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THE Pharmacologist

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Oat Sprouts and the Topliss Tree: Rationalizing SAR

Inside:

ASPET
Transforming Discoveries into Therapies

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Contents...

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Message from The President

My fellow pharmacologists,

I am excited to welcome the incoming ASPET leadership, including Ken Thummel, Dennis Marshall, and Peggy Gnegy as elect-elect: President, Treasurer, and Councilor, respectively. We look forward to their contributions and guidance. All are very active ASPET members, so please join us in welcoming and congratulating them. This is a very good time for ASPET with our good financial position, so it is a great opportunity for current and future leaders to take on new initiatives. Since our most important resource is our membership, we welcome your input on how we can best serve you.

Education was a key topic of our Fall Council meeting and several steps have been taken to advance the educational role and objectives of ASPET. The Division of Pharmacology Education and the Graduate Education and Recruitment Committee are being merged under the leadership of Carol Beck, Kelly Karpa, and Bill Jackson. We appreciate their enthusiasm and look forward to important new initiatives from their group. Also, ASPET has provided support to IUPHAR to assist in building an open-access pharmacology education portal. This will ultimately become part of the Guide to Pharmacology ***www.guidetopharmacology.org***, and we welcome suggestions regarding potential resources that could be linked to and from the site or even added to the site. We are currently assembling a team from ASPET to help with this effort.

As a pharmacologist, it is exciting to see the number of initiatives that the NIH is taking with respect to drug discovery and development. It is clear that Francis Collins is pushing the move from genome to therapeutics, though his roots still remain strongly in genetics. While there is some controversy over the NIH's plans in this space, I think that there are great opportunities for pharmacologists here. The recently announced AMP (Accelerating Medicines Partnership) is one such endeavor along with the Blueprint Neurotherapeutics and CADET (Centers for Advanced Diagnostics and Experimental Therapeutics) programs.

Speaking of the NIH, the ASPET leadership has been working to build stronger ties at the NIH to ensure that we are on their radar. One suggestion from our Fall Council retreat was to bring more NIH leaders to our meetings. This year, Chris Austin Director of NCATS, will be speaking in John Lazo's Drug Discovery and Development Division Symposium, "Productive public private partnerships for pharmacological progress".

We have also taken ASPET input to Bethesda to address two issues of great interest to NIH leaders. Reproducibility of scientific results and workforce development and the necessity to produce trainees who can fit into a variety of scientific and biomedical careers are under active discussion at NIH. Annette Fleckenstein, Judy Siuciak, Jim Bernstein, and I had productive meetings with leadership at NIGMS, NIDA, and NIMH on these topics. There were very different approaches on these topics. NIGMS remains very strong on training and supports broadening of training to enhance the readiness of trainees for non-academic positions.

The "reproducibility" issue has also produced tremendous controversy among scientists, politicians, and the public. In my discussions with members, I have heard strong opinions on this topic. In general, the self-correcting nature of scientific study remains a critical antidote but ways to reduce erroneous results or facilitate correction of them will be welcome. The ASPET journals can play a key role here. We are very proud of our editorial teams that provide strong reviews and of our policies that ensure clear description of methods to facilitate replication. The Board of Publications Trustees is also evaluating policies that would enhance the openness and speed of correction of any problematic publications that do slip through the original review process. We plan to work with NIH to provide a template for enhancing the validity of pharmacological findings through these efforts.

We also heard very encouraging words from Dr. John Lorsch and staff at NIGMS. It is clear that NIH support for basic pharmacological sciences remains strong. Translational science is *de rigueur* at NIH these days but fundamental discoveries often lead to the most important breakthroughs for translation. Interestingly, scientists themselves may over-emphasize translation when basic biomedical science is also critical to the mission of improving human health. We hope to have sessions at the ASPET Annual Meeting at EB 2015 in Boston with NIH leaders to explore this critical topic.

I hope to see you at the ASPET Annual Meeting at Experimental Biology in San Diego along with our Chinese Pharmacological Society guests and perhaps at the IUPHAR meeting in Cape Town as well.

All the best,

Rick Neubig

New Year... New Look

With the March 2014 issue of *The Pharmacologist* we are introducing several exciting new changes for ASPET, most notably the launch of a new ASPET logo and tagline!

Why the New Look Now?

The last several years have shown us that the field of pharmacology is changing. Many academic programs have been absorbed by other departments and many in the field no longer identify themselves as pharmacologists even though they are doing work in pharmacology. Like our members who are dealing with a continually changing field, ASPET must also look ahead to determine how best to evolve along with our field so that we may continue to serve our existing members and attract new ones to grow our Society.

With 105 years behind us, ASPET is steeped in tradition and history, but we are also not afraid of change. Over the last few years, we have been adding programs, updating our website, and utilizing social media outlets to bring our members closer together. Year after year, we have been working to bring the best science and speakers to our annual meeting, improving the content and look of our member newsletter, *The Pharmacologist,* and working hard to listen to our members' needs. But we are not done with these changes and as you will see, we are working on even more new programs and benefits for our members. With all these changes and more to come, we recognize that ASPET's brand and look must accurately reflect our members' current and future needs.

The New ASPET Tagline

Throughout our re-branding process, it was very important for us to define who we are and why we exist. ASPET is all about our members, and we exist to serve them. Therefore, our new tagline, ***"Transforming Discoveries into Therapies,"*** was created to reflect our membership. Every day, our members are doing research and making discoveries that make a difference in people's lives.

The New Logo

The last time ASPET updated our logo was back in 2007 when it was redesigned to celebrate our 100th Anniversary. Now with our anniversary long over, we decided it was time for a change. After nearly a year and half of conducting branding research, interviewing members, and working with members and designers to come up with the new logo, we are proud and excited to present our new look.

Before starting the design process, we asked, what is the purpose of a logo? A logo's purpose is to visually identify an organization and distinguish us among other societies. With this in mind, we decided that our new logo must have universal appeal – because not everyone identifies with the term "pharmacology," we wanted a logo that reflected ASPET as a whole and not just a pharmacological image. We also wanted a logo that was clean, modern, and incorporated our new tagline.

We believe we achieved all of our goals with our new logo. The new logo is fresh and modern with a clean and classic font. The colors are earthy and have a human element to them, and the tagline is incorporated seamlessly into the logo. We love that the logo evokes a feeling of movement, from something small to something big – "transforming

ASPET

Transforming Discoveries into Therapies

discoveries into therapies." And what we love even more is that our logo stands apart from – other scientific society logos.

The New Look for *The Pharmacologist*

Now that we have a new logo and a new tagline, you'll be seeing the logo across all of ASPET's marketing outlets, including this issue of *The Pharmacologist*. Incorporating our new logo, we gave *The Pharmacologist* a fresh new design and layout, making our newsletter more attractive and easier to read. We also worked hard to freshen up our content, bringing you the most useful and interesting news and articles. We hope you enjoy this first issue of the year, but be sure to stay tuned for more changes and interesting content in the coming issues.

What Next?

Along with the changes to the newsletter, we have also been updating the ASPET website. We've moved and consolidated menu items on the homepage, making it easier to navigate and find important content. Throughout the website, we also added easy to use buttons for high interest pages and reformatted the content and layout of those pages. Some of the updated pages include the Career Center pages, Meetings pages, Awards pages, Donations pages and more. We are still working to clean up content and layout for the entire site, so be sure to check out the changes and come back often for updates.

If you are attending the Annual Meeting at EB 2014, you'll see all new merchandise at "Shop ASPET" in the ASPET booth. We'll have a variety of new items with our new logo, so be sure to come and support ASPET with your purchases.

We hope that you enjoy ASPET's new look, but it doesn't just stop here. As mentioned, we are rolling out a new brand for ASPET this year, which means new messaging, new programs, and new ideas to grow ASPET and secure a stronger future for our Society. As always, we would love to hear your comments about the changes so far and any ideas you have for the future. Please send us your comments to Suzie Thompson, Director of Marketing, ***sthompson@aspet.org***.

2014 Election Results

Congratulations to the Newly Elected Officers

The new officers will take office on July 1, 2014.

President-Elect

Kenneth E. Thummel,
University of Washington

Secretary/Treasurer-Elect

Dennis C. Marshall,
Ferring Pharmaceuticals, Inc.

Councilor

Margaret E. Gnegy,
University Michigan Medical School

2014 ASPET Award Winners

Congratulations 2014 ASPET Award Winners!

ASPET will recognize the 2014 Award Winners at the ASPET Annual Meeting at Experimental Biology 2014 during the ASPET Business Meeting and Awards Ceremony on Saturday, April 26, at 6:00PM at the San Diego Convention Center in Ballroom 20 B/C.

Craig W. Lindsley, PhD, Recipient of 2014 John J. Abel Award in Pharmacology

Craig W. Lindsley, PhD, Director of Medicinal Chemistry for the Vanderbilt Center for Neuroscience Drug Discovery and Center Co-Director at Vanderbilt University is the recipient of the 2014 John J. Abel Award. Dr. Lindsley receives the John J. Abel Award as an outstanding young investigator in recognition of his fundamental and transforming impact on pharmacology, medicinal chemistry, and drug discovery in the fields of neuroscience and cancer biology.

Dr. Lindsley received his BS in chemistry from California State University in Chico and earned his PhD from the University of California at Santa Barbara. Following a Postdoctoral Fellowship at Harvard he joined Parke-Davis Pharmaceuticals, then Eli Lilly, and shortly after joined Merck Research Laboratories as Senior Research Chemist. After rising to Senior Research Fellow, he left Merck after several years to join Vanderbilt University where he is currently Professor of Pharmacology and holds the William K. Warren, Jr. Chair in Medicine.

Dr. Lindsley is recognized as a world-class pharmacologist who has made contributions to multiple diverse areas of research including novel approaches to pharmacology as well as medicinal chemistry, cell signaling, psychiatric, and neurological disease, and cancer. He has contributed greatly to the medicinal chemistry and molecular pharmacology of allosteric ligands, not only G protein-coupled receptor (GPCR) signaling but kinase, phospholipases, and ion channels as well. At Merck he advanced nascent programs that were based on cutting edge research but were not sufficiently advanced to warrant a large financial commitment to building a large research team. Dr. Lindsley was able to gain support for developing traditional medicinal chemistry with a technology-enabled synthesis approach to begin research into high risk programs that would not otherwise have been able to receive support. This work eventually led to developing high quality compounds offering proof for targets in multiple therapeutic areas ranging from cancer to neuroscience. Ultimately his work at Merck had a major impact on virtually every therapeutic area represented at Merck.

At Vanderbilt, his work has had a significant impact through the discovery of 1) the first selective and potent inhibitors of key regulatory enzymes such as phospholipase D, 2) highly selective allosteric activators and inhibitors of GPCRs that were previously intractable, and 3) novel modulators of ion transporters for which no ligands or tools previously existed.

Dr. Lindsley's work has also contributed to major shifts in areas as diverse as GPCR signaling, psychiatry, neurology, and cancer research. Also, his discovery of novel modulators of protein kinases that are important drug targets in oncology has promising clinical significance.

Dr. Lindsley's 2014 John J. Abel Award Lecture is titled "Exploiting allosteric sites for target modulation" and will be delivered on Monday, April 28 from 8:30AM – 9:20AM in Room 2 of the San Diego Convention Center.

Jeffrey L. Benovic, PhD, Recipient of the 2014 Julius Axelrod Award in Pharmacology

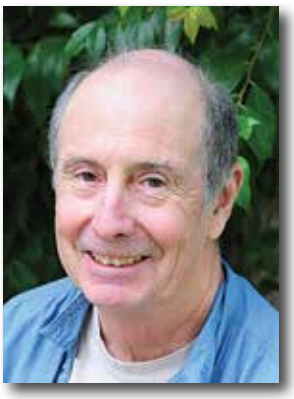
Dr. Jeffrey L. Benovic, Professor and Chair of the Department of Biochemistry and Molecular Biology and the Thomas Eakins Endowed Professor at Thomas Jefferson University has been named recipient of the 2014 Julius Axelrod Award in Pharmacology by ASPET. Dr. Benovic is recognized for his major contributions to research and his outstanding leadership and mentorship to several generations of trainees. The Julius Axelrod Award, named after the 1970 winner of the Nobel Prize in Physiology or Medicine, is given to recognize outstanding scientific contributions in research and mentoring in pharmacology. The award was established to honor the memory of the eminent American pharmacologist who shaped the fields of neuroscience, drug metabolism, and biochemistry.

Dr. Benovic obtained his Bachelor's degree in biochemistry from Penn State University and earned his PhD at Duke University under 2012 Nobel Laureate, Robert Lefkowitz. Following a research associate position under Dr. Lefkowitz, Dr. Benovic moved to Temple University School of Medicine and subsequently to Thomas Jefferson University's Department of Pharmacology where he has served in a number of leadership positions including Director of the Molecular Pharmacology and Structural Biology PhD Program and Leader of the Cancer Cell Biology and Signaling Program at the Kimmel Cancer Center.

Dr. Benovic's investigations opened up an entire new field of study. By applying biochemical approaches creatively and rigorously, he advanced our understanding of how GPCR function is regulated. In groundbreaking fashion, he demonstrated the biochemical mechanism of GPCR desensitization by GPCR kinases and arrestins. He discovered, purified, and cloned GPCR kinase 2 and characterized how it functioned in collaboration with arrestins to desensitize the receptors in a reconstituted biochemical system. Dr. Benovic ultimately discovered that β-arrestins interact with clathrin to promote receptor internalization – one of the core paradigms in GPCR biology today. His studies in the model organism *C. elegans* have uncovered new roles for arrestins in the development of aging.

A committed educator and mentor of young pharmacologists and biochemists, Dr. Benovic's contributions to predoctoral and postdoctoral training have been recognized by awards from the Jefferson Graduate School of Biomedical Sciences and the Jefferson Postdoctoral Association. This devotion to mentoring young scientists and to the professional development of his students ensures that Dr. Benovic's contributions to pharmacology extend well beyond his own scientific discoveries.

Dr. Benovic will give the 2015 Julius Axelrod Lecture next year in Boston, MA. The 2014 Julius Axelrod Award Lecture will be given by last year's recipient, Lee E. Limbird, PhD, of Fisk University. Dr. Limbird will deliver a lecture titled "Seasons of the lives of scientists: The journey from training careers in discovery to service for society" on Sunday, April 27 from 8:30AM – 9:20AM in Room 2 of the San Diego Convention Center.



Bruce D. Hammock, PhD, Recipient of 2014 Bernard B. Brodie Award in Drug Metabolism

Bruce D. Hammock, PhD, Distinguished Professor of Entomology at the University of California at Davis is the recipient of the 2014 Bernard B. Brodie Award in Drug Metabolism. The Brodie Award recognizes Dr. Hammock's outstanding contributions to our understanding of human drug metabolism, transport, and to future research in the field.

Dr. Hammock received his BS in entomology and chemistry from Louisiana State University, earned his PhD at the University of California, Berkeley, and stayed on as a postdoctoral fellow until he entered the Army. Following his service in the US Army Academy of Health Science in San Antonio, TX, he moved to Northwestern University as a Rockefeller Foundation Postdoctoral Fellow. He received tenure at the University of California, Riverside, in the Toxicology Division and then moved to the University of California, Davis, where he is also the Program Director of the NIEHS Superfund Research Program Project, Director of the NIH Biotechnology Training Grant, and a founding member of the University of California, Davis, Medical School Comprehensive Cancer Center. He is a member of the US. National Academy of Sciences.

Following his PhD working on xenobiotic metabolism, Dr. Hammock has studied α/β hydrolase fold enzymes for over 35 years. He has made seminal contributions to our understanding of the α/β hydrolase fold enzymes that include epoxide hydrolases and esterases. His work has often been characterized by introducing innovative technologies into the drug metabolism field, and he was among the first academic scientists to use LC-MS for

rapid monitoring of drug metabolism metabolomics as an indicator of target engagement, and AMS for ultrasensitive detection of ^{14}C labeled drugs. Dr. Hammock's work continues to have substantial impact in the area of drug discovery and development. His collaborative studies as well as his tradition of sharing reagents has enabled investigators in both the private and public sector to make substantial advances in our understanding of the cytochrome P450 branch of the arachidonate cascade and has been critical for the development of potentially useful therapeutic compounds being evaluated as drug leads to treat stroke, atherosclerosis, heart failure, renal failure, inflammation, and neuropathic pain.

Dr. Hammock's 2014 Bernard B. Brodie Award in Drug Metabolism Lecture is titled "Expoxide hydrolases in drug metabolism and as drug targets" and will be delivered on Monday, April 28 at 2:00PM – 2:50PM in Room 5A of the San Diego Convention Center.

James H. Woods, PhD, Recipient of the 2014 P.B. Dews Lifetime Achievement Award in Behavioral Pharmacology

James H. Woods, Professor in the Department of Pharmacology at the University of Michigan Medical School, is the recipient of the 2014 P.B. Dews Lifetime Achievement Award in Behavioral Pharmacology. The award is given in alternate years and honors the fundamental contributions of P.B. Dews to behavioral pharmacology. Dr. Woods' many contributions to behavioral pharmacology have built and expanded upon the many intellectual foundations laid by Peter B. Dews and the broader field of behavioral pharmacology.

As a graduate of Ohio University with a degree in commerce, Dr. Woods attended graduate school at the University of Virginia where he earned his PhD. Dr. Woods' outstanding contributions to behavioral pharmacology extend across a wide range of procedures, drug classes, conceptual frameworks, and public health issues. Beyond Dr. Woods' exemplary scientific achievements are equally significant contributions to teaching, service, and leadership.

Noted for his contributions to opioid pharmacology, Dr. Woods has made seminal contributions to many areas of pharmacology including the application of classical receptor theory to study drug effects on behavior. He has tested the limits of receptor theory for guiding and interpreting drug effects on behavior. Another major contribution by Dr. Woods and his colleagues involved the systemic analysis of drug abuse and dependence in studies of drug self administration. His studies have made significant contributions to our understanding of drug reinforcement and drug abuse. Another influential research area involved the relationship between behavioral pharmacology and medicinal chemistry. For more than 40 years, he has worked tirelessly to advance drug development with an emphasis on translational research.

Dr. Woods has published more than 420 original manuscripts, more than 100 book chapters, and 4 books. He has served extensively on study sections, editorial boards, and advisory committees. His work and mentorship have earned Dr. Woods many prestigious awards. Dr. Woods had been a valued mentor to the next generation of behavioral pharmacologists, many of whom are now independent investigators and leaders in their respective fields.

Dr. Woods' 2014 P.B. Dews Lifetime Achievement Award Lecture is titled "The stimulus function of drugs" and will be delivered on Monday, April 28 from 2:00PM – 2:50PM in Room 4 of the San Diego Convention Center.

Kenneth A. Jacobson, PhD, Recipient of 2014 ASPET Goodman and Gilman Award in Receptor Pharmacology

Kenneth A. Jacobson, PhD, Senior Investigator and Chief of the Laboratory of Bioorganic Chemistry at the NIH's National Institute of Diabetes and Digestive and Kidney Diseases, is the recipient of the 2014 ASPET Goodman and Gillman Award in Drug Receptor Pharmacology. This biennial award was established to recognize and stimulate outstanding research in the pharmacology of biological receptors. Such research is the foundation for a better understanding of the mechanisms of biological processes and potentially provides the basis for the discovery of drugs useful in the treatment of diseases. Dr. Jacobson receives this award for his international leadership and research in the field of pharmacology of GPCRs.

Dr. Jacobson's research in structure-based drug design and chemical synthesis and testing in cellular and animal models has made possible a large body of translational research. New drugs developed under his direction are currently being developed by private industry for therapeutic applications, primarily for cancer

and inflammatory conditions such as rheumatoid arthritis, psoriasis, cardiac ischemia, and glaucoma. His NIH patents have been licensed to industry for development of therapeutic agents and widely used research tools.

Dr. Jacobson graduated from Reed College in Portland, OR with a degree in the liberal arts. He received his PhD from the University of California, San Diego, and was a Fellow at the Weizmann Institute of Science in Israel before joining the NIH. Dr. Jacobson is a past recipient of the Pharmacia-Award for Experimental Therapeutics and was inducted into the Medicinal Chemistry Hall of Fame of the American Chemical Society.

Jürgen Wess, PhD, Recipient of 2014 Pharmacia-ASPET Award for Experimental Therapeutics

Dr. Jürgen Wess, Chief of the Molecular Signaling Section at the National Institute of Diabetes and Digestive and Kidney Diseases is the recipient of the 2014 Pharmacia-ASPET Award for Experimental Therapeutics. The Pharmacia-ASPET Award for Experimental Therapeutics is given annually to recognize and stimulate outstanding research in pharmacology and experimental therapeutics—basic laboratory or clinical research–that has had, or potentially will have, a major impact on the pharmacological treatment of disease. This award is funded by an endowment from Pharmacia (now Pfizer) and by ASPET.

Dr. Wess is one of the world's leaders in the field of GPCRs, with particular focus on the family of muscarinic acetylcholine receptors. His pioneering work in the GPCR field has led to many fundamental new insights into how GPCRs function at the molecular level. Dr. Wess' lab was among the first in the GPCR field to delineate the molecular mechanisms involved in ligand binding, receptor activation, and receptor/G protein coupling selectivity. In addition, his more recent studies with muscarinic receptor knockout/transgenic mice have suggested novel therapeutic approaches aimed at modulating muscarinic receptor function for therapeutic purposes, including new and useful treatments for Alzheimer's disease, drug addiction, obesity, human growth disorders, diabetes, and schizophrenia.

Dr. Wess has been honored with the NIH Director's Award for Scientific Excellence and serves as a member of the International Advisory Board of the Max-Planck Society. He has served on the Editorial Board of ASPET's journal *Molecular Pharmacology* since 2001.

A native of Germany, Dr. Wess studied pharmacy at the University of Frankfurt School of Pharmacy where he also earned his PhD in pharmacology. Shortly after, he moved to the National Institutes of Health as a Postdoctoral Fellow at the National Institute of Mental Health and the National Institute of Neurological Disorders and Stroke.

Ferdinando Nicoletti, MD, Recipient of 2014 Robert R. Ruffolo Career Achievement Award

Dr. Ferdinando Nicoletti, MD, Professor of Pharmacology at the University of Rome School of Medicine, is the recipient of the 2014 Robert R. Ruffolo Career Achievement Award. The award was established in recognition of the contributions made to drug discovery and development by Dr. Ruffolo, former President of Research and Development at Wyeth Pharmaceuticals, and is given to recognize the scientific achievements of scientists who are at the height of their careers and who have made significant contributions to any area of pharmacology. Dr. Nicoletti receives this award for his pioneering work and career achievements in the area of metabotropic glutamate (mGlu) receptors.

Dr. Nicoletti published original pharmacological studies that showed the existence of a second messenger linked glutamate receptors in brain tissue and has spent his entire career developing and leading this field. His seminal studies have extended our knowledge of the pharmacology and therapeutic potential of metabotropic glutamate receptors. These studies have implications for treatments in Alzheimer's disease and other neurodegenerative disorders as well as treatment for chronic pain and amyotrophic lateral sclerosis, His groundbreaking work continues to guide the therapeutic relevance and clinical approaches of this class of agents by many other scientists in industry and academia. Dr. Nicoletti organized the first meeting on metabotripic glutamate receptors in 1991, and with his leadership the meeting has now grown into an international event recognized as the premier scientific venue in this field.

A native of Italy, Dr. Nicoletti completed his medical degree and training in medicine and surgery at the University of Catania. He trained at the NIMH and then at Georgetown University in Washington, DC under the supervision of Professor Erminio Costa before being appointed as Associate Professor at the University of Perugia, Associate Professor at the University of Catania, and later as Full Professor at the University of Rome, Sapienza.

Sue P. Duckles, PhD, Recipient of 2014 Paul M. Vanhoutte Lectureship in Vascular Pharmacology

Sue P. Duckles, PhD, Professor Emerita in the Department of Pharmacology at the University of California, Irvine, School of Medicine is the recipient of the 2014 Paul M. Vanhoutte Lectureship in Vascular Pharmacology. The lectureship was established to recognize scientific contributions that help our understanding and appreciation of the importance of endothelial cells and vascular smooth muscle function in health and disease.

Dr. Duckles receives this honor in recognition of her substantial lifelong scientific achievement and commitment in this research area. Her discoveries in cerebrovascular pharmacology have added significantly to our understanding of the function of the endothelium and vascular smooth muscle cells in cerebral arteries. Her work has also added to our understanding of the effects of sex hormones on the cerebral vasculature, focusing not only on the effects of estrogen, but also on the delicate balance of the effects of estrogens and androgens. Dr. Duckles' more recent studies on the impact of estrogen on mitochondrial function in cerebral arteries are groundbreaking.

Dr. Duckles received her BA in philosophy from the University of California, Berkeley and her PhD from the University of California, San Francisco. Following postdoctoral work and an assistant professorship at the University of California, Los Angeles, she moved to the University of Arizona's Department of Pharmacology until her move to Irvine in 1985. Beyond her groundbreaking scientific discoveries, Dr. Duckles has provided outstanding leadership to the discipline of pharmacology, serving ASPET tirelessly as President, Councilor, and on many committees over three decades. She is a past president of the International Union of Pharmacology and also served IUPHAR as Secretary General and General Assembly Delegate. Dr. Duckles is an Honorary Fellow of the British Pharmacological Society and was a recipient of the ASPET Torald Sollmann Award in Pharmacology. She is renowned for her devotion to mentoring and her training and advocacy of junior scientists, not just those in her department, but also young scientists who would meet or seek her out at scientific meetings where she earned a deserved reputation as an encouraging and supportive mentor for all.

Dr. Duckles' 2014 Paul M. Vanhoutte Lectureship in Vascular Pharmacology Award Lecture is titled "Vascular mysteries: more than the sum of the parts" and will be delivered at the ASPET Annual Meeting at Experimental Biology 2014 in San Diego, CA on Tuesday, April 29 from 4:30PM – 5:30PM in room 3 of the San Diego Convention Center.

Annual Meeting

ASPET Annual Meeting at Experimental Biology 2014

April 26 – 30, 2014 • San Diego, CA

Pharmacology Programming

(All rooms listed are in the Convention Center unless otherwise noted. Rooms are subject to change; please check the ASPET website for any last minute room changes.)

Saturday, April 26, 2014

Room	Session Title	Time
3	**2014 Teaching Institute:** ***Practical technologies for effective teaching*** *R.L. Hayslett and C.M. Davis*	12:00PM – 2:30PM
2	**Graduate Student-Postdoctoral Colloquium:** ***Success skills for all careers*** *S.L. Ingram*	2:45PM – 5:15PM

Sunday, April 27, 2014

Room	Session Title	Time
2	**Julius Axelrod Award in Pharmacology Lecture:** ***Seasons of the lives of scientists: The journey from training to careers in discovery to service for society*** *L.E. Limbird*	8:30AM – 9:20AM
2	**Julius Axelrod Symposium:** ***Surprises at the synapse*** *L.E. Limbird*	9:30AM – 12:00PM
4	***Animal models of polydrug abuse*** *P.W. Czoty and R. De la Garza*	9:30AM – 12:00PM
5A	***Career opportunities beyond the bench: Education as a viable path*** *J.S. Reuben and K.J. Marcdante*	9:30AM – 12:00PM
5B	***Drug discovery against protozoal pathogens*** *M.A. Phillips*	9:30AM – 12:00PM

Lectures

3	***Therapeutic potential of targeting oxidative stress pathways*** *P.R. Mayeux and C. Wu*	9:30AM – 12:00PM
5B	**Pharmacology Education Division Programming: *Addressing prescribing errors through medical student education & assessment*** *S.K. Rajasekaran and D.W. Nierenberg*	3:00PM – 5:30PM
5A	**CNPHARS Lecture: *Target-net based drug discovery for Parkinson's disease treatment by HTS/ HCS*** *G. Du*	2:00PM – 2:50PM
5A	***Drug discovery in China and the United States*** *J. Glowa and Y. Zhang*	3:00PM – 5:30PM
3	***New preclinical & clinical perspectives for smoking cessation*** *R.I. Desai and D.K. Hatsukami*	3:00PM – 5:30PM
2	***New insights derived from cell specific knockout of heterotrimeric G-alpha proteins*** *F. Murray and P.I. Insel*	3:00PM – 5:30PM
4	***Emerging technologies in neuropeptide research: Identification & validation of neuropeptide systems as therapeutic targets*** *S.D. Clark*	3:00PM – 5:30PM

Monday, April 28, 2014

Room	Session Title	Time
2	**John J. Abel Award in Pharmacology Award Lecture: *Exploiting allosteric sites for target modulation*** *C.W. Lindsley*	8:30AM – 9:20AM
2	***Nuclear receptors as therapeutic targets*** *D.P. McDonnell and D.J. Mangelsdorf*	9:30AM – 12:00PM
4	***Fetal programming of adult cardiovascular disease*** *M.C. Chappell and A.C. Marshall*	9:30AM – 12:00PM
5A	***Collaborative role of pharmacology in education of health care professions*** *S.C. Andrieu and R.J. Theobald*	9:30AM – 12:00PM
5B	***Drug-induced idiosyncratic reactions and immunotoxicity*** *J. Uetrecht*	9:30AM – 12:00PM
3	***Sleep disruptions associated with neuropsychiatric & degenerative disorders: Implications, preclinical models & development of novel pharmacotherapies*** *R.W. Gould and C.K. Jones*	9:30AM – 12:00PM
5A	**Bernard B. Brodie Award in Drug Metabolism Lecture: *Epoxide Hydrolases in Drug Metabolism and as Drug Targets*** *B.D. Hammock*	2:00PM – 2:50PM
5A	**Drug Metabolism Division James Gillette Award & Platform Session**	3:00PM – 5:30PM
4	**Peter B. Dews Lifetime Achievement Award in Pharmacology Lecture: *The stimulus function of drugs*** *J.H. Woods*	2:00PM – 2:50PM
4	**Behavioral Pharmacology Division Symposium:** **Making the right choice: *Translational use of choice procedures in understanding the neurobiology and development of pharmacotherapies for drug addiction*** *M.L. Banks and M.A. Nader*	3:00PM – 5:30PM
5B	**Molecular Pharmacology Division Postdoctoral Scientist Award Finalist** *Keynote speaker: R.A. Heyman*	3:00PM – 5:30PM
2	**Neuropharmacology Division Postdoctoral Award Finalists**	3:00PM – 5:30PM
3	***Mitochondrial fragments: A novel mediator between inflammation & cardiovascular disease*** *R.C. Webb and C.F. Wenceslau*	3:00PM – 5:30PM

■ Lectures

ASPET
Transforming Discoveries into Therapies

Improving maternal therapeutics: Drug metabolism and transport during pregnancy and lactation

Wednesday, April 30, 2014, 3:00 – 5:30 p.m. • San Diego Convention Center, Room 3

CHAIRS

Nina Isoherranen
University of Washington

Hollie Swanson
University of Kentucky Medical Center

Donald Mattison
Risk Sciences International

SUMMARY

Use of prescription and over the counter drugs is very common during pregnancy, but due to changes in drug metabolism and transport during pregnancy, the dosing of drugs cannot be directly extrapolated from non-pregnant women or men. Increased scrutiny by the FDA and NIH on therapy of pregnant women has resulted in a considerable increase in the amount of research generated in the area of drug disposition during pregnancy. This symposium is designed to cover the area of drug disposition during pregnancy and highlight the breadth of tools that are currently used to investigate drug disposition during pregnancy.

Supported by funding from:

Pregmedic
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AGENDA

General overview
Nina Isoherranen, University of Washington

Prediction of drug disposition during pregnancy by PBPK modeling and simulation
Jashvant Unadkat, University of Washington

Mechanisms of CYP2D6 regulation during pregnancy
Junior Speaker: Young Jeong, University of Illinois - Chicago

Adaptive changes in liver and intestinal metabolism and transport function in pregnancy and lactation
Mary Vore, University of Kentucky

Addressing pregnancy-associated changes in pharmacodynamics and pharmacokinetics of anti-malaria drugs
Joel Tarning, Mahidol University

Panel discussion
Moderator: Donald Mattison, Risk Sciences International

Tuesday, April 29, 2014

Room	Session Title	Time
5A	***Role of (drug) transporters in imaging in health & disease*** *B. Stieger and Y. Sugiyama*	9:30AM – 12:00PM
4	***Transporters in glial cells as new therapeutic targets*** *L. Annunziato*	9:30AM – 12:00PM
2	***12-lipoxygenase & disease: New insights into regulation & inhibition of a critical enzyme*** *M.A. Holinstat*	9:30AM – 12:00PM
3	***Not just a glue: Pharmacology, Physiology and Pathology of Transglutaminases (focus on the Vasculature)*** *S.W. Watts and E. Bakker*	9:30AM – 12:00PM
5B	***Emerging integrative approaches to predicting host response to antimicrobials*** *N.N. Bumpus*	9:30AM – 12:00PM
Marriott Marquis & Marina, Marriott Hall, Salon 2	**Career Development Workshop: *Establishing individual development plans (IDPs) in your graduate and postdoctoral training programs: The ins and outs of successful IDPs for career development*** *S.L. Ingram*	1:00PM – 3:00PM
5A	**Integrative Systems, Translational and Clinical Pharmacology Division Young Investigator Awards Platform Session**	3:00PM – 5:30PM
5B	**Toxicology Division Symposium: *Macrophages and tissue injury: Agents of defense or destruction*** *D. Laskin*	3:00PM – 5:30PM
4	**Drug Discovery and Development Symposium: *Productive public private partnerships for pharmacological progress*** *J.S. Lazo*	3:00PM – 5:30PM
3	**Cardiovascular Pharmacology Division Trainee Showcase**	2:30PM – 4:30PM
3	**Paul M. Vanhoutte Award in Vascular Pharmacology Lecture: *Vascular mysteries: More than the sum of the parts*** *S.P. Duckles*	4:30PM – 5:30PM
2	***Inhibitory GPCRs as therapeutic targets for obesity and type 2 diabetes*** *M.E. Kimple*	3:00PM – 5:30PM

■ Lectures

Wednesday, April 30, 2014

Room	Session Title	Time
2	**Ray Fuller Lecture: *AMPA receptor potentiation: Implications for the discovery of medicines for treatment-resistant depression*** *J.M. Witkin*	8:30AM – 9:20AM
2	**Ray Fuller Symposium: *Treatment-resistant depression: Biological bases & treatments*** *J.M. Witkin*	9:30AM – 12:00PM
3	***Scientists vs. street chemists: The toxicity of designer marijuana*** *L. James and J.H. Moran*	9:30AM – 12:00PM
5A	***"Target-site" drug metabolism & transport*** *R.S. Foti*	9:30AM – 12:00PM
4	***Chemical biology in drug discovery*** *H. Fu and H. Chen*	9:30AM – 12:00PM
5B	***Arginase as an emerging therapeutic target*** *R.W. Caldwell*	9:30AM – 12:00PM
3	***Improving maternal therapeutics: Drug metabolism & transport during pregnancy & lactation*** *N. Isoherranen, H. Swanson, and D. Mattison*	3:00PM – 5:30PM
5A	***Targeted/individualized therapy: Approaches for the future translational pharmacologist*** *J. Paul*	3:00PM – 5:30PM
4	***Future therapies for chronic pain: Focus on novel non-opioid targets*** *B. Greenwood-Van Meerveld*	3:00PM – 5:30PM
2	***Hydrogen sulfide: From physiological messenger to pharmacological target*** *N.L. Kanagy and U. Sen*	3:00PM – 5:30PM

Have an idea for a symposium at the ASPET Annual Meeting at EB 2015? The EB 2015 proposal submission page is now available online. For more information and to submit your proposal, visit *http://www.aspet.org/Symposium_Submission_Form/*.

Special Events/Ancillary Functions

(All rooms listed are in the San Diego Marriott Marquis & Marina Hotel unless otherwise noted.)

Friday, April 25, 2014

Room	Special Events/Ancillary Functions	Time
Presidio 1 & 2	**Behavioral Pharmacology Society Dinner** *By invitation only • Separate pre-registration required*	6:00PM – 10:00PM

Saturday, April 26, 2014

Room	Special Events/Ancillary Functions	Time
San Diego Ballroom, Salon C	**Behavioral Pharmacology Society Meeting** *By invitation only • Separate pre-registration required*	8:00AM – 6:00PM
Conv. Ctr., 20 B/C	**ASPET Business Meeting**	6:00PM – 7:30PM
Conv. Ctr., Center Terrace	**ASPET Opening & Awards Reception**	7:30PM – 9:30PM
Laguna	**University of Michigan Dept. of Pharmacology Social Hour**	9:00PM – 11:00PM

ASPET Booth #920

Visit the ASPET booth in the exhibit hall! Items for sale at "Shop ASPET" include t-shirts, hats, plush donkeys, and much more. Plus, pick up some free giveaways!

Sunday, April 27, 2014

Room	Special Events/Ancillary Functions	Time
New York/Orlando	**Diversity Mentoring Breakfast**	7:30AM – 9:30AM
Conv. Ctr., Room 5A	**CNPHARS Welcoming Ceremony**	2:00PM – 2:10PM
Conv. Ctr., Room 14A	**Global GI Club Science & Business Meeting**	3:00PM – 6:00PM
New York	**AMSPC Reception**	6:00PM – 7:00PM
Marriott Hall 3/4	**Student-Postdoc Best Abstract Competition**	6:30PM – 8:30PM
Marriott Hall, Salon2	**Student-Postdoc Mixer**	9:00PM – 11:30PM

Monday, April 28, 2014

Room	Special Events/Ancillary Functions	Time
Oceanside	**PhRMA Foundation Reception** *(By invitation only)*	6:00PM – 7:30PM
Point Loma	**BEH/NEU Joint Mixer**	6:45PM – 8:45PM
New York	**DPE/DDD/ISTCP Joint Mixer**	7:30PM – 9:30PM
Chicago/Atlanta	**DM/TOX Joint Mixer**	7:30PM – 9:30PM
Marriott Hall 1	**MP Mixer**	7:30PM – 9:30PM
Marriott Hall 3/4	**Y.E.S. Young Experimental Scientist Mixer** *21 & older must have ID to receive drink tickets.	9:00PM – 11:00PM

Tuesday, April 29, 2014

Room	Special Events/Ancillary Functions	Time
Meet at the ASPET Office (Rancho Santa Fe 3)	**ASPET Networking Walk**	7:00AM – 9:00AM
TBD	**Catecholamine Club Dinner**	5:00PM – 10:00PM
Torrey Pines 2 & 3	**Michigan State University Pharmacology and Toxicology Reception**	7:00PM – 10:00PM
Presidio 1 & 2	**CVP Mixer**	6:30PM – 8:00PM

Wednesday, April 30, 2014

Room	Special Events/Ancillary Functions	Time
Poolside Terrace *(weather permitting)*	**ASPET Closing Reception**	6:00PM – 8:00PM

All Division Meetings/Activities

(All rooms listed are in the San Diego Marriott Marquis & Marina Hotel unless otherwise noted.)

Friday, April 25, 2014

Room	Division Meeting/Activity	Time
Torrey Pines 1	**Council of Division Chairs Meeting**	1:00PM – 5:00PM

Saturday, April 26, 2014

Room	Division Meeting/Activity	Time
Conv. Ctr., 20 B/C	**ASPET Business Meeting**	6:00PM – 7:30PM
Conv. Ctr., Center Terrace	**ASPET Opening & Awards Reception**	7:30PM – 9:30PM

Sunday, April 27, 2014

Room	Division Meeting/Activity	Time
Torrey Pines 2 & 3	**All Divisions Executive Officers Meeting**	7:30AM – 9:00AM
Rancho Santa Fe 2	**CVP Executive Committee Meeting**	12:30PM – 2:30PM
Torrey Pines 2	**DDD Executive Committee Meeting**	12:30PM – 2:30PM
Torrey Pines 3	**DM Executive Committee Meeting**	12:30PM – 2:30PM

Monday, April 28, 2014

Room	Division Meeting/Activity	Time
Rancho Santa Fe 1	**BEH Executive Committee Meeting**	7:30AM – 9:30AM
Torrey Pines 3	**DPE Executive Committee Meeting**	7:30AM – 9:00AM
Torrey Pines 2	**NEU Executive Committee Meeting**	7:30AM – 9:30AM
Torrey Pines 2	**ISTCP Executive Committee Meeting**	12:30PM – 2:30PM
Torrey Pines 3	**MP Executive Committee Meeting**	12:30PM – 2:30PM
Conv. Ctr., Room 4	**BEH Scientific Programming Meeting**	5:30PM – 6:30PM
Conv. Ctr., Room 2	**NEU Scientific Programming Meeting**	5:30PM – 6:30PM
Conv. Ctr., Room 5A	**DM Scientific Programming Meeting**	5:45PM – 7:30PM
Conv. Ctr., Room 5B	**MP Scientific Programming Meeting**	5:45PM – 7:30PM
Conv. Ctr., Room 5B	**TOX Executive Committee & Scientific Programming Meeting**	5:45PM – 7:30PM
Point Loma	**BEH/NEU Joint Mixer**	6:45PM – 8:45PM
New York	**DPE/DDD/ISTCP Joint Mixer**	7:30PM – 9:30PM
Chicago/Atlanta	**DM/TOX Joint Mixer**	7:30PM – 9:30PM
Marriott Hall 1	**MP Mixer**	7:30PM – 9:30PM

Tuesday, April 29, 2014

Room	Division Meeting/Activity	Time
Conv. Ctr., Room 3	**CVP Scientific Programming Meeting**	5:45PM – 6:30PM
Conv. Ctr., Room 4	**DDD Scientific Programming Meeting**	5:45PM – 7:30PM
Conv. Ctr., Room 5B	**DPE Scientific Programming Meeting**	5:45PM – 7:30PM
Conv. Ctr., Room 5A	**ISTCP Scientific Programming Meeting**	5:45PM – 7:30PM
Presidio 1 & 2	**CVP Mixer**	6:30PM – 8:00PM
Rancho Santa Fe 1 & 2	**ASPET Program Committee Meeting** *(By invitation only)*	7:30PM – 10:30PM

Wednesday, April 30, 2014

Room	Division Meeting/Activity	Time
Poolside Terrace	**ASPET Closing Reception** *(weather permitting)*	6:00PM – 8:00PM

Activities for Students & Postdocs

(All rooms listed are in the San Diego Marriott Marquis & Marina Hotel unless otherwise noted.)

Saturday, April 26, 2014

Room	Session/Event Title	Time
Conv. Ctr., Room 2	**Graduate Student-Postdoctoral Colloquium: *Success skills for all careers*** *S.L. Ingram*	2:45PM – 5:15PM
Conv. Ctr., 20B/C	**ASPET Business Meeting**	6:00PM – 7:30PM
Conv. Ctr., Center Terrace	**ASPET Opening and Awards Reception**	7:30PM – 9:30PM

Sunday, April 27, 2014

Room	Session/Event Title	Time
New York/Orlando	**Diversity Mentoring Breakfast** *Keynote speaker: V.A. Love*	7:30AM – 9:30AM
Conv. Ctr., Room 5A	***Career opportunities beyond the bench: Education as a viable path*** *J.S. Reuben and K.J. Marcdante*	9:30AM – 12:00PM
Marriott Hall 3/4	**Student/Postdoc Best Abstract Competition**	6:30PM – 8:30PM
Marriott Hall, Salon 2	**ASPET Student & Postdoc Mixer**	9:00PM – 11:30PM

Monday, April 28, 2014

Room	Session/Event Title	Time
Conv. Ctr., Room 5A	***Collaborative role of pharmacology in education of healthcare professions*** *S.C. Andrieu, R.J. Theobald, Jr.*	9:30AM – 12:00PM
Point Loma	**Behavioral Pharmacology and Neuropharmacology Divisions Joint Mixer**	6:45PM – 8:45PM
Marriott Hall I	**Molecular Pharmacology Division Mixer**	7:30PM – 9:30PM
New York	**Pharmacology Education, Drug Discovery and Development, & Integrative Systems, Translational and Clinical Pharmacology Divisions Joint Mixer**	7:30PM – 9:30PM
Chicago/Atlanta	**Drug Metabolism and Toxicology Divisions Joint Mixer**	7:30PM – 9:30PM
TBD	**Y.E.S. Young Experimental Scientist Mixer** **21 & older must have ID to receive drink tickets.*	9:00PM – 11:00PM

Tuesday, April 29, 2014

Room	Session/Event Title	Time
Meet at the ASPET Office (Rancho Santa Fe 3)	**ASPET Networking Walk**	7:00AM – 9:00AM
Marriott Hall, Salon 2	**Career Development Workshop:** ***Establishing individual development plans (IDPs) in your graduate and postdoctoral training programs: The ins and outs of successful IDPs for career development*** *S.L. Ingram*	1:00PM – 3:00PM
Presidio I/II	**Cardiovascular Pharmacology Division Mixer**	6:30PM – 8:00PM

Wednesday, April 30, 2014

Room	Session/Event Title	Time
Poolside Terrace (weather permitting)	**ASPET Closing Reception**	6:00PM – 8:00PM

Saturday, April 26 - Wednesday, April 30

Room	Session/Event Title	Time
Conv. Ctr., Exhibit Hall D	**FASEB Career Development Seminars and Workshops for Pharmacology**	
Conv. Ctr., Exhibit Hall D and Sails Pavilion	**FASEB Resume Critique/Career Counseling** Sunday, April 26-Wednesday, April 30	
For a full description of these FASEB workshops, please visit: ***http://www.faseb.org/MARC-and-Professional-Development/Career-Resources/Career-Centers/EB-Career-Center.aspx***		
Conv. Ctr., Exhibit Halls C and D	**EB Internet/Cyber Cafés Kiosks**	
Conv. Ctr., Lobby	**Message Center/Free Literature**	

Oat Sprouts and the Topliss Tree: Rationalizing SAR

Rebecca J. Anderson

A pharmacology colleague of mine was fond of saying, when it comes to structure-activity relationships, "little things mean a lot." Long before A. J. Clark formalized his receptor theory of drug action, scientists recognized that a compound's pharmacologic activity was related to its chemical structure. But for many years, medicinal chemists faced a monumental challenge. How should they tweak the molecular structure of a marginally active compound to maximize its efficacy? More than half of all patented drugs contain a substituted benzene ring, and the medicinal chemist has an overwhelming number of synthetic choices. A large variety of possible substituents can be placed at each position around the ring, as well as various heteroatom substitutions in the ring, theoretically creating millions of structurally related analogs. Synthesizing and testing all of these analogs is obviously not practical.

Because there was no scientific rationale for choosing substituents that would optimize activity, medicinal chemists made their choices based on three things: their personal experience with other active compounds, intuition, and the availability of starting materials. It was a slow, trial-and-error process—and not necessarily fruitful. Then in the 1960s, Corwin Hansch, a chemistry professor at Pomona College in California, proposed a rational, systematic, and quantitative method for selecting substituents *(1, 2)*.

Hansch was a most unlikely person to come up with this strategy. He received his PhD in chemistry from New York University in 1944 and immediately joined the Manhattan Project, first at the University of Chicago and then as an analytical chemist with DuPont de Nemours, a contractor at the Hanford, Washington site *(3)*. After the war, Hansch accepted a position at Pomona, viewing the small liberal arts college only as a stepping stone to a large, research-oriented university, but "I found out it was a very fine place to stay" *(4)*. His initial

research focused on the study of high temperature dehydrogenations. Then, by lucky coincidence, Hansch met Robert Muir, a botany professor at Pomona.

Muir had been given an office in the chemistry building, because the college's small biology building lacked room for him. He was studying plant growth regulators and quantitatively testing them on sections of oat sprouts. Of particular interest was 2,4-D (2,4-dichlorophenoxyacetic acid), a commercial weed killer that paradoxically causes cell elongation at low concentrations. Hansch offered to synthesize a series of simple phenoxyacetic acid analogs for Muir and his students to test. Because Hansch carried a heavy teaching load, his primary laboratory assistance in those early years came from undergraduate students. He trained them how to do research, and in the short interval before graduating, they synthesized the compounds under his direction. The college hierarchy at Pomona put no pressure on the faculty to conduct research, and Hansch and Muir "fooled around" for fourteen years, trying to make sense out of how the phenoxyacetic acid analogs affected the growth of oat seedlings *(3)*.

Hansch and Muir "fooled around" for fourteen years, trying to make sense out of how the phenoxyacetic acid analogs affected the growth of oat seedlings

The Hansch Analysis

They initially explored the possibility that the biologic activity of this chemical series was related to electron density at various positions around the molecule's phenyl ring. With funds from a small NIH grant, Hansch invited Toshio Fujita, who had been working on plant growth regulators at Kyoto University, to join his laboratory as a postdoctoral fellow. The landmark work of Meyer and Overton, who showed that potency correlated with a compound's partition coefficient between olive oil and water, influenced Hansch and Fujita to explore the role of lipophilicity on plant growth regulation. Hansch selected octanol as an alternative to olive oil for his partition coefficient measurements because it was simpler, cheaper, and could be easily obtained in pure form. (Although many efforts have been made to find a better solvent for partition analysis, octanol remains the gold standard.)

Corwin Hansch (Courtesy of Pomona College)

In a quantitative manner, Hansch and Fujita showed a correlation between a compound's potency and its partition coefficient. In order to compare compounds in a chemical series, Hansch defined a new constant, π, which characterizes the hydrophobicity of each chemical substituent on an aromatic ring relative to an unsubstituted hydrogen. But the correlation was not perfect. Hansch and Fujita found that the combination of a molecule's hydrophobic and electronic properties provided a better correlation between chemical structure and biologic activity than either factor alone. Hansch later realized that he also needed to consider the shape/size of the molecule. Combining the data on the relative influence of those three parameters, he sought a mathematical expression that would define a simple linear relationship between structure and function.

To supplement the laboratory data generated by his student collaborators, Hansch combed the scientific literature. Each Saturday, he hopped into his Corvette and raced down the freeway from Claremont to the UCLA library.

Hansch's initial herbicide/plant growth studies led naturally to broader investigations of the correlation between chemical structure and activity in other biological systems. To supplement the laboratory data generated by his student collaborators, he combed the scientific literature. Each Saturday, he hopped into his Corvette and raced down the freeway from Claremont to the UCLA library. He wryly explained, "We simply bring [the biological data] back from the library, crank it through the computer, and interpret it" *(4)*. That statement nicely sums up Hansch's ingenious contribution to pharmacology: the interlocking of mechanistic organic chemistry, quantitative biology,

and the use of computers—three previously unrelated lines of investigation. Quite an accomplishment for someone who had flunked high school algebra *(3)*!

Hansch's extensive analysis of data collected from many biological systems and many classes of structurally related compounds showed the importance of hydrophobicity (π), and, to a lesser extent, the contribution of electronic and steric influences by the substituents placed on a phenyl ring. The Hammett constant, σ, expresses a substituent's electron-withdrawing or electron-donating effect compared to an unsubstituted hydrogen, and the Taft constant, E_s, characterizes steric hindrance. The empirical π, σ, and E_s constants for some of the more common substituents on an aromatic ring are shown in Table 1.

Table 1. Substituent Constant Values for Aromatic Ring Substitutions

Substituent (R)	π (hydrophobic)	σ (electronic)	E_S (steric)
H	0	0	0
4-Cl	0.71	0.23	-0.9
3,4-Cl_2	1.25	0.52	
4-CH_3	0.56	-0.17	-1.2
4-OCH_3	-0.02	-0.27	-0.5
3-CF_3,4-Cl	1.59	0.66	
3-CF_3,4-NO_2	0.60	1.21	
4-NH_2	-1.23	-0.66	-0.6
4-Br	0.86	0.23	-1.1
3-CF_3	0.88	0.43	
4-C_2H_5	1.02	-0.15	-1.3
3-Cl	0.71	0.37	
3-CH_3	0.56	-0.07	
4-N=NC_6H_5	1.69	0.39	
4-SO_2CF_3	0.55	0.93	

To establish the structure-activity correlation for a new chemical series, Hansch synthesized an initial group of 6-12 compounds whose aromatic ring substituents gave a good discrimination between π, σ, and E_s. He then used the corresponding biological activity data from these compounds to perform a least squares regression analysis, according to the equation:

$$\log(1/C) = k_1\pi + k_2\sigma + k_3E_S + k_4$$

where 1/C is the biologic activity and k_1 through k_4 are constants. The calculated regression line defined the relative contribution of hydrophobic, electronic, and steric influences on biologic activity. From this regression analysis, he could then select substituents with the appropriate hydrophobic, electronic, and steric characteristics to optimize activity. The observed biologic activity of those newly synthesized analogs also could be used to refine and strengthen the regression correlation, perhaps pointing to even more potent compounds.

This approach, which is now called the Hansch Analysis, launched the new field of Quantitative Structure-Activity Relationships (QSAR) *(2, 5)*. The publication of Hansch's seminal papers in 1962 to 1964 generated immediate interest among chemists *(1)*. Through Fujita's contributions and advocacy, industrial chemists around the world rapidly adopted and successfully applied the Hansch Analysis to develop new agrochemicals. Medicinal chemists also took note because QSAR provided a rational method for systematically optimizing drug potency. Among them was John Topliss.

The Topliss Tree

John Topliss was born in England in 1930 and became passionate about chemistry in grammar school. He wanted to be a chemist. In his second year at the University of Nottingham, he secured a summer job at ICI Pharmaceuticals, which introduced him to the pharmaceutical industry and influenced his decision to pursue graduate work in organic chemistry. "The prospect of synthesizing potential new drugs was very appealing to me." After receiving his PhD from Nottingham and post-doctoral positions in Sweden and at Columbia University, he joined Schering (now part of Merck) in 1957.

At Schering and many other companies, the prevailing approach to optimize drug potency was almost entirely empirical. Topliss explored more rational approaches and initially focused, qualitatively, on the possible electronic and steric effects that influence potency. When he read Hansch's papers, he became aware of the critical importance

John Topliss (Courtesy of University of Michigan College of Pharmacy)

of lipophilicity, as well as the possibility of quantifying the lipophilic, electronic, and steric influences on activity. Topliss looked for opportunities to apply the Hansch Analysis at Schering, and in 1969, he gave one of the earliest presentations from industry on this approach at a meeting of the Society for Drug Research in London.

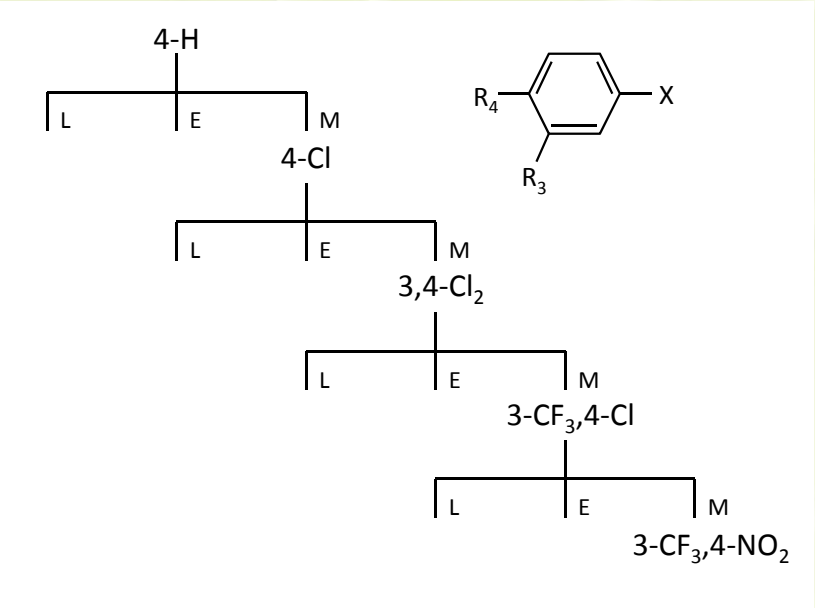


Figure 1.

An example of Topliss's decision cascade, based on the lipophilicity and electronic characteristics of various substituents on a benzene ring and the corresponding biologic activity of the chemical analogs. M = more potent; E = equipotent; L = less potent; R_3 = meta-substituent; R_4 = para-substituent.

Although many medicinal chemists in the pharmaceutical industry, like Topliss, accepted that lipophilic, electronic, and steric effects were the main drivers of drug potency, few applied the Hansch Analysis in their compound synthesis campaigns. Stepwise, multiple regression analysis required mathematical, statistical, and computer methods that did not sit well with most synthetic chemists. Also, Hansch's approach required analysis of data from a sizable number of compounds before useful insights about optimal substituents could be gleaned—necessitating long, uninformative lead times that they could not afford. Their work was time critical. For each synthesized compound, even the first few in a chemical series, they needed to choose substituents that were most likely to increase potency.

Recognizing the barriers that prevented application of the Hansch Analysis, Topliss began thinking about alternative schemes that would employ Hansch's principles and rapidly optimize potency but would circumvent the need for regression analysis. He soon settled on a decision tree scheme, because the sequential branch points would define the most efficient way to maximize drug potency with a minimum number of synthesized compounds.

Topliss's procedure started with the unsubstituted phenyl compound and its corresponding biologic activity (measured by an appropriate bioassay). He then systematically placed substituents on the benzene ring and measured the biologic activity of the new analog. In many systems, activity increases with increasing π values (i.e., lipophilicity), and the 4-Cl analog is a good choice for the first aromatic substitution. In addition, 4-Cl analogs are generally easy to synthesize. The potency of the resulting 4-Cl compound, as measured by the bioassay, can be greater than (M), equal to (E), or less than (L) the activity of the unsubstituted parent compound. If the potency of the 4-Cl analog is greater, as shown in Figure 1, this could be attributed to a positive π effect, a positive σ effect, or the combined positive π and σ values. (As shown in Table 1, for 4-Cl, $\pi = 0.71$ and $\sigma = 0.23$). The 3,4-dichloro compound would be a good choice for synthesis

Biosketch:

Rebecca J. Anderson holds a B.A. in chemistry from Coe College and earned her doctorate in pharmacology from Georgetown University. She has 25 years of experience in pharmaceutical research and development and now works as a technical writer. Her most recent book is *Nevirapine and the Quest to End Pediatric AIDS*. Email ***rebeccanderson@msn.com***.

In the next issue of The Pharmacologist...

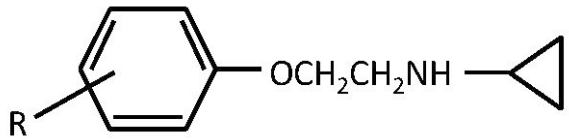
Dr. Anderson will be exploring the story about tamper-resistant drug packaging and the tampering incidents that led to the use of this technology. Don't miss the exciting June 2014 issue.

next, because this substituent has larger values for both π and σ than the 4-Cl substituent. (For 3,4-Cl_2, π = 1.25 and σ = 0.52). If the potency of the 3,4-dichloro compound is, in fact, greater than the 4-Cl compound, then the next choice for synthesis would be the 3-CF_3,4-Cl analog, because the π and σ values are still larger. (For 3-CF_3,4-Cl, π = 1.59 and σ = 0.66). If the potency of the 3-CF_3,4-Cl compound again increases compared to the earlier analogs, the next step might be to synthesize the 3-CF_3,4-NO_2 analog. This substituent has a larger electronic value (σ = 1.21) but a more modest hydrophobicity (π = 0.60) and would determine the relative importance of the substituent's electronic properties. If this compound exhibits a further increase in potency, one can conclude that a +σ is an important factor determining potency in this biologic system.

Obviously, other outcomes are possible. If the newly synthesized compound is equipotent (E) or less potent (L) than the preceding compound, it indicates an unfavorable shift due to the change in hydrophobic, electronic, or steric contributions of the new substituent. By choosing substituents that systematically increase or decrease π, σ, and E_S at each subsequent branch point in this decision tree, the chemist can often optimize the biologic activity after synthesizing only a handful of compounds.

Topliss illustrated his scheme by presenting several specific examples taken from previously collected data. The monoamine oxidase inhibitory activity of a series of N-(phenoxyethyl) cyclopropylamines is shown in Table 2. Starting with the unsubstituted phenyl compound, which had a measured activity value of 5.93, the first analog in the series was the 4-bromo compound (the 4-Cl compound had not been made). The 4-bromo analog exhibited a substantial increase in activity (6.64). According to Topliss's scheme, the 3,4-Cl_2 compound was a logical analog to synthesize next, but unfortunately it had an activity value of 6.30 (lower than the 4-bromo compound). This result may be attributed to an adverse steric effect from meta-substitution (i.e., the 3-Cl substituent). This result would have prompted the synthesis of the 4-CF_3 analog, which had an activity of 6.99, representing an improvement in activity over the 4-bromo analog. With these results in mind, the indicated direction for further chemical synthesis was for other substituents in the 4-position that have highly positive π and σ values. One such compound is the 4-phenyldiazo analog, which was found to be the most active compound in the series (7.56). Another substituent with high, positive π and σ values is the 4-trifluoromethylsulfonyl substituent, which produced an analog that also had an activity of 7.56.

Table 2. Inhibition of Monoamine Oxidase by N-(phenoxyethyl)cyclopropylamines



Order of synthesis (per Topliss Tree)	R	Biologic Activity
1	H	5.93
2	4-Br	6.64
3	3,4-Cl_2	6.30
4	4-CF_3	6.99
5	4-N=N-C_6H_5	7.56
6	4-SO_2CF_3	7.56

Topliss unveiled his decision-tree concept in August 1971 at a joint meeting of ASPET and the Medicinal Chemistry Division of the American Chemical Society held at the University of Vermont. (See Figure 2.) Encouraged by his colleagues' response, Topliss published the details of his scheme the following year *(6)*. The article generated considerable interest among medicinal chemists. Corwin Hansch also reacted favorably to this application of his principles. Topliss was subsequently invited to speak at numerous scientific meetings and at other pharmaceutical companies to discuss his decision-tree rationale. It became a popular tool that medicinal chemists labeled the Topliss Tree.

Maybridge, a supplier of chemical intermediates, further facilitated application of the Topliss Tree methodology by marketing "Topliss Sets" for optimization of aromatic compounds. These prepackaged kits were a set of aromatic intermediates that consisted of the unsubstituted phenyl compound and the corresponding, most commonly used substituent analogs (chloro-, dichloro-, methyl-, and methoxy-). Before long, the Topliss Tree was incorporated into the curricula of medicinal chemistry courses and is now included in medicinal chemistry textbooks alongside the Hansch Analysis.

The Topliss Tree did not address all of the challenges that medicinal chemists face, but it made

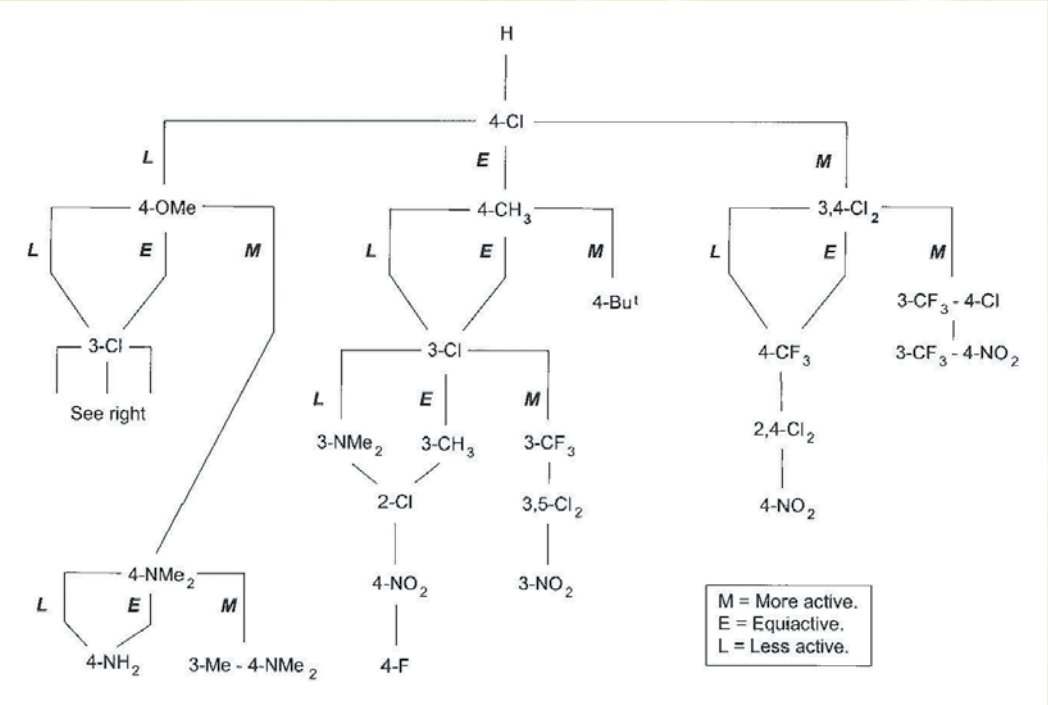


Figure 2. The Topliss Tree.

their choices for chemical synthesis of aromatic compounds more efficient, especially in the early stages of SAR optimization. Once the most favorable type of substituent was identified by working through the Topliss Tree, the chemist could then examine similar substituents in detail, including the more unusual and synthetically difficult ones. In addition, because the Topliss Tree relied on the empirically established lipophilic, electronic, and steric constants, the strategy was compatible with other methodologies and provided a shortcut to the quantitatively rigorous Hansch Analysis.

Both Hansch and Topliss continued to make contributions to chemistry after their initial successes. At Pomona, Hansch and his students developed a computer program for calculating the partition coefficient, log P, using only the compound's chemical structure and created a database of thousands of QSAR parameters, which they have made available to other researchers. Through a collaboration with colleagues at the University of California San Francisco, Hansch further validated his methodology by demonstrating that his mathematical expressions predicted binding sites that matched the computerized 3-D surface of proteins derived from X-ray crystallography data. The use of computer graphics in QSAR is now an indispensable tool to medicinal chemists for drug design. Hansch continued his research activities and his association with Pomona after his official retirement in 1988, a kind and generous mentor whose enthusiasm for research excellence was infectious.

Likewise, Topliss refined the Topliss Tree methodology and outlined another procedure for rapidly optimizing SAR *(7)*. Still avoiding Hansch's statistics-intensive approach, Topliss developed a manual method of drug design in which groups of analog substituents were selected, synthesized, and tested for activity as a batch rather than sequentially synthesizing and testing each one. The rank order of potency of these analogs, in turn, provided a rational basis for selecting new substituents that were likely to be more potent. Topliss hoped his "batchwise" method would be a faster and more advantageous strategy, but medicinal chemists more often employed the original, stepwise Topliss Tree.

In 1979, Topliss joined the Parke-Davis division of Warner Lambert (now part of Pfizer). As he advanced in his career, eventually becoming Vice President of Chemistry, he devoted less time to synthetic chemistry but oversaw development of several innovative new drugs, including the highly successful lipid-lowering statin, atorvastatin (Lipitor®). He also encouraged the chemists at Parke-Davis to apply combinatorial chemistry principles (which had only been used to generate peptides and nucleotide-based oligomers) to synthesize small molecules. They built an apparatus and developed methods for multiple, simultaneous synthesis of organic compounds in a chemical series *(8)*. In 1992, Topliss became a full-time professor of medicinal chemistry after a longstanding affiliation with the University of Michigan and continued to make innovative contributions to drug design methodology. Along with Fumitaka Yoshida, he devised a QSAR model for predicting the human oral bioavailability of compounds, again finding that lipophilicity was a primary determinant of activity *(9)*.

But it was the Topliss Tree that resonated most prominently with medicinal chemists. Hundreds of researchers have cited the Topliss Tree methodology in their publications, and application of the Topliss Tree during the early stages of SAR optimization has facilitated development of several commercially successful drugs. The Topliss Tree has also served medicinal chemists by redirecting their efforts away from inactive chemical analogs and allowing them to rapidly abandon unproductive compound synthesis campaigns.

Forty years ago, when he was sitting alone at his desk quietly sketching out his ideas, Topliss "did not in my wildest dreams expect this to be the outcome."

The Topliss Tree methodology is only one of many tools used in designing a viable drug. But despite the advent of more sophisticated methods such as molecular modeling based on X-ray crystallography data and the willingness of today's synthetic chemists to readily embrace computational chemistry, the Topliss Tree remains a valuable and frequently used tool in the medicinal chemist's toolbox. Forty years ago, when he was sitting alone at his desk quietly sketching out his ideas, Topliss "did not in my wildest dreams expect this to be the outcome."

For their outstanding contributions to medicinal chemistry, Corwin Hansch and John Topliss have both received many honors. Hansch received the American Chemical Society's Smissman Award in 1976, and Topliss received the ACS Division of Medicinal Chemistry Award in 1998. Both were inducted into the ACS Division of Medicinal Chemistry Hall of Fame in 2007.

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In The Spotlight

Interviews with ASPET Members

Stephen F. Traynelis, PhD
Emory University

Regular Member

What sparked your interest in pharmacology?

I began to think seriously about graduate education in my junior year as an undergraduate, seeking advice from a number of professors, friends, and family members. As a young student with a strong interest in both chemistry and biomedical research, I was introduced to the discipline of pharmacology by my brother, who at that time was studying in medical school en route to becoming a neurosurgeon. He explained what pharmacology was and suggested I discuss a research career in pharmacology with a friend of the family, who coincidentally happened to be my neighbor, Dr. William W. Fleming (President of ASPET, 1981). Bill took several evenings to answer all of my questions. At that time, with what I now recognize as profound foresight, Bill described how pharmacology involves all of the physical sciences, medical sciences, and engineering. I was told that pharmacology sought to discover or devise new therapeutic strategies to improve human health from tools, insight, and innovation drawn from consideration of biochemistry, chemistry, physiology, and medicine. Pharmacology seemed unique among biomedical research disciplines in that it required familiarity with multiple disciplines. Moreover, the future was presented at that time (early 1980's) as one in which atomic contacts between pharmacological probes and their protein targets could soon be visualized. I was told advances were just around the corner in terms of synthetic chemistry that would provide new ways to rapidly probe the near infinite chemical space. Bill argued persuasively that the computerization and miniaturization of instrumentation held the promise to accelerate our ability to test and ultimately discover new drugs, and he said it would all occur during my career. How could one not become hooked on this forward-looking view of transformational advances in pharmacology 30 years ago? Remarkably, over the years, the field of pharmacology has come to witness the fulfillment of all of these predictions. I remember being excited then as an undergraduate embarking on a newfound graduate career path. I am still excited today, as we look forward to new predictions such as individualized medicine, context-dependent drugs that are active only where needed, and drug selectivity not just for receptor subtypes but for only one of the multiple signaling pathways each receptor can be connected to, all seemingly within our grasp.

What do you like the most about being a professor at Emory?

Since the day I arrived at Emory, it has been a place where collaboration and collegiality thrive in almost an unstoppable fashion. The early growth of the School of Medicine in the 1990's and into the 2000's brought multiple waves of cutting edge, well-trained, enthusiastic, and energetic new faculty to Emory. It seemed anything I wanted to do was going on somewhere on campus, and all I needed to do was ask for help. Before I knew it, my students were sharing space in other labs to learn new techniques, multi-author projects were being designed, and techniques that were entirely new terrain for me had become accessible. While it sometimes feels as though the age of budgetary austerity and increasing regulatory paperwork sap exciting aspects of academic life, Emory still remains a place where anything is possible, and where we can do more together than is possible to do alone. This is what I like most about Emory.

What advice would you offer to aspiring pharmacologists?

I would tell them that pharmacology is an incredibly important and rewarding field that touches the lives of everyone through the treatment of disease. I would remind them to work hard, to bring all their training in the physical sciences (math, physics, chemistry) to bear on the research problem at hand, to expand their thinking to explore multiple disciplines, to train in the best possible laboratories in the world, to ask hard questions that make a difference to the biomedical field, to think forward as to what they want to do with their career (and life), and to pay attention to what they seem to be good at. I would also remind them that science is fascinating. One should enjoy the privilege of being able to spend time seeking answers to biological questions that can have a profound impact on many people's well-being. Lastly, I would encourage them not to let momentary setbacks derail them from their goals; bumps in the road usually only slow you down for a moment.

As a journal editor, what are the three most important things an author should do when submitting a manuscript to a journal?

First, authors should ensure that the data is technically sound, rigorously analyzed, reproducible, and statistically valid. Second, I would tell them to draw conclusions that are supported by the data and connected to the literature through scholarly discussion. Third, I would remind them to pay attention to detail—the writing should be crisp and error-free, the figures should be carefully laid out in a way that allows data and concepts to be easily understood, and the text should clearly articulate the results, conclusions, caveats, and the relevance of the study.

How has membership in ASPET benefited you and your career?

It is very important that students and scientists participate in and contribute to scholarly societies such as ASPET, which plays so many vital roles in the scientific enterprise. I have personally benefited from ASPET through the meetings it promotes, through the excellent journals it publishes, and through its advocacy for pharmacology as a critical discipline on the national level.

Outside of pharmacology, what are some of your other interests or hobbies?

I have always loved being outdoors and especially love the mountains, having grown up with mountains all around me. I enjoy hiking, mountain biking, canoeing, fishing, and snow skiing. I also like to play racquet sports (tennis, badminton, squash, table tennis) as well as throw a baseball around from time to time. I have a new-found interest in soccer (introduced to me by my children). I have always liked to build things and to garden. I've been interested in art as long as I can remember, and still spend time painting and drawing. Most of all, I tremendously appreciate any time I get to spend together with my family.

LeeCole L. Legette, PhD
Oregon State University

Postdoc Member

What sparked your interest in pharmacology?

I must confess that I am one of those "young hipsters" who considers herself a "foodie." With the increasing global interaction across the world, there is great exposure to a variety of foods. During my culinary adventures, I became curious about the potential health benefits of several dietary bioactives and started my graduate studies at Purdue University examining the health effects of soy botanicals. I became interested in pharmacology because it allowed me the opportunity to assess therapeutic potential of natural products by evaluating various aspects of metabolism. My recent work at Oregon State involves characterizing metabolism of a flavonoid derived from hops, xanthohumol, through animal and clinical pharmacokinetics studies, as well as animal pharmacodynamic studies.

What advice would you offer to students in the field of pharmacology?

"Nothing is so dangerous to the progress of the human mind than to assume that our views of science are ultimate, that there are no mysteries in nature, that our triumphs are complete and that there are no new worlds to conquer."

– Sir Humphry Davy

If I had one piece of advice to give to students in pharmacology, it would be to always keep exploring everything without fear. When starting out and learning about the field, it is very common for people to immerse themselves in one track or discipline and not explore other areas. Although my work primarily focuses on medicinal chemistry and natural product metabolism, I love interacting and learning from all of my colleagues, whether it be discussing best PK models or new methods for predictive toxicology.

What do you find most challenging about being a postdoc?

I find the most challenging thing about being a postdoc is the adjustment to the various roles of a postdoc. A postdoc is directing research and formulating their own long term research plan while acquiring lab management skills, as well as serving as a mentor for students. While all experiences are enriching and rewarding for me, particularly interactions with students, it can be difficult in creating the right balance. The versatile experiences I have obtained during my post-doc, although taxing at times, have greatly broadened my scientific view and aided in keeping me engaged and excited about research.

What do you see in store for the future of pharmacology? How do you see the science advancing?

Recent technological developments in the "omics" fields through advanced chemistry techniques, such as high resolution mass spectrometry and accurate mass, has enabled unprecedented exploration into biochemical pathways as well as the re-emergence of metabolite profiling or metabolomics as an important tool in studying complex metabolic conditions. Specifically, metabolomics analysis has been shown to be a valuable method for examining the effects of various compounds on disease development and gaining new insights into the impact of therapeutics on biochemical pathways. I believe that, with the

advances in “omics” technology as well as general improvements in analysis with high throughput and rapid screening assays, the development of new therapeutics will evolve quickly and lead to more specialized and effective treatments.

What are your career goals or aspirations in pharmacology?

My long-term career goal is to lead basic and pre-clinical translational research that establishes a foundation for personalized medicine in the field of alternative therapeutics, specifically dietary bioactives. Due to the immense potential of dietary bioactives, I am focusing my efforts on evaluating their health promoting properties for a variety of metabolic chronic diseases with an emphasis on obesity and its related disorders.

Allyson Marshall
Wake Forest University, Baptist Medical Center

Student Member

What sparked your interest in pharmacology?

I developed an interest in pharmacology while pursuing undergraduate research in medicinal chemistry at Bucknell University. My research involved synthesis of the antimalarial drug artemisinin. While I found elements of the synthesis process exciting, I was more curious about the drug’s actions in vivo that made it effective for the treatment of malaria. Through this work, I became interested in pharmacology, particularly the areas of research that improve human health.

Who or what have been your greatest influences in your studies?

My graduate school mentors, Dr. Mark Chappell and Dr. Debra Diz at Wake Forest University School of Medicine, have significantly influenced my growth as a scientist. In addition to teaching me how to become a better researcher and writer, they have helped me broaden my understanding of what is possible. One particular set of experiments stands out. The results of an experiment that investigated peptide processing revealed a greater degree of substrate specificity than we had anticipated. Instead of limiting our focus to known peptidase pathways, Dr. Chappell suggested that we should also explore our finding as a novel activity. His willingness to view problems from different angles and design innovative experiments is motivating and encourages me to keep an open mind in the interpretation of experimental results.

What do you find most challenging about being a student in pharmacology?

Finding a balance between conducting experiments in the lab and completing manuscripts is one of the most challenging experiences of being a pharmacology student but also one of the most rewarding. I dedicate myself to developing new experiments, optimizing the conditions, and striving to obtain results. At times, it is difficult to step back from my work in the lab and focus on writing manuscripts. However, I have developed an interest in writing and enjoy sharing my experimental results with others through manuscripts. I appreciate the value of dedicating time to both aspects of being a pharmacology student and will continue to strive for the ideal balance.

Tell us about your most favorite experiment/study with which you have been involved.

My favorite study involved the characterization and purification of a novel peptidase from the brain medulla and cerebrospinal fluid of sheep that may influence angiotensin peptide expression. We found sheep exposed to betamethasone in utero have higher activity of this peptidase by six months of age, indicating that betamethasone has a long-term programming effect on peptidase activity. This project continues to be challenging because we are attempting to purify an unknown protein and retain its biologic activity. From our current studies, we have established the inhibitor sensitivity, substrate specificity, and pH profile of the peptidase. We take advantage of these characteristics in order to enrich the peptidase while removing contaminating proteins. Although we have encountered many obstacles, we are slowly moving toward our goal of identifying a novel peptidase in brain. This may result in the development of inhibitors that target the enzyme in the treatment of cardiovascular disease.

What might someone be surprised to know about you?

I played the violin and viola for 16 years and seriously considered a career as a classical musician. During middle and high school, I played viola with the State University of New York New Paltz Symphony and attended music classes at Ramapo College every week. I auditioned for music conservatories after high school, but decided to attend Bucknell University where I could study classical music performance and biochemistry.

27th Great Lakes Chapter ASPET Annual Meeting

Stem cells: Current and future use in pharmacology

Friday, June 13, 2014

Rosalind Franklin University of Medicine and Science

North Chicago, IL

Duncan Stewart, MD, FRCPC

Keynote Speaker: Duncan Stewart, MD, FRCPC
CEO & Scientific Director, Ottawa Hospital Research Institute, University of Ottawa

Other Invited Speakers Include:

Brenda Russell
University of Illinois at Chicago

Eric Lagasse
University of Pittsburgh

Daniel A. Peterson
Rosalind Franklin University of Medicine & Science

The Annual Meeting will also include a career workshop, a poster session, and the annual graduate student and postdoctoral research competition. Postdoctoral fellows and junior scientists will give a presentation addressing the theme "Stem cells: Current and future use in pharmacology" in a mini-symposium.

Science Policy

New Momentum for Sustained NIH Funding?

Is the budget agreement reached last December that ultimately restored $1 billion in funding to the National Institutes of Health the start of a more promising and sustained level of funding for the agency? Or will Washington soon revert back to chaotic political dysfunction once again threatening funding levels for NIH and other federal science agencies?

In the short term, there is certainly room for optimism. December's budget agreement essentially restored, for the time being, "regular order," established a total spending level for domestic discretionary programs in FY 2014 and FY 2015, and removed the threat of sequestration. All good news. As the biomedical research community knows all too well, in the last few years the political process has completely broken down. Final spending decisions were made by a few individuals in Congressional leadership, side-stepping the normal regular order process that allows for appropriators to deliberate spending decisions on programs under their jurisdiction. These spending decisions were made not with reasoned public policy but in the most politically inspired fashion in the context of rising deficits and federal debt.

The President's FY 2015 budget was to be released in early March. Soon appropriators will move forward deliberating each of the 12 appropriations bills (the NIH is funded by the House/

Senate Labor/HHS & Education Subcommittee). Ideally, each of the subcommittees would pass its own bill, reconcile any differences between the House and Senate bills, pass the agreed upon bill in the House and Senate, and then have the President sign the bill into law. That is what regular order looks like and what has been absent the past few years.

But such optimism might be misplaced. December's budget agreement is often viewed as an example of a new bi-partisanship spirit. Fearing repercussions from voters who would likely have blamed Republicans for continued political dysfunction and the government shutdown in this election year, Republican leadership was also able to earmark projects to certain members of their caucus to garner their vote. And, with a Presidential election two years away there is no way to know if this "phantom" bi-partisan spirit will remain once politics as usual rears its head once again. So all the promise of regular order could break down along the usual partisan fault lines; while the deficit has been roughly cut in half of what it was two years ago, the federal debt continues to rise and dissent over raising the federal debt ceiling limit continues.

What remains constant is the need for ASPET members to continue to raise public awareness among the Congressional delegation about why the NIH needs sustained, predictable increases and what the consequences to public health will be if the NIH's funding needs are not met.

Although the next couple of years may see some reprieve to the dysfunction the country recently endured, all these issues seem to conspire against the likelihood of seeing long-term sustained progress to restore the NIH's funding power.

What remains constant is the need for ASPET members to continue to raise public awareness among the Congressional delegation about why the NIH needs sustained, predictable increases and what the consequences to public health will be if the NIH's funding needs are not met. Toward that end, the biomedical research community is rallying around a FY 2015 NIH budget of at least $32 billion.

ASPET Advocacy Outreach Program Complements Graduate Student and Postdoctoral Training

Interested in a real "inside baseball" look at how Washington works? Want to improve your science advocacy skills? ASPET's Advocacy Outreach Program is dedicated to educating and training graduate students, post-docs, and faculty in pharmacology departments on the importance of grassroots advocacy in support of the National Institutes of Health. The ultimate goal of the advocacy outreach program is to 1) develop a cadre of interested individuals who will more effectively advocate on critical issues of science funding and science policy and 2) provide individuals with the skills needed to become informed and proactive participants in these issues at whatever institution they may find themselves in the near future. As a scientist, you are the most effective advocate for the biomedical science research enterprise – and the most credible

As a scientist, you are the most effective advocate for the biomedical science research enterprise – and the most credible too.

too. These skills are important for young investigators as they begin their careers and for those individuals considering pursuing career options in science policy.

Today's economic and political environment make it imperative that biomedical scientists, particularly graduate students and young investigators, become more informed and involved in policy. A continued effort must be made to help make the case to Congress, media, and the public about the health and economic benefits of a robust biomedical research enterprise and the need for steady and sustained increases for the NIH.

The ASPET Advocacy Outreach Program has met with many postdoctoral associations and departments taking a look at what is happening in Washington and why, and what young scientists can do to help change the current funding environment. To date, ASPET has visited University of Texas Southwestern, Emory University, Wayne State for Michigan's Annual Research Colloquium, University of Louisville, Vanderbilt University Medical Center, Drexel University College of Medicine, Virginia Commonwealth University, the University at Buffalo, University of South Florida, Medical University of South Carolina, and University of Texas Health Science Center San Antonio.

If there is an opportunity for ASPET to make a presentation at your institution or for information on ASPET's Advocacy Outreach Program, contact Jim Bernstein, ASPET's Director of Government and Public Affairs at 301-634-7062 or *jbernstein@aspet.org*. There is no cost to your institution as ASPET assumes all travel expenses for this effort.

2015 ASPET Washington Fellows Program

Applications Now Open - Deadline September 2, 2014

Program Mission

The mission of the ASPET Washington Fellows Program is to enable developing and early career scientists interested in science policy to learn about and become more engaged in public policy issues. Fellows will develop an understanding of how public policy decisions made in Washington help shape and impact science policy, such as funding for the National Institutes of Health and other science agencies. Fellows will also learn how to advocate effectively on Capitol Hill and in their home districts. This program will help fellows develop the skills and insights to become future leaders in science.

What Will ASPET Fellows Do?

- ***Advocate on Capitol Hill:*** ASPET Fellows will come to Washington, DC to meet with their Congressional delegation to advocate for biomedical research and increased funding for the NIH. Fellows will be well trained by ASPET and prepared with the appropriate message to deliver to their Members of Congress. ASPET will cover transportation costs, hotel, and other reasonable expenses that follow ASPET's reimbursement policy.
- ***Become advocates in their home districts:*** ASPET Fellows will meet with Members of Congress in their home district, act as a conduit to inform colleagues within their departments/institutions about federal legislative matters, write op-ed pieces to local papers, etc. All these activities will be prepared with the support and advice of ASPET.
- ***Attend the ASPET Annual Meeting at Experimental Biology 2015.*** ASPET Fellows will attend the ASPET Annual Meeting in Boston in 2015 and any related policy program sessions assigned. Fellows will receive an ASPET travel award to attend the meeting.

Qualifications

The ASPET Washington Fellows Program is open to any graduate student, postdoctoral trainee, or researcher no more than 4 years past the completion of his/her postdoctoral training. Applicants must be members of ASPET in good standing and have a strong interest in science and its intersection with public policy. Fellows will be selected by the ASPET Science Policy Committee.

Application Information

ASPET anticipates up to 10 Washington Fellows Program participants in 2015. Fellows serve one-year terms.

All applications must contain the following information and be submitted by September 2, 2014 as a single combined PDF:

- a letter (no more than two pages) from the applicant stating their interest in public policy and why they are interested in the ASPET Washington Fellows Program,
- a *curriculum vitae,* and
- a brief letter of support from the candidate's mentor and/or department chair supporting the application.

Incomplete applications and/or applications received after September 2, 2014 will not be considered. Applications may also be weighed to assure a broad geographical distribution of applicants to allow the opportunity to inform a variety of selective Congressional delegations. For additional information, contact Jim Bernstein, ASPET Government & Public Affairs Director, at (301) 634-7062 or *jbernstein@aspet.org*.

Journals

Journal News

New Editorial Board Members

The *Drug Metabolism and Disposition* Editorial Advisory Board has four new members. Namandjé Bumpus, PhD, is Assistant Professor of Pharmacology and Molecular Sciences, Johns Hopkins University. Aiming Yu, PhD, is Associate Professor of Biochemistry and Molecular Medicine at the University of California, Davis, and Director of the PK/PD Bioanalytical Laboratory there. Swati Nagar, PhD, is Associate Professor of Pharmaceutical Sciences at Temple University. Upendra Argikar, PhD, is Investigator III in the Metabolism and Pharmacokinetics Department at the Novartis Institutes for BioMedical Research, Inc.

In addition, Nina Isoherranen, PhD, is now the *DMD* Associate Editor in charge of reviews and commentaries. Dr. Isoherranen is Associate Professor in the Department of Pharmaceutics at the University of Washington.

Dr. Joe Blumer, PhD, at the Medical University of South Carolina has been named an associate editor for *JPET.* Dr. Blumer will be responsible for *JPET's* minireviews. Dr. Blumer is an Associate Professor with both the Department of Cell and Molecular Pharmacology and the Department of Neurosciences at MUSC.

New Look for Content Alerts

In mid-February the content alerts for ASPET's journals were redesigned. The new alerts list only the authors and titles of articles without the volume, page numbers, DOI, publication date, and journal title included with each. This new design is cleaner, easier to read, and especially helpful when reading on a mobile device. All citation information is available from the articles and can be easily downloaded to any of the 12 citation management services available.

Several alert types are available:

- Fast Forward articles (the manuscript version of each article as it is accepted for publication, provided daily or weekly),
- continuous publication alerts (the final version of each article as it goes online, provided once a day for all articles uploaded that day), and
- alerts to notify you when an issue has closed (either with or without the complete table of contents).

Readers can also sign up to receive important announcements from the journal. These are sent to notify readers of new editorial board members, changes to the Instructions to Authors, and new policies.

Sign up for alerts from the homepage of every ASPET journal. Just click the ALERTS button and register for the alerts of your choosing to stay current with ASPET's journals.

Members in the News

Achievements, awards, promotions, and scientific breakthroughs

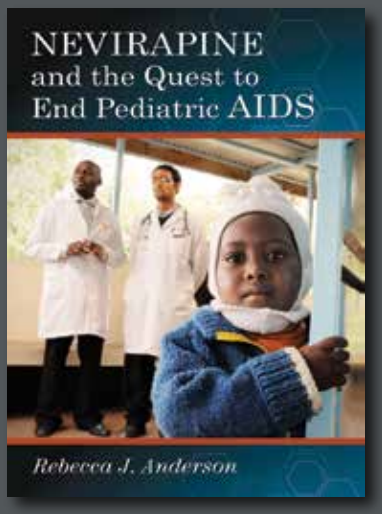
Rebecca J. Anderson, PhD

Rebecca J. Anderson, after 25 years in pharmaceutical research and development, now works as a medical writer. You will recognize her as a frequent contributor of feature articles to *The Pharmacologist*. Her book, *Nevirapine and the Quest to End Pediatric AIDS,* was recently published by McFarland Publishing.

In 1999, investigators announced that a single dose of nevirapine, a new antiviral drug, could stop the spread of the AIDS virus from infected mothers to their newborn babies. It was a discovery that "changed the face of AIDS globally," but it came at a high price, after years of scientific research, political conflict, social unrest, and the loss of many thousands of lives. This book is the historical account of pediatric AIDS from the first reported cases in the early 1980s to the first effective treatments in the 1990s and then to the prevention of HIV infections altogether. It tells the story through the experiences of individual children infected with HIV, their families, and the physicians who treated them, as well as the scientists who sought to understand the virus, discovered nevirapine's unique properties, and worked tirelessly to get it to the patients who needed it.

Additional information is available at the publisher's website: *http://www.mcfarlandpub.com/book-2.php?id=978-0-7864-7780-7*.

Dr. Anderson has been an ASPET member since 1980.



During the American Public Health Association's (APHA) 2013 annual meeting, held November 2 – 6 in Boston, MA, **Linda S. Birnbaum, Ph.D.** was honored as the 44th recipient of the Homer N. Calver Award. The Calver Award recognizes dynamic leadership in environmental health. As the Calver Award recipient, Dr. Birnbaum, Director of the National Institute of Environmental Health Sciences (NIEHS) and the National Toxicology Program (NTP) was invited to present a lecture at the Environment Section Homer N. Calver Award Lunch on November 4 during the APHA meeting. Her lecture focused on "When environmental chemicals act like uncontrolled medicine." In addition to the APHA's Calver Award, Birnbaum is a past recipient of numerous awards, including the 2011 NIH Directors Award and the National Center for Women's 2012 Health Policy Hero Award. She has been an ASPET member since 1979. *http://www.niehs.nih.gov/news/newsletter/2013/12/spotlight-birnbaum/index.htm*

The lab of **Christopher R. Triggle, PhD,** a professor in the Department of Medical Education at Weill Cornell Medical College in Qatar, recently completed a study that broke ground on understanding the molecular and cellular mechanisms of metformin, a hypoglycemic drug used by type-2 diabetes sufferers. The study, published in the *British Journal of Pharmacology,* reports that metformin, via an insulin-independent mechanism, protects mouse microvascular endothelial cells from high glucose-induced senescence and apoptosis. Metformin is the first choice oral hypoglycemic drug for the treatment of type 2 diabetes and was first introduced for use in the UK in 1958 and in the USA in 1995. The therapeutic success of metformin relates to a very low incidence of serious side effects, low association with a risk for hypoglycaemia, positive effects on lipids, blood pressure and a lack of weight gain with long-term use. Despite extensive investigation the cellular mode(s) of action of metformin that link to its therapeutic actions to reduce hepatic gluconeogenesis and improve glucose uptake remain controversial. Furthermore, metformin also possesses pleiotropic actions including a vascular protective action and it was the latter that Dr Triggle's group investigated. In part the lack of clarity concerning the cellular targets of metformin relates to the wide range of concentrations of metformin that have been used in the ex vivo studies. For instance, clinical data indicate that plasma levels of metformin above 300 micromolar have been associated with lactic acidosis in patients, but concentrations of 500 micromolar and higher have frequently been used in ex vivo studies. In the study from the Triggle laboratory, the endothelial protective action of metformin was associated with a comparatively low concentration of metformin and linked to the so-called longevity gene, SIRT1. In the absence of sirtuin-1, the NAD-dependent deacetylase, metformin no longer protected against glucose toxicity. Dr. Triggle stated that: "These data provide a cellular mechanism of action for the clinical reports that indicate that metformin improves endothelial function in patients with type 2 diabetes." *http://weill.cornell.edu/news/news/2014/01/weill-cornell-medical-college-in-qatar-discovers-molecular-and-cellular-mechanisms-of-popular-diabet.html*

Linda S. Birnbaum, PhD

Christopher R. Triggle, PhD

New Members

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National Ctr for Toxicological Research, AR
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Yu Zhang
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Special Thanks to Our Members Who Participated in the 2014 Member-Get-A-Member Program

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Roshanak Rahimian
Jeffrey Staudinger
Gregory G. Tall
Maren von Köckritz-Blickwede
Val J. Watts
Susan K. Wood
Luyong Zhang
Bin Zhu

In Sympathy

ASPET notes with sympathy the passing of the following members:

James Ellingboe
Elizabeth H. Jenney
Joseph Larner

Have an idea for a symposium at EB 2015?

Submit your symposium proposals today!

Do you have an idea for a scientific symposium for the ASPET Annual Meeting at Experimental Biology 2015 in Boston? Submit your ideas to your division!

ASPET encourages the presentation of symposia on timely topics at our Annual Meeting. Symposia are valuable for promoting scientific interchange and developing new concepts in a way that crystallizes thinking in particular areas. This particular format helps investigators keep abreast of developments in fields that may not be intimately related to their own major research interests. The ASPET Program Committee is responsible for selecting symposia, submitted from the divisions, for the Annual Meeting.

PROPOSE AN EB 2015 SYMPOSIUM at http://www.aspet.org/Symposium_Submission_Form/. Be sure to read the guidelines, fill out an application form, and send your proposal to your Division Chair for consideration for next year's meeting.

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For more info contact:
Danielle Jordan, Meeting Manager, djordan@aspet.org

Division News

Division for Behavioral Pharmacology

Member Achievements

Wael M. Mohamed, MD, PhD, received an International Brain Research Organization award to return to Egypt and start his own laboratory. Wael completed his doctorate degree at Penn State University.. He is in the process of establishing his own laboratory at Menoufia Medical School in Shebin El Kom, Egypt, where he is studying the effect of early iron deficiency anemia on the brain. According to his scientific mentor, Professor Richard Kostrzewa of East Tennessee State University's Quillen College of Medicine, Dr. Mohamed's "achievements exceed the expectations of a young academician, and demonstrate his potential – and desire – to develop as an accomplished scientist. He published his first research paper while a master's student in Egypt, and he has now first-authored eight scientific articles." Early iron deficiency anemia is the most prevalent single-nutrient deficiency in the world today, significantly present in developing as well as industrialized countries. "In my home country of Egypt, this is a major problem, leading to cognitive impairment," wrote Dr. Mohamed. "Completing this work will greatly enhance the management and treatment of some cognitive disorders like ADHD, especially among school age children."

Upcoming Meetings of Interest

Behavioral Pharmacology Society Annual Meeting at EB 2014

April 25 – 26, 2014

San Diego, CA

For more information, contact: Wouter Koek, PhD, President, (210) 567 5478 or koek@uthscsa.edu

Division for Drug Metabolism

Election Results

Chair-Elect
Emily E. Scott
University of Kansas

Secretary/Treasurer-Elect
Robert S. Foti
Amgen

Division for Integrative Systems, Translational, & Clinical Pharmacology

Election Results

Chair-Elect
Pamela J. Hornby
Janssen R&D

Secretary/Treasurer-Elect
Benedict T. Green
USDA, ARS

Member Achievements

Molly K. Altman, BS was named a 2012-2013 ASPET Washington Fellow and awarded the Stewart Endowment in the University of Georgia, College of Pharmacy.

D. Samba Reddy, PhD received the International Hind Rattan Award 2014 from the Indian Government for work in pharmacology.

Michael A. Holinstat, PhD received the 2013 Young Investigator Award in Structure and Function from the Eicosanoid Research Foundation at the bi-annual Bioactive Lipids Meeting. He was also promoted to Associate Professor of Medicine and Biochemistry and Molecular Biology at Thomas Jefferson University.

Avadhesh C. Sharma, PhD has been promoted to Professor and Chair of Pharmaceutical Sciences at Philadelphia College of Osteopathic Medicine, School of Pharmacy.

Andrea Gaedigk, PhD has been promoted to Professor of Clinical Pharmacology and Therapeutic Innovation at Children's Mercy Hospital.

Notable at EB

Don't miss the ISTCP sponsored symposia at EB including:

Fetal programming of adult cardiovascular disease

This symposium, chaired by Allyson Marshall and Mark Chappell, PhD, Wake Forest University, investigates the relationship between alterations in the fetal environment and cardiovascular disease in adulthood. The epidemiologist, Dr. David Barker, proposed that such alterations may result in developmental adaptations that predispose offspring to cardiovascular and metabolic diseases later in life. Potential models of fetal programming include nutrient and growth restriction, environmental stressors, and administration of various drugs during pregnancy, all of which are associated with cardiovascular disease, hypertension, and diabetes. The invited speakers will discuss pathways vulnerable to insult by fetal programming events and possible sites of pharmacological intervention to correct the long-term consequences. While it may be difficult to abrogate the immediate effects of fetal programming events, understanding the long-term outcomes in both central and peripheral systems may allow for more effective therapeutic approaches of the affected population.

12-Lipoxygenase and disease: New insights into regulation and inhibition of a critical enzyme

The focus of this symposium (chaired by Michael Holinstat, PhD, Thomas Jefferson University) is on 12-lipoxygenase and its effect on a number of disease conditions including thrombosis, diabetes mellitus, and cardiovascular disease. This symposium will discuss the evolution of this field and will highlight 12-lipoxgenase as a preferred therapeutic target for treatment of these pathophysiological conditions.

Emerging integrative approaches to predicting host response to antimicrobials

The purpose of this symposium (chaired by Namandjé N. Bumpus, PhD, Johns Hopkins University) is to bring together researchers who will share their progress in investigating host responses to antiviral therapy through application of systems biology, metabolomics, and novel modeling approaches based upon the use of innovative in vitro and in vivo systems. This will facilitate harmonization of the diverse array of methods being developed by leading researchers to predict host response to viral infection and antimicrobials.

Targeted/individualized therapy: Approaches for the future translational pharmacologist

The purpose of this symposium (chaired by Jeffrey Paul, PhD, Astellas Pharmaceuticals) is to introduce molecular approaches available to the pharmacologist and provide current tools for integration with translational bioinformatics. The focus of this symposium will be to review the use of various -omic platforms, including genomics, transcriptomics, proteomics, and metabolomics platforms. The need for bioinformatics and disease pathway identification will also be covered as necessary tools to interpret the results of the -omics laboratory and to assign translational/therapeutic relevance.

Division for Cardiovascular Pharmacology

Member Achievements

R. Clinton Webb, PhD of the Cardiovascular Division is the new featured member on the ASPET website. Dr. Webb's research interests focus on the physiology of the cardiovascular system, with particular emphasis on hypertension and erectile dysfunction. In terms of his science, his colleagues stated that Dr. Webb has the gift of insight and novel ideas and has the ability to make scientific connections that others do not, envisioning mechanisms and ideas ahead of the field. His long-term commitment to the vasculature, since his work in graduate school, has laid the foundation for a career teeming with interesting and fascinating science. He knows the pharmacology of the vasculature in ways few people do, and this epitomizes the work of Paul Vanhoutte, for whom one of our ASPET awards is named. Read more about our featured member at *http://www.aspet.org/CardiovascularPharmacology/ASPET-members-achieve/clinton-webb/*

Notable at EB

Our Trainees Shine at Our Showcase on Tuesday, April 29th!

We have the privilege of sharing the scientific work of graduate students and postdoctoral fellows at our Trainee Showcase. This event, now over a decade strong, will be held on Tuesday April 29 from 2:30PM – 4:30PM in the San Diego Convention Center, Room 3. It will be followed by a lecture you won't want to miss, the Paul M. Vanhoutte Lecture. Dr. Sue P. Duckles, Professor Emerita at University of California at Irvine, will deliver this highly anticipated lecture on the vasculature at 4:30PM .

Division for Molecular Pharmacology

Election Results

Chair-Elect
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University of Rochester Medical Center

Secretary/ Treasurer-Elect
Joe B. Blumer
Medical University of South Carolina

Division for Neuropharmacology

Election Results

Chair-Elect
Beverly Greenwood-Van Meerveld,
Oklahoma University Health Science Center

Secretary/ Treasurer-Elect
Michael W. Wood,
AstraZeneca Pharmaceuticals LP

Division for Pharmacology Education

Notable at EB

Division of Pharmacology Education Travel Awardees Highlight Applications of Educational Technologies and Team Work

Each year, the Division of Pharmacology Education (DPE) sponsors travel awards for members to attend the Annual Meeting at EB and present their work about pharmacology education. The 2014 DPE Travel awardees are Dr. Mark Hernandez of the Alabama College of Osteopathic Medicine and Dr. Abu-Bakr Al-Mehdi of the University of South Alabama College of Medicine.

Dr. Mark Hernandez is an Assistant Professor of Physiology and Pharmacology in the Department of Biomedical Sciences, Alabama College of Osteopathic Medicine. As part of the founding faculty of the Alabama College of Osteopathic Medicine and Curriculum Course Director for Pharmacology Content, Dr. Hernandez has been given the opportunity to both lead and participate in multiple curriculum initiatives. He will be presenting his experiences with a paperless curriculum in "Challenges and opportunities in the implementation of a paperless curriculum at a new osteopathic medical school" on Monday, April 28 in the exhibit

hall. This is a timely topic with environmental benefits and also reflects the increasing use of electronic learning devices in medical education. Dr. Hernandez is also a co-presenter for a poster describing their experiences with faculty utilization of a SurfacePro tablet computer for classroom presentations instead of being tethered to a podium and students. They combine the use of the SurfacePro tablet and SmoothBoard software to engage medical students in the learning process. He will describe how this was used in pharmacology learning.

Dr. Abu-Bakr Al-Mehdi is an Associate Professor in the Department of Pharmacology, University of South Alabama College of Medicine. When the discipline-based curriculum was changed to an integrated organ systems-based curriculum, human simulation exercises were included as a mandatory component. As a course director for the discipline-based curriculum, a pharmacotherapeutics thread leader in the new curriculum, and the curriculum coordinator for human simulation (which existed before the change), Dr. Al-Medi has been busy incorporating all aspects of pharmacology into the curriculum. Students work on the simulation cases in groups of 5 or 6. Cases require history taking, physical examination, procedures, lab result analysis, through prescription and order writing for treatment. Pathology and pharmacology relevant to each case are reviewed with faculty preceptors in debriefing sessions. The effects of the exercises were measured by looking at student perceptions of the usefulness of the simulations (subjective data) and NBME medical pharmacology subject examination performance (objective data). Dr. Al-Medhi's poster "Human simulation exercises help improve medical pharmacology learning," will be presented on Wednesday, April 30 in the exhibit hall.

The value of these presentations to ASPET members is an opportunity to see how various approaches and technologies are applied to the teaching of pharmacology. Also, although both of the awardees describe applications to educational principles and technology to the teaching of pharmacology, it is clear that at both of these institutions, medical education is a team effort, involving colleagues from other disciplines. Please stop by and visit the DPE Travel Awardees at their posters and see what you can learn from their experiences to apply to your own particular situation.

Division for Toxicology

Election Results

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Gary O. Rankin
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Secretary/ Treasurer-Elect
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CAPE TOWN, SOUTH AFRICA

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- Prof Alex Dodoo (GHANA) – PharfA Lecture
- Prof Dariono Fabbro (UK) - Tyrosine kinase inhibitors
- Dr Suzanne Hill (AUS) - Medicines selection
- Prof Nicholas Holford (NZ) – Pharmacometrics
- Prof Kazuhide Inoue (JAPAN) – Neuropharmacology
- Prof Kozo Kaibuchi (JAPAN) – Signal transduction
- Prof Yoshikatsu Kanai (JAPAN) - Fundamental oncology
- Prof Simon Mallal (USA) – Drug hypersensitivity
- Dr Martin Michel (GERMANY) - Pharmacology of urogenital tract
- Prof Simon Maxwell (UK)– Drug prescribers
- Prof Bruce McEwan (USA) – Stress
- Prof Salvador Moncada (UK) - Cardiovascular system
- Dr Clive Ondari (KENYA) – Medicines selection
- Prof Munir Pirmohamed (UK) - Drug safety
- Prof Dan Roden (ZA) – Pharmacogenomics
- Prof Stephan Stahl (USA) - Psychopharmacology
- Prof Brian Strom (USA) – Pharmacoepidemiology
- Dr Ronald Taylor (USA) - Oncology
- Prof Nicholas White (UK) – Antimalarials

ACTIVITIES IN AND AROUND CAPE TOWN

Table Mountain Aerial Cableway tablemountain.net

Sunset cruise – departing from the V&A Waterfront www.waterfrontboats.co.za/

Robben Island Museum www.robben-island.org.za

Noon Gun http://bokaap.co.za/noon-gun/

Whale Watching in Hermanus www.hermanus.co.za/whales.asp

Kirstenbosch National Botanical Gardens www.sanbi.org/gardens/kirstenbosch

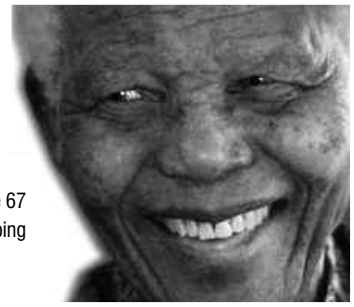
Winelands Tours and Wine Tasting

Cape Town Museums www.iziko.org.za

NELSON MANDELA DAY

Following the success of Nelson Mandela's 90th birthday celebrations in London's Hyde Park in June 2008, it was decided that there could be nothing more fitting than to celebrate Mr Mandela's birthday each year with a day dedicated to his life's work and that of his charitable organisations, and to ensure his legacy continues forever.

The WCP 2014 Organising Committee is working together with various community projects in Cape Town and its surrounds where delegates will be given the opportunity to give 67 minutes of their time to helping those from less privileged backgrounds.



www.wcp2014.org

For more information contact Scatterlings Conferences and events:
Carolyn Ackermann - caro@soafrica.com

Meetings & Congresses

April 2014

Amer. Lung Assn. Massachusetts Pulmonary Section Ann. Mtg.
http://www.lung.org/associations/charters/northeast/programs/msb/mps/annual-meeting.html
Apr. 3, Boston, MA

Optogenetics: Controlling the Brain with Light
http://www.bna.org.uk/events/view.php?permalink=34WB6VQDV1
Apr. 3, Oxford, UK

2nd Ann. Biomarkers in Drug Discov. & Develop.
http://pharma.flemingeurope.com/biomarkers-conference
Apr. 3-4, Berlin, Germany

Amer. Assn. for Cancer Res. Ann. Mtg.
http://www.aacr.org/home/scientists/meetings--workshops/aacr-annual-meeting-2014.aspx
Apr. 5-9, San Diego, CA

16th Intl. Neurosci. Winter Conf.
http://www.winterneuroscience.org/2014/
Apr. 8-12, Sölden, Austria

8th Intl. Symp. on Neuroprotection Neurorepair
http://www.neurorepair-2014.de/
Apr. 9-12, Magdeburg, Germany

5th FIP Pharmaceut. Sci. World Congr.
http://www.fip.org/pswc2014/
Apr. 13-16, Melbourne, Australia

7th Asian Pacific Cong. of Heart Failure
http://www.apchf2014.org/
Apr. 17-19, Bali, Indonesia

Org. for the Study of Sex Differences Ann. Mtg.
http://www.ossdweb.org/2014meeting.html
Apr. 24-26, Minneapolis, MN

Experimental Biology 2014
http://experimentalbiology.org/2014/Home.aspx
Apr. 26-30, San Diego, CA

Astrocytes in Health & Neurodegenerative Disease
http://www.biochemistry.org/Conferences/AllConferences/tabid/379/Page/1/MeetingNo/SA160/view/Conference/Default.aspx
Apr. 28-29, London, UK

5th BPS Focused Mtg. on Cell Signaling
http://www.bps.ac.uk/meetings/139a131cf49
Apr. 28-29, Leicester, UK

British Pharmacol. Soc. Statistics Workshop
http://www.bps.ac.uk/meetings/13cdd704c87
Apr. 30, Leicester, UK

61st Ann. Conf. of the Israel Heart Soc.
http://www.globaleventslist.elsevier.com/events/2014/04/the-61st-annual-conference-of-the-israel-heart-society-in-association-with-the-israel-society-of-cardiothoracic-surgery/
Apr. 30-May 1,Tel-Aviv, Israel

May 2014

Amer. Assn.of Immunologists Ann. Mtg.
http://immunology2014.org/
May 2-6, Pittsburgh, PA

Digestive Disease Week 2014
http://www.ddw.org/
May 3-6, Chicago, IL

Assn.for Res. in Vision & Ophthalmology Ann. Mtg.
http://www.arvo.org/Annual_Meeting/
May 4-8, Orlando, FL

20th Ann. APHMG Workshop & Special Interest Groups Mtg.
http://www.aphmg.org/2014/
May 7-9, Napa Valley, CA

5th Asia Pacific ISSX Mtg.
http://www.issx.org/?page=Upcoming
May 9-12, Tianjin, China

Intl. Behavioural & Neural Genetics Soc. Mtg.
http://www.ibangs.org/2014-genes-brain-and-behavior-meeting-chicago
May 10-13, Chicago, IL

7th Intl. Conf.: SUMO, Ubiquitin, UBL Proteins: Implications for Human Diseases
http://www.mdanderson.org/education-and-research/departments-programs-and-labs/departments-and-divisions/cardiology/sumo/index.html
May 10-13, Shanghai, China

Cancer Biomarker Discovery & Assay Develop.
https://www.regonline.co.uk/builder/site/Default.aspx?EventID=1256613
May 13, London, UK

21st Ann. Intl. "Stress & Behavior" Neurosci. & Biopsychiatry Conf.
http://stressandbehavior.com/Years/2014/Stpetersburg/stpetersburg2014.html
May 16-19, St. Petersburg, Russia

XXIX Cong. of the Intl. Soc. for Advance. of Cytometry
http://cytoconference.org/2014/Home.aspx
May 17-21, Ft. Lauderdale, FL

35th Ann. Scientific Mtg. of the Canadian Pain Soc.
http://www.canadianpainsociety.ca/en/meetings_cps.html
May 20-23, Quebec City, Canada

20th Intl. Symp. on Microsomes & Drug Oxidations
http://www.mdo2014.de/
May 18-22, Stuttgart, Germany

Assn.for Psychological Sci. 26th Ann. Conf.
http://www.psychologicalscience.org/index.php/convention#.Uvk6RfuaVvZ
May 22-25, San Francisco, CA

Intl. Symp. Neutrophil 2014
http://www.theneutrophil.com/Program.html
May 31-June 3, Montreal, Canada

June 2014

FASEB Sci. Res. Confs.: Phospholipid Cell Signaling & Metabolism in Inflammation & Cancer
https://secure.faseb.org/FASEB/meetings/summrconf/selecttopic.aspx
June 1-6, Niagara Falls, NY

FASEB Sci. Res. Confs.: Retinoids
https://secure.faseb.org/FASEB/meetings/summrconf/selecttopic.aspx
June 1-6, Chicago, IL

FASEB Sci. Res. Confs.: Trace Elements in Biology & Med.
https://secure.faseb.org/FASEB/meetings/summrconf/selecttopic.aspx
June 1-6, Steamboat Springs, CO

3rd Intl. Conf. on Hydrogen Sulfide in Biology & Med.
http://www.aeplan.co.jp/h2s2014/
June 4-6, Kyoto, Japan

Frontiers in Metallobiochemistry III
http://symposium.psu.edu/
June 4-7, University Park, PA

Intl. Behavioral Neuro Sci. Soc. Ann. Mtg.
http://www.ibnsconnect.org/?page=2014_Meeting
June 10-15, Las Vegas, NV

Amer. Diabetes Assn. 74th Sci. Sessions
http://professional.diabetes.org/Congress_Display.aspx?TYP=9&CID=93229
June 13-17, San Francisco, CA

DIA 2014 50th Ann. Mtg.
http://www.diahome.org/en-US/Flagship-Meetings/DIA2014.aspx
June 15-19, San Diego, CA

FASEB Sci. Res. Confs.: Immunoreceptors
https://secure.faseb.org/FASEB/meetings/summrconf/selecttopic.aspx
June 15-20, Steamboat Springs, CO

Intl. Soc. for Stem Cell Res. 12th Ann. Mtg.
http://www.isscr.org/home/2014annualmeeting
June 18-21, Vancouver, Canada

16th Intl. Cong. of Endocrinology/ ENDO 2014
http://www.endocrine.org/endo-2014
June 21-24, Chicago, IL

4th Intl. Regional (North America) Stress & Behavior Conf.
http://stressandbehavior.com/Years/2014/NOLA/nola2014.html
June 22-24, New Orleans, LA

2014 Worldwide Innovative Networking Symp.
http://www.winconsortium.org/symposium.jsp?id=400
June 22-24, Paris, France

FASEB Sci. Res. Confs.: Genome Engineering: Cutting-Edge Res. & Application
https://secure.faseb.org/FASEB/meetings/summrconf/selecttopic.aspx
June 22-27, Nassau, The Bahamas

The Physiological Soc.
http://www.physiology2014.org/
June 30-July 2, London, UK

July 2014

The Cong. of the Intl. Union of Microbiological Socs. 2014
http://www.montrealiums2014.org/
July 27-August 1, Montreal, Canada

9th Fed. of Europ. Neurosci. Socs. Forum of Neurosci.
http://fens2014.neurosciences.asso.fr/
July 5-9, Milan, Italy

FASEB Sci. Res. Confs.: Biological Methylation: Reg. of Chromatin, Epigenetics, & Disease
https://secure.faseb.org/FASEB/meetings/summrconf/selecttopic.aspx
July 6-11, Nassau, The Bahamas

FASEB Sci. Res. Confs.: Liver Biology: Fundamental Mechanisms & Translational Applications
https://secure.faseb.org/FASEB/meetings/summrconf/selecttopic.aspx
July 6-11, Keystone, CO

28th Intl. Cong. of Appl. Psychology
http://www.icap2014.com/
July 8-13, Paris, France

41st Ann. Mtg. & Expo. of the Controlled Release Soc.
http://www.controlledreleasesociety.org/meetings/annual/Pages/default.aspx
July 13-16, Chicago, IL

17th World Cong. of Basic & Clin. Pharmacology
http://www.wcp2014.org/
July 13-18, Capetown, South Africa

FASEB Sci. Res. Confs.: Translational Neuroimmunology: From Mechanisms to Therapeutics
https://secure.faseb.org/FASEB/meetings/summrconf/selecttopic.aspx
July 13-18, Big Sky, MT

Soc. for Develop. Biology 73rd Ann. Mtg.
http://www.sdbonline.org/sites/2014MTG/2014OnlineFlyer.pdf
July 16-17, Seattle, WA

14th Intl. Fragile X Conf.
http://www.fragilex.org/community/international-fragile-x-conference/
July 16-20, Orange County, CA

Intl. Soc. for Eye Res. XXI Biennial Mtg.
http://www.iserbiennialmeeting.org/#mtg
July 20-24, San Francisco, CA

FASEB Sci. Res. Confs.: Protein Kinases, Cellular Plasticity, & Signal Rewiring
https://secure.faseb.org/FASEB/meetings/summrconf/selecttopic.aspx
July 20-25, Snowmass, CO

FASEB Sci. Res. Confs.: Protein Phosphatases
https://secure.faseb.org/FASEB/meetings/summrconf/selecttopic.aspx
July 20-25, Nassau, The Bahamas

Intl. Pediatric Endosurgery Group 23rd Ann. Cong. for Endosurgery in Children
http://www.ipeg.org/meeting/
July 22-26, Edinburgh, UK

Intl. Acad. of Cardiology Ann. Sci. Sessions 2014/19th World Cong. of Heart Disease
http://www.cardiologyonline.com/wchd2014/index.html
July 25-28, Boston, MA

28th Symp. of the Protein Soc.
http://www.proteinsociety.org/symposium/
July 27-30, San Diego, CA

FASEB Sci. Res. Confs.: Lipids & Lipid Regulated Kinases in Cancer
https://secure.faseb.org/FASEB/meetings/summrconf/selecttopic.aspx
July 28-August 1, Steamboat Springs, CO

August 2014

Amer. Psychological Assn. Ann. Conv.
http://www.apa.org/convention/
Aug. 7-10, Washington, DC

Clin. Project Mngmnt.
http://www.diahome.org/en-US/Meetings-and-Training/Find-Meetings-and-Training/Meeting-Details.aspx?productID=2904811
Aug. 18-19 Boston, MA

EMBO Conf. Series: Chem. Biol. 2014
http://www.embl.de/training/events/2014/CHB14-01/
Aug. 20-23, Heidelberg, Germany

9th World Cong. on Alternatives & Animal Use in the Life Sci.s
http://www.wc9prague.org/
August 24-28, Prague, Czech Republic

September 2014

66th Clin. Endocrinology Update
http://www.endocrine.org/meetings/clinical-endocrinology-update-and-board-review/san-francisco#/nav/ceu
Sept. 4-6, 2014, San Francisco, CA

Eurotox: 50th Cong. of the Europ. Socs. of Toxicol.
http://www.eurotox2014.com/
Sept. 7-10, 2014, Edinburgh, UK

11th Intl. Symp. on Resistance Arteries
http://www.isra2014.org/
Sept. 7-11, 2014, Banff, Canada

4th Intl. Conf. on Pharmaceutical Regulatory Affairs
http://regulatoryaffairs2014.pharmaceuticalconferences.com/
Sept. 8-10, Raleigh, NC

5th Intl. Cong. on Cell Membranes & Oxidative Stress: Focus on Calcium Signaling & TRP Channels
http://www.cmos.org.tr/2014/
Sept. 9-12 2014, Isparta, Turkey

37th Ann. Mtg. of the Japan Neurosci. Soc.
http://www.neuroscience2014.jp/en/information/index.html
Sept. 11-13, Yokohama, Japan

Amer. College of Clin. Pharmacology Ann. Mtg.
http://www.accp1.org/2013_meetings_welcome.shtml
Sept. 14-16, Atlanta, GA

14th Intl. Cong. of Ethnopharmacology
http://14ise-slf.utalca.cl/
Sept. 23-26, Puerto Varas, Chile

7th Santorini Conf. Biologie Prospective
http://www.santorini2014.org/santorini_accueil.php
Sept. 25-27, Thira, Greece

FASEB Sci. Res. Confs.: AMPK: Biological Action & Therapeutic Perspectives
https://secure.faseb.org/FASEB/meetings/summrconf/selecttopic.aspx
Sept. 28-Oct. 3, Lucca, Italy