-hydroxytryptaminergic" receptors. So I was more or less prepared to tackle the task that Sir Colin bestowed upon me. I still remember the first Nomenclature Committee meeting, where the consensus seemed to be that the undertaking would never work. I recall in particular the ironic remarks in this regard made by Ullrich Trendelenburg, as he toyed with his eternal cigarette. Nonetheless, we rolled up our sleeves and got going. The first important decision was to abandon the task of classifying drugs, and to focus on cell membrane receptors, and, much later, ion channels. NC-IUPHAR was born.

Cover of the Pharmacological Reviews *special issue distributed at the World Congress in Montreal*
http://pharmrev.aspetjournals.org

We decided to meet twice a year, a fundamentally important decision that has been crucial in carrying the committee forward, despite the financial burden to the Union. We chose to publish the results of our deliberations in *Pharmacological Reviews*, to which I remain immensely grateful and profoundly attached for providing NC-IUPHAR with such a prestigious vehicle for disseminating its work. Early Committee members will no doubt vividly recall the pressure to get the special issue of *Pharmacological Reviews* ready in time for the Montreal World Congress.

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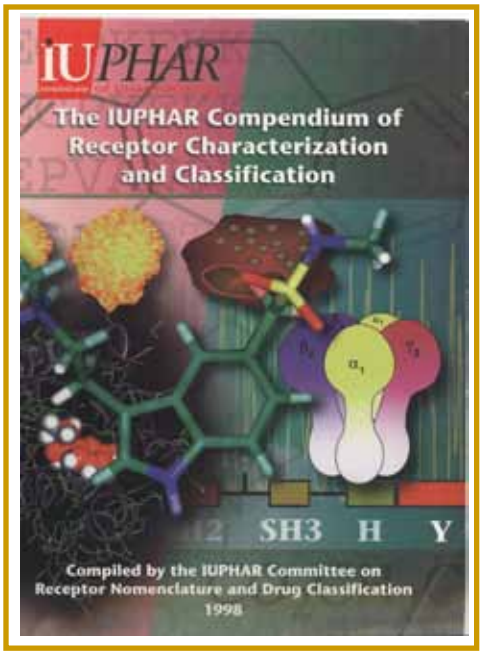
MY TWENTY YEARS AT IUPHAR (CONTINUED)



Cover of the IUPHAR compendium distributed at the World Congress in Munich

We published the IUPHAR Compendia, with the first one distributed at the Munich World Congress. It was during this Congress that I stepped down as chair of NC-IUPHAR to become Secretary-General of the Union. There will be no IUPHAR compendium in Copenhagen, as we unavoidably evolve towards the immediate and permanently updated electronic dissemination of science. During my nine years as the head of NC-IUPHAR I was helped considerably by the dedication of its members, in particular the secretaries, first Richard Bond and then my old friend Michael Spedding, the current chair of the committee. I witnessed again and again the enthusiasm and passion that issues of nomenclature can generate in otherwise very rational scientists. I have learned that if people of good will decide to work together, the seemingly unattainable can be achieved. Above all, I have seen an originally sporadic effort to bring order to receptor nomenclature grow into a major a undertaking that now provides, at no cost to the user, valuable information to the scientific community. Indeed, it has always been the policy of NC-IUPHAR to provide access to its most updated information to colleagues who need it the most, our fellow pharmacologists in the emerging countries. Under the direction of my successor, Bob Ruffolo, and thanks to the perseverance of Michael Spedding, NC-IUPHAR has grown considerably since I was chair. With the creation of the database orchestrated by Tony Harmar, the Committee recommendations and deliberations are now readily accessible worldwide [see article by Michael Spedding and Tony Harmar in this issue].

It has been a long road, but it was worth the effort. As of today, I still attend the NC-IUPHAR meetings whenever possible. Electronics have taken over, with PowerPoint replacing slides and transparencies. Only three members of the original Committee remain: me, Tom Bonner, and Colin Dollery. While we are a bit greyer, our dedication and enthusiasm for the task remains unchanged. My continued service makes me feel young, and fills me with pride for what NC-IUPHAR has become.

For me, the years after the Munich World Congress were different, as I had to immerse myself in the daily affairs of the entire Union. The years as Secretary-General were intense, but exhilarating. When Bill Fleming became President he immediately told me that the Secretary-General runs the Union and, therefore, does all the work. I promptly passed this message on to Sue Duckles when I became President in San Francisco and she succeeded me as Secretary-General. She, in turn, broke the news to Sam Enna, the current Secretary-General, in Beijing.

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MY TWENTY YEARS AT IUPHAR (CONTINUED)

My years as an IUPHAR officer were dominated first by the preparations for the World Congress in Beijing, a large challenge made much easier by the dedication of my dear friends in the Chinese Pharmacological Society. A constant hassle was the financial situation of the Union, but with the diligence of our eternal Guardian of the Membership, Karl Netter, the efforts of the Treasurers [Ernst Mutschler, Salomon Langer and Urs Ruegg] and the long-standing support of our industrial and academic friends [Servier, Synthelabo, SKB/GSK, BPS, and others] things remained under control.

Probably the most challenging task was to maintain the unity of basic and clinical pharmacology, which we achieved mainly with the support of Folke Sjöqvist and Patrick du Souich. This is crucial in these days of translational thinking for the survival of pharmacology as an independent scientific discipline. In this regard there were two major milestones. One was changing the name of IUPHAR to the International Union of Basic and Clinical Pharmacology. The second was the decision to have the World Congress in Copenhagen be a World Congress in Basic and Clinical Pharmacology. Another ongoing concern was to increase the visibility and impact of IUPHAR in the emerging world. Major steps in that direction were made by providing free access to the NC-IUPHAR database, the creation of a Section on the Pharmacology of Natural Products, the holding of the World Congress in Beijing, and the decision to have the 2014 Congress in South Africa.

When I first heard of IUPHAR, before the World Congress in Amsterdam, the first one I attended, I had the impression the Union was a bit of an “old boys” club. This is certainly no longer the case. IUPHAR is young, vibrant and truly international, thanks to the effort and dedication of so many people with whom I have had the pleasure to interact over the last twenty years. This is why the day of the 50th Anniversary IUPHAR lecture will be a very special one in my life. ●

Taken during the 2002 World Congress of Pharmacology in San Francisco, this photograph contains three IUPHAR presidents (L→R): William Fleming (1998-2002), Sue Piper Duckles (2006-2010) and Paul Vanhoutte (2002-2006).

THE IUPHAR MEMBERSHIP COMMITTEE

By K. J. Netter
Marburg, Germany
IUPHAR Membership Committee Chair 1994-2006
IUPHAR Secretary-General 1987-1994

In IUPHAR's fiftieth year it seems appropriate to look back at its growth. Today, IUPHAR is composed of nearly seventy member societies, reflecting the increasing independence of the discipline from physiology. While a section on pharmacology, the forerunner of IUPHAR, was first established within the International Union of Physiological Sciences (IUPS) in 1959, the two disciplines were recognized as separate identities well before then, with distinct pharmacology departments and divisions housed in academia and industry. Also, national pharmacology societies had been in existence since the early 20th century. The original 25 members of the IUPS pharmacology section ultimately were the founding societies of IUPHAR, which was formally chartered at a meeting in Tokyo on September 2, 1965.

The history of this organisational development parallels the expansion of drug research and development in the latter half of last century. It is very aptly described by Helena Rašková and Börje Uvnäs in their "History of the International Union of Pharmacology (IUPHAR)" published in 1980.

The Membership Committee was established during the first IUPHAR Council meeting in Tokyo. This committee is charged with "examining and recommending applications for national and regional IUPHAR memberships". The first voting members of the IUPHAR Membership Committee were H. Herken (Germany) (Chairman), K. K. Chen, G. B. Koelle (USA), H. Kumagai (Japan) and V. V. Zakusov (USSR). Thus, the Membership Committee has been operating continuously for 45 years.

The Membership Committee fostered the growth of IUPHAR from the original 25 member societies in 1959, to 45 national and 3 regional Full Member societies by 1990. An Associate Member category was added some time ago to allow inclusion of supranational organizations and other relevant scientific societies with interests in the field. Over the past two decades the number of Full Members has grown to 55 and the number of Associate Members to 11.

With the recent abolishment of the Associate Member option, all those now accepted into the Union are awarded full member privileges. In considering an application for admission to IUPHAR, considerable time and effort must be expended by members of the Membership Committee in evaluating the applicant organization.

In conclusion, the number of IUPHAR member societies has increased from 25 to 66 over the past half-century. As the 55 national societies in this group represent the majority of such organizations throughout the world, future growth

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THE IUPHAR MEMBERSHIP COMMITTEE (continued)

will come from the establishment of new national societies and the admission of more organizations with a vested interest in the field but that are composed of scientists who were not necessarily trained as pharmacologists. Efforts should also continue to form a closer working relationship with the International Union of Toxicology (IUTOX), given the overlapping interests of the two organizations, and the shared backgrounds of so many of the members of their constituent societies. ●

The roster of past and present Membership Committee members, except those who served between 1978-1986, is shown below to pay tribute to them:

Karl J. Netter

D.R. Abernethy (2006-2010, USA)
A. Atkinson (2002-2006, USA)
K.K. Chen (1965-1966, USA)
M. Endo (1994-1998, Japan)
G. Fassina (1990-1994, Italy)
W.W. Fleming (1990-1994, USA)
H. Herken (1965-1972, Chairman, Germany)
E. Hosoya (1972-1978, Japan)
Y. Huang (2006-2010, Hong Kong)
M. Iino (2002-2006, Japan)
B. Jarrott (1998-2002, Australia)
G.B. Koelle (1972-1978, Chairman, USA)
H. Kumagai (1965-1972, Japan)
F. Lembeck (1986-1990, Chairman; 1990-1994, Austria)
B. Lyoussi (2002-2006, Morocco)
J. MacLagan (1994-1998; 1998-2002, UK)
T. Masaki (1998-2002, Japan)
C. Masimirembwa (2006-2010, Zimbabwe)
H. Matthies (1986-1990, Germany)
K.J. Netter (1994-2010, Chairman 4 terms, Germany)
M. Otsuka (1990-1994, Chairman, Japan)
M.K. Paasonen (1986-1990, Finland)
R. Pekelmann-Markus (2006-2010, Brazil)
M. Rand (1986-1990; 1994-1998, Australia)
J. Reid (2002-2006, Australia)
M.M. Reidenberg (1990-1994; 1994-1998; 1998-2002, USA)
J. Schou (1972-1978, Denmark)
R. Soares de Moura (2002-2006, Brazil)
E.S. Vizi (1998-2002, Hungary)
V.V. Zakusov (1965-1972, USSR)

As records covering the 1978-1986 workings of the Committee are unavailable, it is not possible to acknowledge those who served during that time. Currently, committee members serve four year terms spanning the time between IUPHAR General Assemblies.

Editor's Note: From 1972 to 1987 Dr. Netter was the German Delegate to the General Assemblies held during that time. From 1987 to 1994 Dr. Netter served as IUPHAR Treasurer and, thereafter, chairman of the Membership Committee. As of the Copenhagen congress, Dr. Netter will have served IUPHAR for 38 years. We thank him for his dedication and generous support of IUPHAR and its mission.

CLINICAL PHARMACOLOGY AND THE RATIONAL USE OF DRUGS (RUD)

By Folke Sjöqvist and Anthony Smith
Stockholm, Sweden
Dr. Sjöqvist served two terms as the
Chair of the IUPHAR Clinical Pharmacology Division from 1996 to 2002.

Historical glimpses

For decades there have been productive collaborations between academic pharmacologists and the World Health Organization (WHO). One of the first joint projects was a December 1969 conference in Geneva chaired by Sir Derrick Dunlop, with Hans Friebel as secretary, entitled "Clinical Pharmacology. Scope, Organization, Training". The conference resulted in recommendations concerning the new discipline and its role in teaching, research and health care delivery (WHO Technical Report Series No 446, 1970).

Between 1977 and 1983, several members of IUPHAR have participated in, and in some cases chaired, the early expert committees on the selection of essential drugs. Included in this group were Daniel Azarnoff, Iwan Darmansjah, Paul Lechat, Per-Knut Lunde and Marcus Reidenberg. Moreover, Clinical Pharmacology and Therapeutics world conferences have included sessions devoted to RUD, particularly in recent years.

Over the past 30 years clinical pharmacologists and WHO have held conferences to jointly define clinical pharmacology services of importance for RUD (Clinical Pharmacological Services, WHO, Copenhagen, 1977 and Clinical Pharmacology. The European challenge, WHO, Regional Publication, Eur. Ser. No. 39, 1991).

More recent collaboration between IUPHAR and WHO include:

- Developing a core clinical pharmacology curriculum and for renewing the WHO Technical Report Series No. 446.

  A first discussion (November 2007) in Copenhagen with participants from WHO and the Clinical Division of IUPHAR was followed by a meeting in Stockholm in 2008. A preliminary draft of the revised Technical Report will be presented at a joint IUPHAR-EACPT meeting in Edinburgh in July 2009. The final draft will be part of a symposium on RUD at World Pharma in Copenhagen in 2010.

- Supporting the development and utilization of clinical pharmacology in developing countries.

  A project entitled "Clinical Pharmacology for Rational Drug Prescription in Egypt" was initiated by the late Prof. Mohamed Ibrahim from Menoufia, and supported by Prof. Mohamed Khayyal from Cairo, a member of the IUPHAR executive committee. The TEMPUS organization within EU asked IUPHAR-associated clinical pharmacologists at the Karolinska Institute and Odense University to organize a Danish-Swedish-Egyptian task force to assist Egypt in

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CLINICAL PHARMACOLOGY AND THE RATIONAL USE OF DRUGS (RUD) (continued)

developing the discipline. Thirteen Egyptian universities have participated in the project, which has had three major aims:

i. To develop clinical pharmacology in the undergraduate teaching of medical students and in the continued training of physicians.
ii. To introduce the Nordic concept of Drug and Therapeutics committees guiding drug selection and RUD.
iii. To introduce drug utilization studies and pharmacoepidemiology as the basis for RUD.

Advanced courses in clinical pharmacology have focused on methods and principles in drug utilization research and on principles in drug evaluation. The former was held in May 2007, after which 25 Egyptian physicians and pharmacists were assessed and certified. The Eastern Mediterranean office of WHO (EMRO, Cairo) participated in several of these meetings, with the project leaders maintaining continuous contacts with this office.

Clinical pharmacologists from Europe and North America have worked with colleagues in South America to improve training and service delivery in medication use, while Australasian clinical pharmacologists have worked extensively with WHO and other aid agencies to create and implement National Medicines* Policies, especially in smaller developing countries of the Asia-Pacific region.

An important new activity in paediatric clinical pharmacology has been to support projects on drug use in children. Several experts from IUPHAR are involved. Clinical pharmacologists from several countries have also been actively involved in preparing the first WHO list of Essential Medicines for children. This is a welcome recognition of the importance of paediatric clinical pharmacology.

- Organization of a Subcommittee for Clinical Pharmacology in Developing Countries
  This new subcommittee was established by the IUPHAR Clinical Division at the 2006 World Congress of Pharmacology in Beijing. A tentative work program for 2007-2010 was developed with the main aims being to support teaching and research in clinical pharmacology and to enhance clinical services, such as drug information, continuing education in RUD, and the establishment of drug and therapeutics committees in developing countries.

- Support of an International Textbook of Clinical Pharmacology entitled “Drug Benefits and Risks” (2001, 2008), edited by C. van Boxtel, B. Santoso and R. Edwards.
  Forewords have been written by the chairman of the IUPHAR Clinical Division and by many members of IUPHAR affiliated societies.

While each of these, and many other, projects have had individual impact, they are all part of an ongoing and more coordinated program of training for clinical pharmacologists working in teaching, research or health service delivery. Many countries have now adopted National Medicines Polices modelled on the WHO prototype. The implementation of these policies involves strengthening drug regulation and ensuring equitable access to medicines and improving their use. It requires the skills that derive from training in clinical pharmacology, as well as other disciplines. Although larger countries can usually locate the expertise needed to address these issues, clinical pharmacologist can be difficult to find in smaller developing countries where the need for a National Medicines Policy may be most urgent. Greater advocacy through WHO and IUPHAR is needed to ensure that clinical pharmacology is recognised as an important specialty, which is not the case throughout the world. The opportunity to accomplish this would be greatly facilitated by the publication of the revised WHO Technical Report referred to above. ●

* The preferred word, in the future, to replace ‘drugs’ with their connotation of illicit practices.

IUPHAR CLINICAL DIVISION ACTIVITIES AT THE CENTRE OF GLOBAL ACTION FOR BETTER MEDICINES FOR CHILDREN

By Kalle Hoppu
Helsinki, Finland
IUPHAR Clinical Division Subcommittee for Pediatric Clinical Pharmacology Chair on behalf of the Subcommittee

The pivotal regional paediatric medicines initiatives, the most prominent ones being in the United States and Europe, have in the last few years led to a global paediatric program. The momentum for this was accelerated significantly by the 2007 World Health Assembly resolution entitled Better Medicines for Children. The opportunities provided by IUPHAR as a global umbrella of the international basic and clinical pharmacology communities have been of vital importance for the paediatric pharmacology community worldwide. The IUPHAR Clinical Division SubCommittee for Pediatric Clinical Pharmacology represents this community in their efforts to catalyse and support work at the World Health Organization (WHO). This undertaking, which is aimed at providing children with better access to appropriate medications, is essential for achievement of the Millennium Development Goals, especially goal four, to reduce childhood mortality and goal six, to combat HIV/AIDS, malaria, and other diseases.

One of the posters commemorating 30 years of WHO Model List for Essential Medicines at the same time highlighting the lack of attention to childrens' medicines. The first WHO Childrens' Model List for Essential Medicines was approved at the anniversary meeting (October 2007). Source: www.who.int/entity/medicines/events/WhereEssentMeds.jpg

Through international networking, advocacy and discussions at national levels, IUPHAR facilitated the passage of the World Health Assembly (WHA) resolution from proposal stage through to final endorsement. The status of IUPHAR as an NGO in official relations with WHO made it possible for the academic and professional communities to participate in the discussions at the WHO Executive Board and 60th WHA in May 2007. It was at this gathering that WHA Resolution 60.20, Better Medicines for Children, was adopted.

As early as 2006 IUPHAR joined the International Pediatric Association (IPA) in trying to convince the WHO Essential Medicines Program to recognize more adequately the special health needs of children, especially in the important WHO Model List for Essential Medicines. These efforts led to the establishment of a temporary Paediatric Subcommittee of the Expert Committee on the Selection and Use of Essential Medicines. Asked to develop a Model List of Essential Medicines for Children, the Paediatric Committee met for this purpose in July 2007 and September

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IUPHAR CLINICAL DIVISION ACTIVITIES AT THE CENTRE OF GLOBAL ACTION FOR BETTER MEDICINES FOR CHILDREN (continued)

2008 in Geneva. As a result, the first WHO Essential Medicines List for Children (EMLC) was formally adopted in October 2007, practically on the 30th anniversary of the adult Essential Medicines List. The 2nd EMLC, including a special section on specific medicines for neonatal care, was officially released at the end of April 2009.

The IUPHAR Clinical Division has made a valuable contribution to the WHO paediatric medicines initiative by recruiting key experts from the very small paediatric clinical pharmacology community to serve on the WHO Subcommittees, Expert Committees and to prepare important documents for these meetings. Experts within the IUPHAR paediatric pharmacology community have also made, and continue to make, valuable contributions to various other WHO activities related to the Better Medicines for Children program. Among these are defining WHO research priorities for childrens' medicines, reviewing the evidence supporting current formulation and dosage guidelines for paediatric TB drugs, working to identify the dosage forms of medicines most suitable for children, and employing modelling techniques to identify improved paediatric fixed dose combinations for TB medicines.

Together with UNICEF, WHO recently received a US$9.7 million grant from the Bill & Melinda Gates Foundation to conduct crucial research in children's medicines, with the aim of increasing the number of medications designed and formulated specifically for this cohort. IUPHAR has been invited to join the External Advisory Group of this project. To help in the work to bring the Essential Medicines for Children into the countries with the greatest needs, IUPHAR is joining forces with the IPA and the International Pharmaceutical Federation (FIP) in a collaborative effort for multi-professional country level actions beginning with Sub-Saharan Africa. The resources within IUPHAR, in this case through the invaluable assistance of the South African Society for Basic and Clinical Pharmacology, in providing contacts from its 'Pharmacology for Africa' Initiative, has made it possible to identify pharmacologists in several Sub-Saharan African countries willing to volunteer their time for this undertaking. The elevation of children's medicines to a topic of global importance also provides opportunities for paediatric pharmacologists around the world to advocate for national and regional activities related to this issue. Examples include the organisation of joint meetings of the Japanese, Chinese and South-Korean paediatric pharmacologists, a national paediatric medicines research network (CICEF) in Chile, and advocacy for specific actions on paediatric medicines as part of National Medicines Policy and Quality Use of Medicines (QUM) initiatives in Australia.

These unprecedented developments within the field of paediatric medicines globally, and the invaluable support provided by IUPHAR and, in particular, the IUPHAR Clinical Division has enabled the paediatric clinical pharmacology community to successfully lobby for greater focus on the unique needs of this patient population. ●

Members of the Clinical Pharmacology Paediatric Subcommittee are (L→R): Gabriel Anabwani (Botswana), Madlen Gazarian (Australia), Kalle Hoppu (Finland), Hidefumi Nakamura (Japan), and Gregory L. Kearns (USA). Additional members not pictured include Facundo Garcia-Bournissen (Argentina/Canada) and Shalini Sri Ranganathan (Sri Lanka).

BRIDGING BASIC AND CLINICAL PHARMACOLOGY IN WORLDPHARMA 2010

By Kim Brøsen
Odense, Denmark
IUPHAR Councilor 2006-2010
WorldPharma 2010 President

While the actions of drugs on living organisms have been studied since the Middle Ages, it wasn't until the mid-19th century that pharmacology emerged as a distinct scientific discipline, with the establishment, most notably in Europe, of chairs and institutes in the field. Initially pharmacologists focused mainly on the study of drugs derived from natural products, such as quinine, morphine and digitalis glycosides. In time, advances in chemistry made possible the synthesis of new chemical entities as drug candidates. This heralded the beginning of the modern pharmaceutical industry.

During ist first century, research in pharmacology relied heavily on the use of physiological techniques. To characterize pharmacological properties, and determine mechanisms of action, pharmacologists of that time studied drug effects in living animals or isolated organs. Such research led to many important discoveries and the establishment fundamental principles, such as the dose-response relationship. Pharmacokinetics emerged as a distinct sub-discipline in the 1940's when new analytical methods made possible the measurement of drug concentrations in organs and tissue fluids.

By the latter half of the 20th century, and with the ascendency of biochemical pharmacology, the research emphasis in pharmacodynamics shifted to more precisely defining drug targets, including receptors, enzymes, and transporters. Such work was facilitated by the development of highly selective agonists and antagonists. Thanks to the explosive growth in new technologies and developments in molecular biology, the past two decades have been characterized by studies aimed at defining the precise chemical composition and cellular localization of these sites, as well as the manner in which they are expressed and regulated.

While for over a century pharmacology was a unified discipline, the situation changed in the early 1960's as clinical pharmacology became more independent. Many believe the development of clinical pharmacology was fostered, if not initiated by, the thalidomide disaster in the late 1950's. In Europe, approximately 10,000 children whose mothers had taken this medication were born with phocomelia, which is characterized by very short or absent long bones. While this birth defect occurs spontaneously in one out of 500,000 newborns, it was seen in one out of 4 children born to mothers treated with thalidomide. This event was the first to demonstrate to healthcare workers, patients, politicians and government regulators alike that the advantages of a new drug may be outweighed by disadvantages. It also graphically demonstrated the risks involved in extrapolating the data obtained from laboratory animals to humans.

Accordingly, a system was devised for more rigorous human testing of drug candidates before they are released on the market. Clinical pharmacology was

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BRIDGING BASIC AND CLINICAL PHARMACOLOGY IN WORLDPHARMA 2010 (continued)

therefore initially established as a discipline to develop scientific methods to determine the efficacy and safety of new chemical entities in humans. In succeeding years clinical pharmacologists made important contributions to the field, including a demonstration of the need to use placebo controls in randomised clinical trials. Clinical pharmacologists also pioneered the development of pharmacoepidemiology, population pharmacokinetics, and played a significant role in advancing studies in pharmacokinetics, pharmacogenetics, and drug-drug interactions. Clinical pharmacologists also pioneered the study of drug effects, and uses, in special populations, such as the elderly and children.

The first generation of clinical pharmacologists was dominated by physicians with specialized training in pharmacology or specialists in general internal medicine with a particular interest in hypertension. Thus, clinical pharmacology is a scientific medical discipline that combines pharmacology with clinical medicine to promote the rational and safe use of drugs. In the public sector, clinical, as well as basic, pharmacologists, have commitments in research and teaching, with clinical pharmacologists also having obligations to the health care system and in drug regulation at the national and international levels. Perhaps the single most important contribution of clinical pharmacology to the delivery of health care is the integration of what is known about molecular mechanisms of drug action to clinical trials and population aspects of drug use. This information is then utilized in devising therapies for individual patients.

For too many years there has been a strain in the relationship between basic and clinical pharmacologists. Often this has been due to personal conflicts between strong personalities and opinion makers in each discipline rather than to fundamental disagreements between the groups as a whole. This tension has been counterproductive for medicine in general, and the discipline of pharmacology in particular. It has also been meaningless as there is a strong need, and ample room, for both fields. The basic pharmacologists are the natural inheritors of the classical discipline, whereas as medical specialists the clinical pharmacologists advance the science by the breadth of their knowledge and their clinical observations and studies. Clinical pharmacology would not exist without basic studies in the field, and advances in basic or fundamental pharmacology would not be possible without the information provided by informed clinicians. Indeed, clinical pharmacology distinguishes pharmacology from other classical basic sciences, all of which utilize the same basic laboratory techniques in defining biological systems.

WorldPharma2010
Bridging Basic and Clinical Pharmacology

A distinguishing feature of the 16th World Congress on Basic and Clinical Pharmacology in Copenhagen, Denmark, in July 2010, is that it brings the two disciplines together in one congress for the first time in the history of the International Union of Basic and Clinical Pharmacology. The meeting is organised jointly by the newly established Danish Society for Pharmacology, an umbrella organization composed of specialised scientific Danish societies in pharmacology, and the British Pharmacological Society. The scientific program consists of 18 focused conferences, each of which takes place over 2 to 2½ days. While a few of the topics covered are clearly either basic or clinical, most are translational, with emphasis placed on combining information from both basic and clinical research to improve patient care and plan strategies for future studies in the field. In addition, the meeting includes plenary lectures, poster sessions, workshops, satellites and industry-sponsored symposia. Altogether, there will be approximately 400 invited speakers, with room for over 3,000 participants. The overall aim of the congress is to promote the development of new drugs for unmet medical needs, and to foster the rational, and intelligent, use of therapeutic agents. The organisers firmly believe this goal is best attained if basic and clinical scientists stand together once again in a united discipline: pharmacology. •

Kim Brøsen

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Pharmacology International

June 2009

IS BIOASSAY DEAD OR MERELY FORGOTTEN?

By Sérgio H. Ferreira and Y. S. Bakhle
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IUPHAR Councilor 2006-2010

We live in an era in which the interest and enthusiasm of our students and of many of their teachers are directed towards biotechnology and the scientific consequences of the elucidation of the human genome (genetic engineering, proteomics, metabonomics). Against this background of high-tech, high profile science, combined with new and truly powerful techniques to manipulate the basic molecules of biology, it is easy to forget the old, "low-tech" bioassay methods. It is also easy to forget that such "low-tech" methods have contributed significantly to our understanding of the action of many drugs, have identified new targets for drug intervention, and have advanced our understanding of physiology, pharmacology and drug discovery.

One powerful incentive, in pharmacological terms, for the full elucidation of the human genome was the expressed hope, at times amounting to a prediction, that knowledge of the genes involved in a disease, coupled with new technology, would lead to more effective and selective treatments. Assays using cloned, expressed proteins and vast libraries of diverse compounds could be employed for this purpose. Better still, computer-aided drug design might eliminate screening altogether.

Sadly, few, if any, of these predictions have come true. Why is this and can we realistically expect a time when bioassays will no longer be needed, perhaps even for the advancement of biological knowledge? The answer to both these questions lies in the nature of the bioassay. Bioassays elicit a biological response from a biological system and critically contains some measure of the interactions that differentiate biology from a mere collection of molecules. Thus, bioassays are functional assays and as such contribute unique and crucial information that will always be needed for drug development and the advancement of biological knowledge.

While Gaddum (1964) first used the term bioassay to define the particular skill set of the pharmacologist, bioassays had proven their worth for many years before then, and have contributed to more recent advances in pharmacology and medicine. Thus, histamine H_2 receptors and their selective antagonists were discovered from observations in bioassays. In this case it was noted that some responses of atria and uterus to histamine were resistant to mepyramine, suggesting a different receptor subtype. Bioassays established the physiological importance of angiotensin converting enzyme (ACE) and were used to identify the first ACE inhibitors. Indeed, both ACE inhibitors and bradykinin were initially isolated, using a bioassay to monitor activity, from the same Brazilian snake venom. Vane's cascade bioassay uncovered the mechanism of action of nonsteroidal anti-inflammatory agents, and identified the potent biological activity of thromboxane A_2 and prostacyclin. Endothelium derived relaxing factor was defined by Furchgott and Zawadzki in a bioassay and characterised as nitric oxide by Moncada's group using the cascade bioassay. The isolation and identification of the first of the endogenous opioids, enkephalin, were assessed using the mouse vas deferens bioassay. The most recent endogenous vasoactive mediator, H_2S, was also identified and characterized by bioassay.

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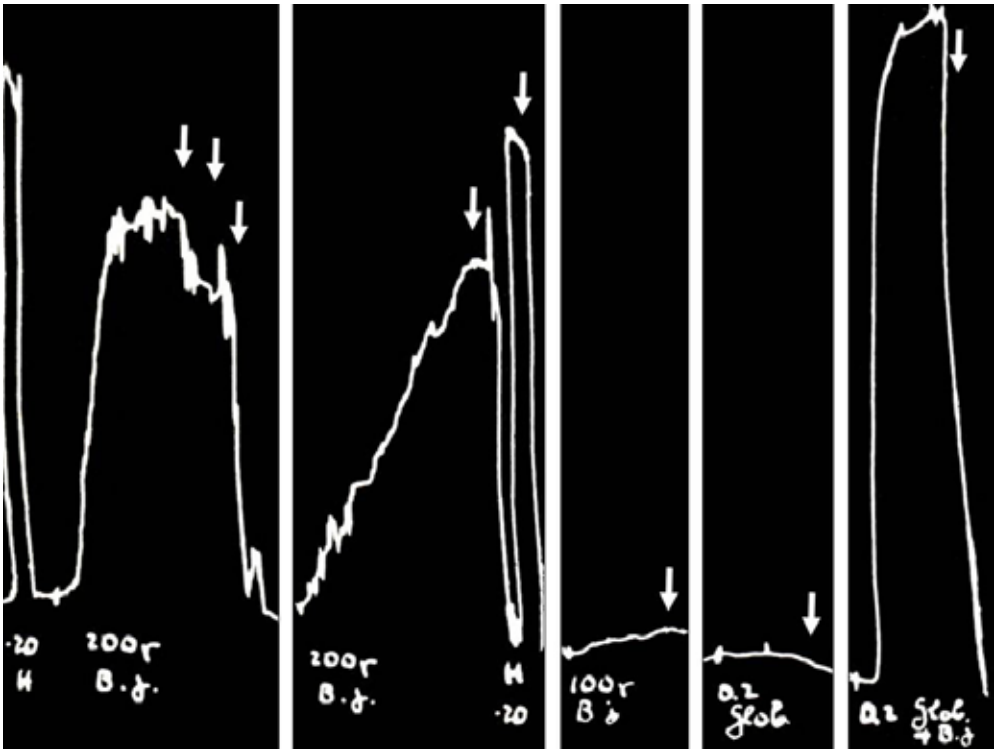
IS BIOASSAY DEAD OR MERELY FORGOTTEN? (continued)



Rocha e Silva's original kymographic tracing of the demonstration of generation of bradykinin by incubation of globulin and Bothrops jararaca venom. The first tracing shows histamine contraction and the first contraction induced by the venom. The second and third panels show the desensitization of the isolated guinea pig ileum. Globulin did not induce contraction by itself (fourth panel), however, it induced an intense and slow contraction in the presence of bradykinin. Bradykinin was primarily discovered by the incubation of the venom with plasma. The arrows indicate the preparation was washed with the bathing fluid (M. Rocha E Silva, W.T. Beraldo, and G. Rosenfeld. Bradykinin, a hypotensive and smooth muscle stimulating factor released from plasma globulin by snake venoms and bytrypsin. Am. J. Physiol 156 (2):261-273, 1949).

In a striking example of the power of molecular biological techniques, the cause of the cardiac dysrhthymia torsade des pointes was tracked down to blockade of the hERG potassium channel. However, measurement of the binding affinity of drug candidates to the channel protein is not enough to assess torsadogenic potential, as both agonists and antagonists can bind strongly but have opposing – but still clinically serious – consequences. Automated procedures have been devised for electrophysiological measurements using cells transfected with this channel. Because there are many other ion channels affecting the action potential of the cardiomyocyte, and there are other cells influencing cardiomyocyte function, more complex bioassays are necessary to provide the final reliable estimate of the potential for a drug candidate to cause, or predispose, to torsade des pointes.

So, even in these days of post-genomic biology, there is no indication that the power and utility of the bioassay has diminished. It is still capable of disclosing new biological activities, of illuminating our understanding of physiology and pathophysiology, and still performs a pivotal role in drug discovery. The absolute necessity of bioassays in drug development has been recognised by the pharmaceutical industry, as has the scarcity of pharmacologists with the skills, knowledge and experience to perform and interpret the results of such experiments. Now industry is joining with academic institutions to fund courses designed to teach bioassay techniques. It is hoped this effort will help ensure an ongoing supply of appropriately trained new graduates for the pharmaceutical industry and of teachers to maintain these skills and techniques in academia.

Y. S. Bakhle (on left) and S.H. Ferreira

This brief exposition does not seek to discount or discredit the first-class science involved in the human genome project or to undervalue the new molecular tools used to address pharmacological problems. Rather, we seek only to remind those who may have forgotten, or those who never knew, that bioassays are still making essential contributions in pharmacological research and that we must safeguard its survival for the sake of all those conducting research in physiology, pharmacology and drug discovery. ●

Acknowledgements: We thank our many colleagues, particularly Dr. V.A. Alabaster and Dr. G.J. Blackwell, for their most valuable discussions and comments.

IN VIVO VERITAS: WHY INTEGRATIVE PHARMACOLOGICAL TECHNIQUES REMAIN ESSENTIAL FOR DRUG DISCOVERY AND DEVELOPMENT

By Bevyn Jarrott
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IUPHAR Councilor (2 terms) 1990-1998
IUPHAR Teaching Section Founding Chair

The human desire to consume substances for pleasure and the relief of pain and suffering dates from at least 2,200 BC. Thus, for over four millennia mankind has been engaged in the *in vivo* testing of pharmacological agents. Because extracts of plants such as the poppy, foxglove, nightshade, cinchona, coca, and hemp, as well as simple organic chemicals, such as ethanol, were taken by humans without prior animal experimentation, the safe dose and frequency of administration were determined empirically over decades or centuries of informal experimentation.

Drug discovery relied exclusively on *in vivo* animal experimentation into the 20th century. This is exemplified by the work of Gerhard Domagk at I.G. Farbenindustrie (Germany) in 1932. Professor Domagk inoculated mice with hemolytic Streptococcus bacteria followed by administration of one of many dyes and then counted the number of surviving mice after 24 hours. He found that Prontosil Red, an azo dye, eliminated the Streptococci without causing any obvious systemic toxicity. A few years later, Daniel Bovet and co-workers at the Institut Pasteur (Paris) found that although the urine of mice treated with Prontosil Red did not contain the dye it was still highly effective as a bacteriostat *in vitro*. This group subsequently identified sulfanilamide as a colorless metabolite formed by the *in vivo* reduction of the azo bond of the parent compound. They went on to show that synthetic sulphanilamide alone is a potent bacteriostat against gram positive bacteria *in vitro* and *in vivo*. These discoveries led to the synthesis and testing of approximately 6,000 substituted sulfonamides that varied in their pharmacokinetic properties.

Comprehensive structure-activity studies of this pharmacophore, most of which were performed *in vivo*, resulted in the discovery of three other classes of therapeutic agents: carbonic anhydrase inhibitors, loop diuretics, and orally active hypoglycemic drugs. Although sulphanilamide was first synthesised in 1908, it was nearly 30 years before it was tested for pharmacological activity. Undoubtedly tens of thousands, if not millions, of lives were lost to infection that might have been saved had the therapeutic potential of this chemical class been appreciated earlier.

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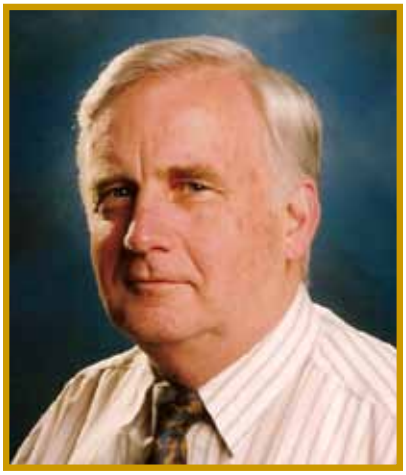
IN VIVO VERITAS: WHY INTEGRATIVE PHARMACOLOGICAL TECHNIQUES REMAIN ESSENTIAL FOR DRUG DISCOVERY AND DEVELOPMENT (continued)

The past decade has witnessed a reduced use of *in vivo* screening in the drug discovery process. This has been due, in part, to the slow throughput and high cost of such assays. Rather, pharmaceutical firms have emphasised the use of combinatorial chemistry and parallel synthesis for rapidly preparing novel chemicals that are then screened using high throughput *in vitro* assays for selected biological targets (reductionism). To date this approach has not proven to be particularly productive, as evidenced by the significant decline in the approval of new drugs in recent years even though there has been an increase in expenditures for research and development.

An example of the reductionistic approach to drug discovery is the search for antidepressants by the screening of chemicals for their ability to inhibit the active transport of monoamines into aminergic neurons. While effective drugs such as fluoxetine, escitalopram, and duloxetine, have been discovered using this approach, there is a temporal discrepancy between their biochemical effect on transmitter uptake and the clinical response to these agents, with the latter requiring one to three weeks of continuous administration to become apparent. As it now appears that chronic blockade of amine uptake may lead to either increased neurogenesis in key brain regions and/or increased expression of neurotrophins, such as BDNF, monoamine uptake alone may not be the best experimental end-point if the aim is to discover a novel antidepressant. Rather, thanks to the *in vivo* work demonstrating the potential importance of neurogenesis in the response to these agents, new screening approaches, including *in vivo* assays, should be considered if novel drugs are being sought.

The case for *in vivo* screening assays has also been strengthened by the dramatic developments in imaging technologies, such as x-ray and positron emission tomography, functional magnetic resonance, sonography, near-infrared radiation imaging, and luminescence imaging, and of radiotelemetry, which allows for the remote monitoring of biosignals for weeks or months. This allows for a more precise measurement of the time course of drug action in laboratory animals as it relates to pharmacokinetic parameters in laboratory animals following either acute or chronic administration of a test substance. Ultimately, for some disorders, the longitudinal sampling of disease biomarkers will be an important element of the drug development process for assessing potential safety and efficacy of drug candidates. As compared to 50 years ago when IUPHAR was founded, the integrative pharmacologist now has a larger array of techniques for pursing *in vivo* studies in wild type and transgenic laboratory animals. Moreover, some of the new imaging techniques in particular make it possible to obtain more precise pharmacokinetic and pharmacodynamic information from research on human subjects, the most relevant subject for *in vivo* tests aimed at developing safer and more effective medications. ●



Bevyn Jarrott

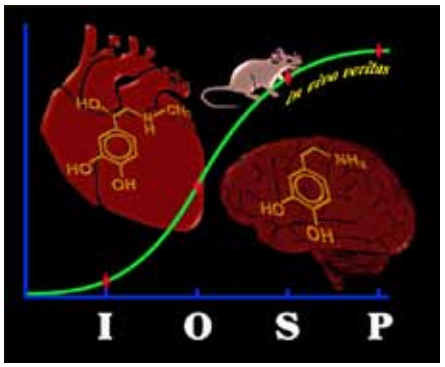
THE IUPHAR INTEGRATIVE ORGAN AND SYSTEM PHARMACOLOGY (IOSP) INITIATIVE

By David B. Bylund
Omaha, Nebraska, USA
Chair, IUPHAR IOSP Initiative

The IUPHAR Integrative Organ and System Pharmacology (IOSP) Initiative was undertaken in 2007 to promote IOSP throughout the world, with a particular focus on developing countries. The aim of this program is to counter the loss of knowledge and skills in the area of integrative and organ system pharmacology that has occurred in recent years. Pharmacologists in the United Kingdom have been a leader of this movement, both in terms of fundraising and the ethical use of animals. Recognizing the loss of expertise in this area, the United States National Institutes of Health established four short-course programs a few years ago.

Four phased strategies to re-establish IOSP competence have been formulated during meetings of the IUPHAR IOSP Initiative:

- Short term: Organize short courses in various locations around the world
- Mid term: Catalog, organize and make freely available resources for teaching IOSP
- Long term: Create knowledge objectives and/or a core curriculum
- Ultimately: Offer a certification program



Two IUPHAR IOSP Initiative meetings have been held: one during the IXth World Congress of Clinical Pharmacology and Therapeutics in Québec (July 2008), and the other in Cairo (March 2009) in conjunction with the annual meeting of the IUPHAR Executive Committee.

As a result of the Québec meeting, a survey was conducted in 2008 to assess IOSP training needs and resources in various countries. We thank the many individuals who participated in this survey. A total of 40 responses were received from eleven countries, with scientists from the African continent particularly well-represented among this group.

In December 2008, IUPHAR sponsored a workshop on integrative and organ systems pharmacology at the International Conference on Translational Pharmacology held in New Delhi, India. Speakers included Jintana Sattayasai (Khon Kaen University and President of the Pharmacological and Therapeutic

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THE IUPHAR INTEGRATIVE ORGAN AND SYSTEM PHARMACOLOGY (IOSP) INITIATIVE (continued)

Society of Thailand); Mahbub Mostofa (Bangladesh Agricultural University, Mymensingh, Banglandesh); Y.K. Gupta, (All India Institute of Medical Sciences, New Delhi); and Kurtis Cornish and David Bylund (University of Nebraska Medical Center, Omaha, NE, USA). At this workshop Dr. Cornish distributed approximately 100 CDs describing a dog preparation used for cardiovascular studies. Partial support for Drs. Sattayasai and Mostofa was generously provided by the American Society for Pharmacology and Experimental Therapeutics Integrative Organ Systems Science fund.

A one-day, hands-on IOSP workshop was held as part of the 31st Annual Meeting of the Pharmacological and Therapeutic Society of Thailand on March 20, 2008. This included demonstrations of the effects of drugs *in vivo* on the cardiovascular system, on behavior, and on skeletal muscle organ bath preparations.

Support for the IUPHAR IOSP initiative has to date been provided by the Union and two other organizations. The American Society for Pharmacology and Experimental Therapeutics kindly donated $10,000 to support these activities, and the International Council for Science (ICSU) has awarded IUPHAR a grant of €30,000 to underwrite the participation of young scientists in African IOSP training workshops.

In the coming year IUPHAR will help support three 3-day IOSP short courses in Africa. The first will be held September 19 - 22, 2009 in Potchefstroom, South Africa before the Congress of the South African Society for Basic and Clinical Pharmacology. This short course will be organized by Christiaan Brink (North-West University, Potchefstroom, and Secretary of the IUPHAR Teaching Section and Secretary of the 2014 World Congress of Pharmacology) and Douglas Oliver (North-West University, Potchefstroom and President of the 2014 World Congress of Pharmacology) who are members of that society. The second course will be presented in Cairo before or after the meeting of the Egyptian Society of Pharmacology and Experimental Therapeutics in mid-November 2009. It will be organized by society members Mahmoud Khayyal (Al-Azhar University, Cairo) and Ahmed Abdel-Tawab (Ain Shams University, Cairo). The third will be held in May 2010 in Nairobi, Kenya, and will be organized by Anastasia Guantai (University of Nairobi and President of the Kenyan Society for Basic and Applied Pharmacology).

The IUPHAR IOSP Committee will also be devoting considerable time during the coming year on the development of knowledge objectives and training materials, and on creating a web site with details on various IOSP training materials. An IOSP Workshop is planned in conjuction with WorldPharma 2010, which be held in Copenhagen in July, 2010.

As the IUPHAR IOSP Committee values feedback and participation, feel free to e-mail dbylund@unmc.edu with any comments or to learn more about this initiative. ●

David Bylund

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Pharmacology International

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50th Anniversary Edition

GASTROINTESINAL PHARMACOLOGY THE PAST AND THE FUTURE

By Jimmy Y.C. Chow and C.H. Cho, IUPHAR Gastrointestinal Pharmacology Section Chair
Hong Kong, China

The Gastrointestinal Pharmacology Section of IUPHAR was established in 1994 in Montreal, Canada. The initiative was spearheaded by T.S. Gaginella (USA), the first chair of the section. Dr. Gaginella was followed as chair by K. Takeuchi (Japan), G. Mozsik (Hungary) and, currently, C.H. Cho (China). Section council membership includes scientists from Canada, China, Hungary, Japan, Norway, United Kingdom and the United States. Since its inception, the section has sponsored numerous symposia in China, Japan, Hungary and the United States. These meetings were aimed at providing the latest information on the pathogenesis and treatment of gastrointestinal diseases.

As knowledge about the etiology of gastrointestinal diseases has grown, so has the number and quality of drugs used to treat these conditions. Thus, ulcer medications developed over the past two decades target major pathogenic factors rather than just symptoms of this condition. Treatments for functional disorders and inflammatory bowel disease have also improved somewhat, although treatment options for gastrointestinal cancers remain limited. Discussed below are selected milestones in the history of the development of drugs to treat gastrointestinal disorders and future directions for research in this area.

The advent of the histamine H_2 receptor antagonists (e.g. cimetidine), and later the proton pump inhibitors (PPIs, e.g. omeprazole), revolutionized the treatment of the upper gastrointestinal inflammation and ulcers. The concept of “No acid, No ulcer” became the mantra for the development of drugs to treat these conditions. Nevertheless, as ulcer relapses remained a problem, efforts turned to developing more effective agents that not only inhibit gastric acid secretion but also reduce recurrence.

The discovery of *Helicobacter pylori* caused a paradigm shift for the treatment of gastrointestinal ulcers. Indeed, the discovery of this organism as the causative agent for the initiation and recurrence of upper gastrointestinal ulcer and gastric cancer is one of the most significant findings in the history of the field. Extensive studies subsequently led to the use of antibiotics and a PPI as the treatment standard for peptic ulcer disease. Although in recent years the incidence of this condition has remained low in developed countries, antibiotic abuse has become a major clinical problem. New therapeutic strategies should be undertaken to prevent multi-drug resistance in the management of this disorder.

The association of non-steroidal anti-inflammatory drugs (NSAIDs) with gastropathy and upper gastrointestinal hemorrhage stimulated, in part, the development of cyclooxgenase-2 (COX-2)-selective inhibitors (e.g. Vioxx). It was

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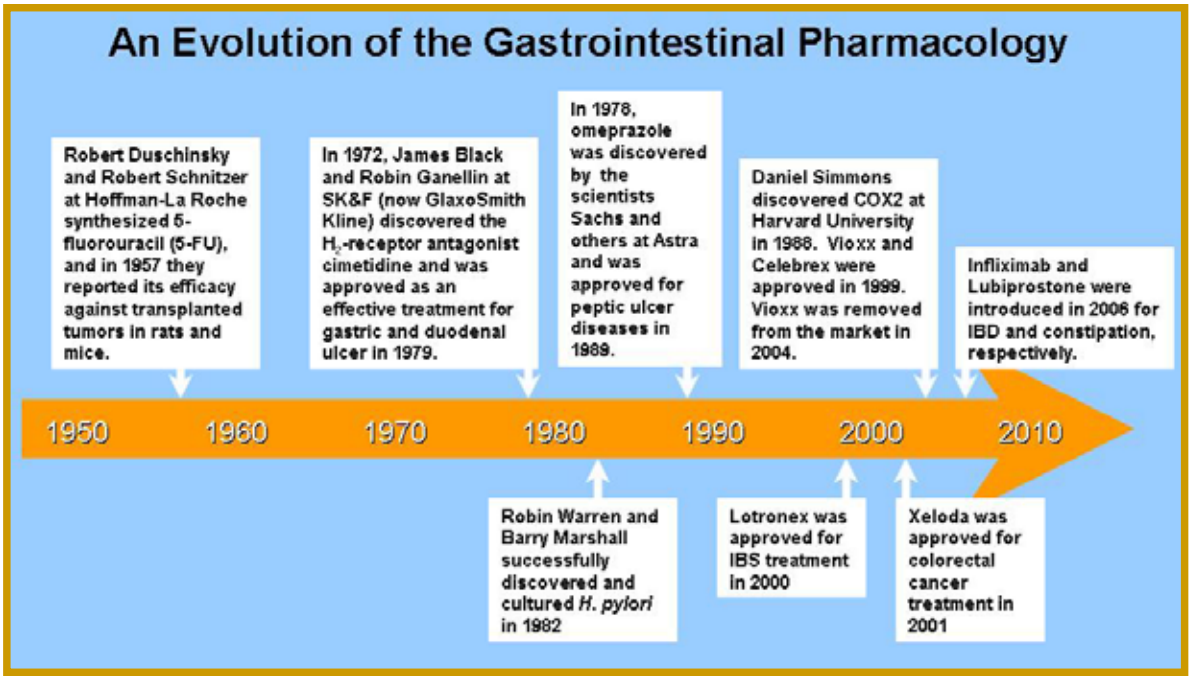
GASTROINTESINAL PHARMACOLOGY THE PAST AND THE FUTURE (continued)

originally thought that COX-2 inhibitors would minimize the adverse gastrointestinal and antiplatelet effects of nonselective NSAIDs while not compromising the analgesic and anti-inflammatory actions of such agents. Unexpectedly, gastrointestinal toxicity was in fact induced by the COX-2 inhibitors. Moreover, with long-term use they increase cardiovascular risks by inducing a prothombotic state by causing a rise in the ratio of endothelial thromboxane A2 to platelet-derived prostacyclin. For this reason, Vioxx and other COX-2 inhibitors were withdrawn from the market.

Functional disorders, including gastroesophageal reflux disease, dyspepsia, irritable bowl syndrome, and constipation, affect millions of people. In recent years there has been tremendous progress in defining the pathogenesis of these disorders and in devising new strategies for their treatment. While the number of more effective therapies is limited, there is interest in examining drugs acting on the serotonin receptors (e.g. Alosetron), and cholecystokinin agonists (e.g. Dexloxiglumide) as treatments for digestive motility, secretion, and visceral sensitivity. Although lower gastrointestinal tract disorders, such as constipation, are still typically treated with laxatives, a new class of chloride channel opener selective for ClC-2 (e.g. Lubiprostone) is now being used for this purpose.

Inflammatory bowl disease (IBD) is most commonly encountered in Western countries. In the past, anti-inflammatory agents, such as aminosalicylates and corticosteroids, were used to treat this condition, the etiology of which remains unknown. The development of a TNF-α neutralizing chimeric antibody (Infliximab) has greatly enhanced the quality of life for some IBD patients, and indicates that significant progress can be made in managing this condition.



Challenges remain in gastrointestinal pharmacology research because the changes in environmental factors and eating habits, especially in the East, have increased the incidence of certain cancers. This is particularly true for colorectal cancer, which is rapidly becoming the number one cancer-related cause of death in the Asian population. For years, 5-fluorouracil has been the drug of choice for the treatment of colorectal and other types of gastrointestinal cancers, even though its use is associated with a host of systemic side effects. A prodrug, Xeloda, was approved recently by the FDA for the treatment of colorectal and gastric cancers. As this agent is converted to 5-fluorouracil by thymidine phosphorylase only after it accumulates in tumor cells, it is more site-selective in its action, reducing the potential for untoward side effects.

Thanks to the efforts of pharmacologists, the management of various gastrointestinal diseases has improved dramatically over the years. While this era has witnessed the rise and fall of some drugs, overall significant progress has been made in advancing the treatment of certain conditions. New directions include the identification of novel chemical entities designed to target underlying pathologies, as well an increased focus on alternative medicines and other biological agents that may have some value in treating these disorders. Undoubtedly, as in the past, gastrointestinal pharmacology will continue to evolve for the benefit of mankind. ●

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PERSONAL VIEWS ON PHARMACOLOGY IN JAPAN: THE PAST AND THE FUTURE

By Makoto Endo
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IUPHAR Councilor 2002-2006

Pharmacology has made significant progress over the past 50 years. When IUPHAR was launched in 1959, I was a graduate student in the Department of Pharmacology, the University of Tokyo under Hiroshi Kumagai. The number of demonstrably effective drugs at that time was rather small. While chlorpromazine and other major tranquilizers were already widely used, their mechanisms of action remained a mystery.

I was attracted to Prof. Kumagai's laboratory because of his interest in utilizing drugs as tools to define basic physiological mechanisms. Setsuro Ebashi, Prof. Kumagai's most accomplished pupil, was the first to establish that Ca2+ ion mediates excitation-contraction coupling in striated muscles, a monumental achievement. This landmark discovery was made possible by studying the effect of chelating agents on ATP-induced contractile responses in actomyosin preparations, demonstrating further that the judicious use of xenobiotics can yield valuable insights into important physiological processes. With the elucidation of the molecular mechanisms of action of many drugs, the past half-century has witnessed further demonstrations of their value as tools for basic research. This will remain one of the strengths of pharmacology into the future. Most of the drugs utilized in the 1950's were discovered empirically. While this is still the case for many agents, more and more are being discovered by design thanks to the technological progress made in life science research. Nonetheless, significant challenges remain for drug discovery, given the new demands by regulatory agencies and the need to better understand the molecular basis of disease in order to identify novel targets for treating these conditions. The increased emphasis on the practical application of research findings is reflected in the decision by IUPHAR to place greater emphasis on clinical pharmacology and translational medicine. This bodes well for the future of the field and the Union.

Setsuro Ebashi

The Japanese Pharmacology Society has a history of recognizing work with obvious clinical relevance. For example, in July, 2006 Professor Setsuro Ebashi passed away, and the next year the Japanese Pharmacological Society created the Setsuro Ebashi Prize, commemorating his great achievements in pharmacology and life sciences in general. The first Ebashi Prize Winner was Dr. Tomoh Masaki, the discoverer of endothelin, and the second, in 2008, was Dr. Shinya Yamanaka in recognition of his work on iPS cells. The accomplishments of these individuals continue a long tradition of Japanese scientists making major contributions to the pharmacological sciences.

The Japanese Pharmacological Society has been a major supporter of IUPHAR for decades. Prof. Kumagai, one of the first IUPHAR Councillors, was involved in winning the independence of the Union from the IUPS in 1966. In 1981 the very successful VIII International Congress of Pharmacology was held in Tokyo under the leadership of Prof. Ebashi, who also served as IUPHAR President from 1990 to 1994. As the partnership between IUPHAR and the Japanese Pharmacological Society has been so fruitful in the past, there can be little doubt we will continue to collaborate in the future for the benefit of our discipline and of mankind. ●

Makoto Endo

THE FUTURE OF PHARMACOLOGY

By Sergio Erill
Barcelona, Spain
IUPHAR Nominating Committee Member 2006-2010

There are many ways to consider the prospects for the future of pharmacology. Were we to look at the number of first class papers in which drugs are used for one purpose or another, a bright future would be taken for granted. A similar conclusion would be reached from a study of articles originating from departments of pharmacology. However, enthusiasm might be tempered by the fact that pharmacologists are not widely known or appreciated by the lay public or even other biological scientists. Ask a university colleague from any other scientific discipline to name pharmacologists at a major institution in another state and you are likely to be disappointed by the response, or lack thereof.

Of course, over the past hundred years there has been an explosive growth in pharmacology in both academic and industrial settings. Historically, pharmacology has benefited from, and incorporated, methods and techniques from other disciplines. Moreover, the number of journals bearing the name of the discipline has multiplied and we have witnessed the development of a sister

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THE FUTURE OF PHARMACOLOGY

discipline, clinical pharmacology. These marks of success could easily be interpreted as guarantees of progress and expansion. While this is hopefully the case, other factors must be taken into consideration when trying to divine the future of the field.

While the tools of molecular biology have been adopted by a host of disciplines, among them pharmacology, the benefits they provide are accompanied by risks. Thus, some argue that work purported to be pharmacological in nature is actually just a routine molecular biology study, with scant relevance in defining drug action or clinical utility. It is sometimes difficult to escape the feeling that some pharmacological research is no more than the systematic application of molecular biology techniques that yield simply descriptive results. There is, of course, nothing wrong with utilizing the tools of the molecular biologist and the important role of taxonomy in the progress of knowledge cannot be discounted. Nevertheless, the use of any technique to simply generate results rather than to use it for rigorously testing hypotheses inhibits creativity. Furthermore, the industrialization of drug discovery has led in some cases to the near extinction of animal pharmacologists in the pharmaceutical industry. Clinically, it is common to encounter clinical pharmacologists who are actually working as epidemiologists. Indeed, some of the most important clinical trials conducted in recent years did not include a pharmacologist among the investigators.

It is sad to realize that pharmacology cannot escape many of the problems associated with modern research. Much has been said about the evils associated with overloading a graduate student curriculum as this interferes with the quality of research. However, attention must also be paid to the fractal nature of current knowledge. The focus on minute facets of biology has led to a situation where scientists working in what are actually related fields do not interact until they return to the diverging root of the fractal. While the volume of knowledge makes it impossible to train renaissance scientists, a lack of opportunities for lateral thinking and sharing of ideas has negative consequences.

Is the future therefore bleak for pharmacology? Absolutely not. Rather, these brief comments are only intended to sound an alert that unqualified optimism about the future of our discipline is unwarranted even though objective factors, such as the number of societies, journals, and articles, appear positive. While Lord Kelvin's dictum that measurements ought to be expressed in numbers is as valid as ever, we should not be enraptured by them. Let us also pay attention to qualitative measures as a focus on scientific excellence and a pride of identity are good for science in general, and for pharmacology in particular, both now and into the future. ●

Sergio Erill

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Pharmacology International

June 2009

50th Anniversary Edition

NIDA-IUPHAR EARLY CAREER INVESTIGATOR TRAVEL AWARD WINNERS

By S. J. Enna
Kansas City, Kansas, USA
IUPHAR Secretary-General

The U.S. National Institute of Drug Abuse (NIDA) will hold a mini-convention entitled "Frontiers in Addiction Research" as a satellite of the Society for Neuroscience Annual Meeting in Chicago, Illinois, on Friday, October 16, 2009, from 8:00 a.m. to 6:25 p.m.

At the NIDA meeting scientists will present recent findings from studies on the neurobiology of drug abuse and addiction, and discuss future directions for research in the field. The mini-convention will include four symposia, a presentation by the Jacob Waletzky Memorial Prize winner, and the poster session for early career investigators. The symposia this year will be:

Non-Cannibinoid Receptor-Mediated Actions of Endocannabinoids
Delayed Neurobiological Plasticity in Drug Abuse and Chronic Pain
Epigenetics Modulation of Brain Function
Role of Neurotrophic Factors in Drug Addiction

For meeting registration information please visit www.seiservices.com/nida/frontiers2009/Index.htm .

Again this year, NIDA and IUPHAR are jointly sponsoring young investigator awards to underwrite attendance at this meeting. The awardees will each receive US$1,000 to help cover the costs of travel and expenses associated with participation in this event. The 2009 awardees are (in alphabetical order):

Valeria Capurro is a Ph.D. candidate at the University of Milan. Ms. Capurro was nominated by the Italian Society of Pharmacology. Her research, which is being conducted in the laboratory of Dr. Mariaelvina Sala, is aimed at examining the extent to which prior exposure to THC affects the reinforcing properties of other agents. In 2007, Ms. Capurro was awarded the Fellowship for Young Promising Students from the University of Milan. Her NIDA meeting abstract is entitled "Previous exposure to Delta-9-tetrahydrocannabinol (THC) increases vulnerability to Salvinorin A-induced reinforcing effects".

Liang Liu, a Ph.D. candidate working with Dr. Mark Hutchinson at the University of Adelaide, was nominated by the Australasian Society of Clinical and Experimental Pharmacologists and Toxicologists (ASCEPT). Mr. Liu obtained a Master of Engineering Science before pursuing his Ph.D. in the biological sciences. His research project, which is the subject of his presentation for the Chicago meeting, is aimed at exploring a possible relationship between IL-1 b genetic polymorphisms and an increased risk for opioid and alcohol dependence.

Gustavo Moraga-Cid, nominated by the Chilean Society of Pharmacology, recently received his Ph.D. in Biological Sciences from the University of Conception in Chile. His abstract entitled "Multiple residues along the α2 glycine receptor control the ethanol sensitivity" describes the results of his studies into the selective effects of ethanol on glycine receptor subtypes.

IUPHAR is proud to join with NIDA in sponsoring this worthwhile program. ●

International Research Funding Opportunity

We help the world breathe

PULMONARY • CRITICAL CARE • SLEEP

The American Thoracic Society is pleased to announce the ATS Foundation Tobacco-Dependence Research Fund Grants. Funding to begin in January 2010. A primary goal of the ATS Research Program is to enable new investigators the chance to make the transition to careers as established investigators. Applicants must have completed their primary research training (PhD or sub-specialty fellowship training) by July 1, 2009 and have a firm commitment from their home institution for a faculty position. Partnerships between junior and senior investigators are strongly encouraged, particularly for new investigators who are within 1 to 5 years of the completion of their research training. We encourage U.S. and non-U.S. based investigators to apply. At least one of the investigators must be an ATS member at the time of application, and the principal investigator must be an ATS member at the time that the grant is awarded. Indirect costs will not be paid to the sponsoring institution. Each applicant may only submit one full grant application for the ATS Foundation Tobacco-Dependence Research Fund Grants.

1. **The ATS Foundation Tobacco-Dependence Research Fund Grant** (one grant available) is made possible by a generous educational grant from the ATS Foundation Tobacco-Dependence Research Fund. The grant will be targeted to research in basic science, genetics, neurogenetics, pharmacology, neuropharmacology, and clinical intervention and treatment in the area of tobacco dependence. Preference will be given to projects that, because of their novelty, require bridge funding before becoming competitive for other funding mechanisms. Applicants may request up to $50,000/year for 2 years for salaries, supplies or a combination of these two.

2. **The ATS/ALA of Hawaii Research Grant – International Research Project US-Asia** (one grant available) is made possible by a generous educational grant from the ALA of Hawaii and the ATS Foundation Tobacco-Dependence Research Fund. The grant will be targeted to research in basic science, genetics, neurogenetics, pharmacology, neuropharmacology, or clinical intervention and treatment in the area of tobacco dependence. This grant will be specifically restricted for the funding of a collaborative international research project between investigators in the U.S. and Asia. Preference will be given to projects that, because of their novelty require bridge funding before becoming competitive for other funding mechanisms. Applicants may request up to $50,000/year for 2 years for salaries, supplies or a combination of these two.

3. **The ATS/ALA of Hawaii Research Grant – Open to all Geographic Areas** (one grant available) is made possible by a generous educational grant from the ALA of Hawaii and the ATS Foundation Tobacco-Dependence Research Fund. The grant will be targeted to research in basic science, genetics, neurogenetics, pharmacology, neuropharmacology, and clinical intervention and treatment in the area of tobacco dependence. Preference will be given to projects that, because of their novelty, require bridge funding before becoming competitive for other funding mechanisms. Applicants may request up to $50,000/year for 2 years for salaries, supplies or a combination of these two.

Potential applicants should submit a grant application using the application that is available through the proposalCENTRAL website at https://proposalcentral.altum.com . Applications should be submitted via the proposalCENTRAL website by 9:00a.m. Eastern Time (6:00a.m. Pacific Time) on **Tuesday, September 1, 2009**. Late submissions will not be accepted. For more information please visit www.thoracic.org or contact Ms. Monica Simon at msimon@thoracic.org .

13th Meeting of the International Conference on Gastrointestinal Research

(formerly known as the International Conference on Ulcer Research)

September 10th - 16th, 2009

Hotel Lav Le Meridien

Split, Croatia

www.icur2009.com

On behalf of the Gastrointestinal Pharmacology Section of IUPHAR, I invite you to attend the ***13th International Conference on Gastrointestingal Research*** to be held in Split, Croatia. This meeting has a full scientific program combining both basic and clinical aspects of diseases in the gastrointestinal tract, ranging from functional disorders to inflammation and cancers. I am sure both basic and clinical scientists will greatly benefit from attending this meeting by sharing their experiences and getting valuable information from others in different areas of gastrointestinal research. This meeting will also enable us to enlarge our research networking around the globe as there will be participants from different parts of the world.

My past experience at the 11th ICUR meeting was also in Croatia and gave me a memorable moment in my academic career. I enjoyed not only the treasure of science during the meeting but also the friendship, and the most scenic place I have ever visited. In this regard, apart from the science, I would strongly encourage you to bring your family to have a wonderful vacation in Croatia.

I look forward to seeing you in Split in September.

Chi Hin Cho, B.Pharm, Ph.D.,
Chair, IUPHAR Gastrointestinal Pharmacology Section

THE 1ST WORLD CONFERENCE ON THE PHARMACOLOGY OF NATURAL AND TRADITIONAL MEDICINES

September 9th to 12th, 2009

Hangzhou, China

Dear colleagues,

The First World Conference on the Pharmacology of Natural and Traditional Medicines, sponsored by the Section on Pharmacology of Natural Products of the International Union of Basic and Clinical Pharmacology (IUPHAR) and the Chinese Pharmacological Society (CNPHARS), will be held from September 9th to 12th, 2009, in Hangzhou, China.

The theme of the conference is **"The present and the future of natural and traditional medicines"**. The meeting will consist of oral communications, posters presentations and discussion sessions, all focusing on basic pharmacological, toxicological, clinical research, as well as on the discovery and development of new drugs related to natural and traditional medicines or ethnomedical resources. The conference will offer an outstanding opportunity for delegates and guests to communicate their results, ideas, and new methods developed for studying the pharmacology of natural and traditional medicines.

On behalf of the Organizing Committee, we look forward to welcoming scientists from all over the world to meet in the beautiful green city of Hangzhou, one of the jewels of China. We promise a scientifically excellent program as well as the opportunity to enjoy the beautiful scenery and comfortable atmosphere in Hangzhou. We believe that the conference will contribute greatly to international communication and collaborations, and foster progress in the field of natural and traditional medicines.

We look forward to seeing you in Hangzhou.

Co-Chair
Professor Zhi-bin Lin

Co-Chair
Professor Yong-sheng Fan

Please visit www.cnphars.org/event/2009/pharm_ntm/indexen.asp for more information.

Meeting Secretary

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International Symposium on Drug Transport and Metabolism

October 13th to 14th, 2009

Buenos Aires, Argentina

Dear colleagues,

The Drug Metabolism Section of IUPHAR is sponsoring an **International Symposium on Drug Transport and Metabolism** (Buenos Aires, October 13th to 14th), organized by the Argentinean Society of Experimental Pharmacology (SAFE).

The symposium will focus on the action of metabolic and transport systems affecting the availability and therapeutic effects or toxicity of drugs. The scientific program will present basic and clinical aspects of the role of major drug transporters and biotransformation enzymes in health and disease.

This meeting will be the first ever sponsored by the Drug Metabolism Section of IUPHAR in South America and its aim is to stimulate scientific interaction between young and senior South American scientists and international experts in the areas of drug transport and metabolism.

We invite you to attend this meeting and enjoy a combination of good science and the beauty of Buenos Aires and the outstanding hospitality of its people.

For more information, please visit the website of SAFE:
www.safe-digital.org

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E-mail the society at safe@canopus.com.ar
or Prof. Aldo Mottino at aldomottino@yahoo.com.ar

We look forward to seeing you in Buenos Aires.

Jaime Kapitulnik and *Olavi Pelkonen*
Chair Secretary
Drug Metabolism Section of IUPHAR

NEUROPEPTIDES

19th *Neuropharmacology* Conference

October 14-16, 2009 | Hyatt Regency McCormick Place, Chicago, USA

Satellite to the 2009 meeting of the Society for Neuroscience

REGISTER NOW

Early booking deadline: August 14, 2009

CONFERENCE SESSIONS AND CHAIRS

Imaging of neuropeptidergic action in the CNS
Chair: Craig Ferris, *Northeastern University, USA*

Neuropeptide systems in social behavior
Chair: Jim Goodson, *Indiana University, USA*

Neuropeptidergic control of stress responsivity
Chair: Inga D. Neumann, *University of Regensburg, Germany*

Arousal and sleep
Chair: Darryle Schoepp, *Merck, USA*

Emerging neuropeptide systems
Chair: Robert H. Ring, *Wyeth, USA*

Feeding behavior and appetite
Chair: Richard Hargreaves, *Merck, USA*

The role of neuropeptides in neuronal plasticity
Chair: Richard Miller, *Northwestern University, USA*

Neurogenic inflammation and pain
Chair: Andrew Russo, *University of Iowa, USA*

Lessons learned from translation
Chair: Menelas Pangalos, *Wyeth, USA*

Hot topics: Oral communications drawn from contributed abstracts
Chair: David Bleakman, *Eli Lilly and Co., USA*

SPEAKERS INCLUDE

Lisa Arvanitis, *Sanofi-Aventis, USA*
Ceri H. Davies, *GlaxoSmithKline, UK*
Marcelo Febo, *Northeastern University, USA*
David Feifel, *University of California San Diego, USA*
Craig Ferris, *Northeastern University, USA*
Jim Goodson, *Indiana University, USA*
Thomas S. Kilduff, *SRI International, USA*
Luis de Lecea, *Stanford School of Medicine, USA*
Richard Miller, *Northwestern University, USA*
Tooru Mizuno, *University of Manitoba, Canada*
Charles Nemeroff, *Emory University School of Medicine, USA*
Inga D. Neumann, *University of Regensburg, Germany*
Hans-Christian Pape, *University of Münster, Germany*
Steven M. Phelps, *University of Florida, USA*
Frank Porreca, *University of Arizona, USA*
William Z. Potter, *Merck, USA*
Rainer K. Reinscheid, *University of California Irvine, USA*
Robert H. Ring, *Wyeth, USA*
Andrew Russo, *University of Iowa, USA*
Darleen Sandoval, *University of Cincinnati, USA*
Helen Scharfman, *New York University, USA*
Gary J. Schwartz, *Albert Einstein College of Medicine, USA*
Sanbing Shen, *University of Aberdeen, UK*
Ron Stoop, *University of Lausanne, Switzerland*
Ralf Stumm, *Otto von Guericke University of Magdeburg, Germany*
Gilles Tamagnan, *Molecular Neuroimaging LLC, USA*
Richmond R. Thompson, *Bowdoin College, USA*
Alexa Veenema, *University of Massachusetts, USA*
Fletcher A. White, *Loyola University of Chicago, USA*
Christopher J. Winrow, *Merck, USA*

Register now at: www.neuropharmacology-conference.elsevier.com

SEPHAR-IUPHAR 1959-2009

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Have you marked your calendar yet?

Cape Town

(Source: www.flagpictures.org)

What are your plans for the summer 2010?

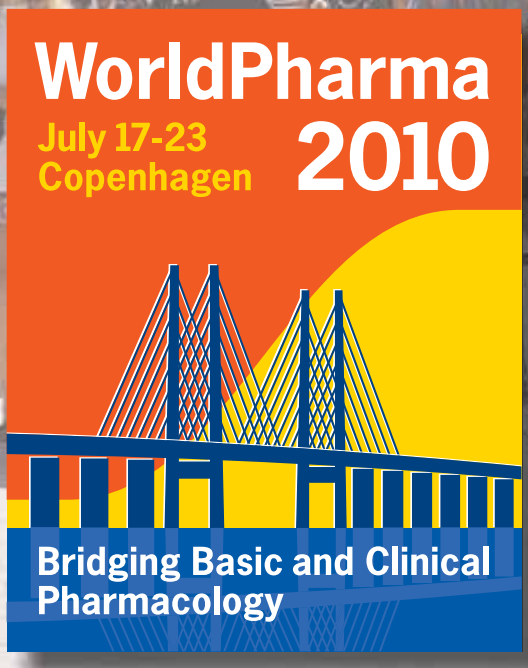
How about spending a week in Wonderful Copenhagen in the company of 3000 other top scientists within basic & clinical pharmacology?

In July 2010 basic and clinical pharmacology will come together again to encompass the whole process of drug development from molecular biology to clinical practice.

Here we will discuss how we can work together to meet the needs for safe and effective medicines at affordable prices.

Please find more information on:

www.WorldPharma2010.org



Upcoming Events

July/August

Summer Meeting of the British Pharmacological Society
Where: Edinburgh, Scotland, UK
When: July 8 - 10, 2009
Website: www.bps.ac.uk/site/cms/contentCategoryView.asp?category=258

The Congress of the European Association for Clinical Pharmacology and Therapeutics (EACPT)
Where: Edinburgh, Scotland, UK
When: July 12 - 15, 2009
Website: www.eacpt2009.org

36th International Congress of the International Union of Physiological Sciences
Joint IUPHAR-IUPS Symposium: Cotransmission and Presynaptic Receptors on July 28th at 14:00
Where: Kyoto, Japan
When: July 27 - Aug. 1, 2009
Website: www.iups2009.com

September

7th James Black Conference - Integrative Pharmacology and Physiology: Translating "omics" into Functional and Clinical Applications sponsored by the British Pharmacological Society and the Physiological Society
Where: London, UK
When: September 1 - 3, 2009
Website: www.bps.ac.uk/site/cms/contentCategoryView.asp?category=404

Upcoming Events

September (continued)

7th Congress of Toxicology in Developing Countries
Where: Sun City, South Africa
When: September 6 - 10, 2009
Website: www.7ctdc.co.za/m/invitation

The 1st World Conference on the Pharmacology of Natural and Traditional Medicines sponsored by the IUPHAR Section on Pharmacology of Natural Products and the Chinese Pharmacological Society (CNPHARS)
Where: Hangzhou, China
When: September 9 - 12, 2009
Website: www.cnphars.org/event/2009/pharm_ntm/indexen.asp

ET-11: American Physiological Society International Conference on Endothelin
Where: Montreal, Canada
When: September 9 - 12, 2009
Website: www.the-aps.org/meetings/aps/ET11Montreal/index.htm

13th International Conference on Gastrointestinal Research (formerly Ulcer Research) co-sponosored by the IUPHAR Section on Gastrointestinal Pharmacology
Where: Split, Croatia
When: September 10 - 16, 2009
Website: www.icur2009.com

22nd Congress of the European College of Neuropsychopharmacology
Where: Istanbul, Turkey
When: September 12 - 16, 2009
Website: www.ecnp.eu

Upcoming Events

September (continued)

38th Annual Meeting of the American College of Clinical Pharmacology

Where: San Antonio, Texas, USA
When: September 13 - 15, 2009
Website: www.accp1.org

9th Annual Meeting of the Safety Pharmacology Society

Where: Strasbourg, France
When: September 15 - 18, 2009
Website: www.safetypharmacology.org/am2009

43rd Annual Congress of the South African Society for Basic and Clinical Pharmacology

Where: Potchefstroom, South Africa
When: September 23 - 26, 2009
Website: www.sapharmacol.co.za

October

9th Annual Meeting of the International Society of Pharmacovigilance - From pharmacovigilance to risk management

Where: Reims, France
When: October 6 - 9, 2009
Website: www.isop2009.org

International Symposium on Drug Transport and Metabolism sponsored by the IUPHAR Section on Drug Metabolism, the Argentinean Society of Experimental Pharmacological (SAFE), the University of Buenos Aires (UBA), El Rosario University (UR) and the National Academy of Pharmacy and Biochemistry (ANFB)

Where: Buenos Aires, Argentina
When: October 13 - 14, 2009
Website: www.safe-digital.org

Upcoming Events

October (continued)

19th *Neuropharmacology* Conference
Where: Chicago, Illinois, USA
When: October 14 - 16, 2009
Website: www.neuropharmacology-conference.elsevier.com

November/December

15th Scientific Symposium of the Austrian Pharmacological Society (APHAR)
Invited Guest Societies: Hungarian Society for Experimental and Clinical Pharmacology (MFT) and Slovenian Society of Pharmacology (SDF)
Where: Graz, Austria
When: November 19 - 21, 2009
Website: www.aphar.at/aphar2009.html

41st Congress of the Argentinean Society of Experimental Pharmacology (SAFE)
Where: Rosario, Argentina
When: November 23 - 27, 2009
Website: www.safe-digital.org

Annual Meeting of the Australasian Society of Clinical & Experimental Pharmacologists and Toxicologists
Where: Sydney, Australia
When: November 29 - December 2, 2009
Website: www.ascept.org/meetings.htm

Winter Meeting of the British Pharmacological Society
Where: Brighton, UK
When: December 15 - 17, 2009
Website: www.bps.ac.uk/site/cms/contentCategoryView.asp?category=258

To include your IUPHAR member society events here, please e-mail the details to iuphar@kumc.edu .

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Contributions:

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Membership:

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