



THE Pharmacologist

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The Discovery and Development of Heparin



INSIDE

2019 ASPET Fellows

2020 Annual Meeting

Colloquium on G
Protein-Coupled
Receptors



Contents

- 133** Message from the President
- 135** 2019 ASPET Fellows
- 136** 2020 Annual Meeting
- 147** Feature Story: The Discovery and
Development of Heparin
- 158** Science Policy News
- 164** Education News
- 168** Meeting News
- 172** Journals news
- 177** Membership News
Obituaries: Joel Hardman
Ray Ruddon
- 185** Members in the News
- 189** Division News
- 192** Chapter News

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Message from The President

Dear ASPET Members,

It is a privilege for me to serve as the 88th president of the American Society for Pharmacology and Experimental Therapeutics. I am humbled by your support and will appreciate your help over the coming year. First, I would like to express my thanks to our members who have rotated off Council, John Schuetz, John Tesmer, Carol Beck, and Brian Cox, for their efforts in support of the Society. I also want to give a special thanks to Eddie Morgan for his guidance over the past year as the ASPET president who, among his other accomplishments, initiated the joint ASPET-APS Presidential Symposium Series at EB 2019.

During the past year, there have been several ongoing initiatives that we anticipate will continue to be important issues for the Society.

Plan S – The first issue is Plan S, which is the proposal put forth by several European funding agencies to require manuscripts from their scientists to be published as open access articles. The relevance of the issue to ASPET is the potential impact on our journal revenue, which is the major component of our annual operating revenue. All accepted manuscripts in ASPET's primary research journals are freely available through *Fast Forward*, and this appears to allow Plan S-funded researchers to publish with ASPET. We are continuing to monitor the situation closely. Implementation of Plan S has been delayed until January 1, 2021. Hopefully, this will give us additional time to make necessary adjustments that may result from their recommendations.

Governance Review – At the most recent Council meeting, there was a review of the governance policies that are currently in place. This review has provided Council with recommendations on how to function more efficiently and better engage our membership in Society operations.

Philanthropy Proposal – There has been increasing interest in providing a more consistent base of philanthropic donations to the Society, especially if we encounter diminishing journal revenues as a result of Plan S and the move to open access publication in general. If you would like to support ASPET, consider our many giving opportunities at www.aspet.org/donate.

ASPET Fellows Program – An initiative that was begun by my predecessors on Council was to recognize long-standing ASPET members who have provided leadership to the discipline of pharmacology and to the Society. The inaugural list can be found in this issue of *The Pharmacologist*, and includes many of our distinguished colleagues. The selection of new ASPET fellows will continue on an annual basis through a Fellows Committee.

EB 2020 Meeting Preview – Continuing on the success of EB 2019, we are excited about the developing program for EB 2020, which will run from April 4-7 in San Diego, California. We plan to continue some of the popular innovations, including the Datablitz presentations by poster presenters, and the unopposed poster sessions. We received very positive feedback on the shorter 90-minute symposia and will continue with this option. We also plan to continue the Joint ASPET-APS Presidential Symposium Series. The title for the series will be "Inflammation and Oxidative Stress," with different subtopics being covered each morning.

Future EB Meetings – EB 2021 is already scheduled for May 1-4, 2021 in Indianapolis, Indiana. The EB societies (ASPET, APS, ASBMB, AAA, and ASIP) are currently working hard to put plans in place for EB 2022. Stay tuned for more information on the date and location.

Board of Publications Trustees – We are pleased to announce that Dr. Emily Scott has agreed to serve as the next chair of the Board of Publications Trustees starting on January 1. Dr. Scott brings a wealth of expertise to the position, having served on several editorial boards and on the BPT. More information about her is available on page 172. Dr. Mary Vore will continue to serve as the BPT Chair until the end of her term on December 31.

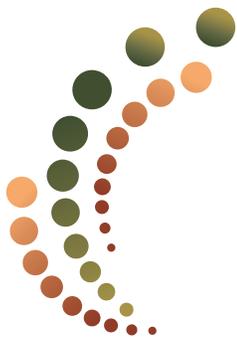
Finally, I would like to thank the ASPET staff for their continued support. Their efforts are truly appreciated.

We are looking forward to another exciting year for ASPET. Please feel free to contact me or any of the Council or ASPET staff with your suggestions, thoughts, and concerns.

Sincerely,



Wayne L. Backes, Ph.D.
ASPET President



Inaugural Class of ASPET Fellows

ASPET recently announced a new Fellows Program to honor our most distinguished members. Selection as a fellow of the American Society for Pharmacology and Experimental Therapeutics (FASPET) is an honor bestowed on ASPET members who have demonstrated excellence via their overall contributions to pharmacology and the Society. Learn more about the FASPET program at www.aspet.org/faspet.

The ASPET Council is pleased to announce the 2019 inaugural class of fellows:



Susan G. Amara, PhD



James E. Barrett, PhD



David B. Bylund, PhD



Christine K. Carrico, PhD



William A. Catterall, PhD



Sue P. Duckles, PhD



S. J. Enna, PhD



Annette E. Fleckenstein, PhD



Michael M. Gottesman, MD



Frederick P. Guengerich, PhD



James R. Halpert, PhD



Paul F. Hollenberg, PhD



Paul A. Insel, MD



Brian Kobilka, MD



John S. Lazo, PhD



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Ken E. Moore, PhD



Richard R. Neubig, MD, PhD



Charles O. Rutledge, PhD



Elaine Sanders-Bush, PhD



Palmer W. Taylor, PhD



Lynn Wecker, PhD

To read more about the ASPET fellows and their accomplishments, please visit:

<http://www.aspet.org/faspet-2019>

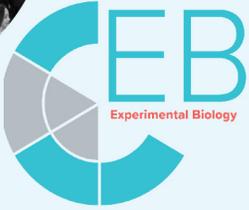


2020 Annual Meeting

April 4 – 7 • San Diego, California

ASPET 2020 Annual Meeting

at Experimental Biology

Preliminary Program

Plan to attend the ASPET Annual Meeting at Experimental Biology, **April 4-7, 2020** in San Diego, California! Join 1600 scientists passionate about pharmacology as ASPET intersects with 10,000 other life scientists in physiology, biochemistry, molecular biology, pathology, and anatomy.

Keynotes

In early January, we'll announce lectures by the preeminent winners of the John J. Abel Award in Pharmacology, the Goodman & Gilman Award in Receptor Pharmacology, and the Otto Kraymer Award in Pharmacology.



Alexandra C. Newton, PhD



Yoshikatsu Kanai, MD, PhD



Brian Kobilka, MD

The 2020 **Julius Axelrod Award in Pharmacology Lecture** will be presented by Dr. Alexandra Newton from the University of California, San Diego, titled *Protein Kinase C Out of Tune: Deregulated Signaling in Disease*. Dr. Newton is the 2019 recipient of the Axelrod Award.

In partnership with the Japanese Pharmacological Society, the 2020 **ASPET-JPS Lecture** will be presented at the ASPET annual meeting by Dr. Yoshikatsu Kanai from Osaka University. His lecture is titled *Nutrient Transporters in Molecular Target Drug Discovery*.

The recipient of the 2012 Nobel Prize in Chemistry, Dr. Brian Kobilka from Stanford University, will present the keynote lecture at ASPET's pre-conference **Colloquium on G Protein-Coupled Receptors: Evolving Insights from Pharmacology to Physiology**. Separate registration fees apply, see page 168.

ASPET Division Keynotes and Award Lectures:

- Bernard B. Brodie Award in Drug Metabolism Lecture
- P.B. Dews Lifetime Achievement Award for Research in Behavioral Pharmacology Lecture
- Paul M. Vanhoutte Distinguished Lectureship in Vascular Pharmacology Lecture
- Scientific Achievement Award in Drug Discovery and Development Award Lecture
- Keynote Address in Molecular Pharmacology

Symposium Highlights

For the full ASPET program with session descriptions, speaker names, and talk titles, visit www.aspet.org/eb2020-program-sept-tpharm

ASPET-APS Presidential Symposium Series

Saturday, April 4 – Tuesday, April 7

ASPET's president, Wayne Backes, has collaborated with APS's president, Meredith Hay, to bring us a workshop and three symposia on inflammation and oxidative stress. The Saturday workshop is titled: *CRISPR-Cas and miRNAs in the Study of Drug Metabolism, Cancer and Other Diseases*. The symposia on Sunday, Monday, and Tuesday will cover CV and renal inflammation in health and disease, inflammation and drug disposition, and central nervous system inflammation (pain and cognition).

**Axelrod Symposium:
Protein Kinases in Tune**

Sunday, April 5

Accompanying Alexandra Newton's Axelrod Award Lecture, titled *Protein Kinase C Out of Tune: Deregulated Signaling in Disease*, will be this symposium celebrating the exquisite regulation of protein kinases, one of the largest gene families in humans. The >500 members in this family are instruments nature uses to relay information throughout the cell. Every instrument not only has a precise and finely controlled role in the symphony that controls cell function but is itself finely tuned for perfect pitch. When these instruments are not in tune, the ensuing cacophony is causal in disease. The symposium will cover protein kinases from structure to biology.

46 Years of GPCR Pharmacology and Mentoring in the Field of Pain Research; A Tribute to G. W. Pasternak

Monday, April 6

Gavril Pasternak's 45+ years in science produced 400 papers, 14 patents, and numerous well mentored students, postdoctoral fellows, residents, and visiting professors. ASPET honored Dr. Pasternak with the Julius Axelrod Award in 2012 for his contributions

to the discipline of pharmacology and his mentorship of pharmacologists. To honor Gavril Pasternak, this symposium highlights advances in opioid and non-opioid receptor-mediated signaling, development of novel pain and cancer therapies, and the significance of Gavril's body of work. The symposium concludes with a panel discussion by former students, postdocs, and fellows on careers in pharma and biotech, marketing, academia, the FDA, and the NIH.

**ADME in Neonates and Infants:
Therapeutics, Toxicity, and Development of New Drugs**

Tuesday, April 7

Patients at ages of neonate and infant are at developmental ages facing special challenges on drug therapy and toxicity. Most prescription drugs are used as off label for neonates and infants. They have the highest medical errors and adverse drug action rates. There is a specific requirement for the inclusion of neonates and infants as a study population for the therapeutic efficacy, toxicity, and development of new drugs. Several knowledge gaps exist, making it too difficult to study neonates and infants. The aim of the symposium is to bring several experts in the field to discuss studies of ADME at these specific ages.

Behavioral Pharmacology of Biased Agonists

Sunday, April 5

The development of “biased ligands” preferentially activating specific signaling pathways by stabilizing subsets of receptor conformations that invoke distinct G protein-dependent or -independent signaling are underway. Development of novel analgesics acting via CB1, μ -, δ -, and κ -opioid receptors is focused on identification of G protein-selective compounds that are devoid of β -arrestin 2 recruitment because evidence suggests that this may reduce adverse effects. Results of these efforts appear promising in vitro, but in vivo confirmation of biased agonism is relatively rare. This symposium will survey biased agonism across pharmacological classes, focusing on behavioral effects that may differentiate them from traditional unbiased agonists.

Development of Cannabinoids for Clinical Use— CNS Hazards and Therapeutic Effects

Tuesday, April 7



The development of potential therapeutic products such as cannabinoids is a complex process that requires the integration of various types of data to understand the potential therapeutic and toxic effects of products in humans. This symposium will review the regulatory expectations of the FDA for the quality of

cannabinoid-containing products that are either botanicals or highly purified drug products, discuss the antinociceptive and adverse effects of cannabinoids in animals and leverage these results to inform the design of clinical protocols, as well as review the analgesic and adverse effects of cannabinoids in humans.

G Protein Signaling in Regulation of Metabolism and Diabetes

Saturday, April 4

G protein-coupled receptors (GPCRs) activate signaling pathways in the pancreas, skeletal muscle, the CNS, and other tissues to regulate metabolism. This signaling is important in normal physiology, but its dysregulation can lead to diseases such as diabetes and obesity, which are the major contributing factors to cardiovascular disease. Talks in this session will address recently emerged unique and understudied aspects of G protein signaling in metabolism. The session will provide a unifying theme by which targeting novel aspects of GPCR signaling has the potential to be therapeutically relevant in diabetes and obesity.

Targeting Autophagy in Cancer

Tuesday, April 7

Although autophagy, the process by which cellular material is delivered to lysosomes for degradation and recycling, is known to be important in many diseases, the majority of active clinical trials where autophagy is being targeted are in cancer. All these trials are attempting to inhibit autophagy usually in combination with other drugs. This symposium will discuss the science and mechanistic rationale behind these treatments and provide an update on current efforts to improve the selectivity and potency of autophagy inhibitors in cancer therapy.

Updating the Opioid Crisis: Novel Approaches to Reducing Opioid Abuse and Overdose

Sunday, April 5

The United States is in the midst of an opioid epidemic, with current estimates placing the number of opioid-related deaths at more than 70,000 per year. This symposium will provide an update on the current state of the epidemic, with an eye toward challenges that we will face in the coming years. This symposium will also describe novel pharmacokinetic and pharmacodynamic approaches to combat opioid addiction and overdose, such as opioid-specific vaccines and pseudo-irreversible opioid receptor antagonists. Finally, this symposium will discuss innovative approaches to reduce opioid addiction through the development of non-opioid (or opioid-sparing) strategies to relieve pain.

Join the Conversation with these Exciting Sessions

“Guppy Tank” Translational Science Pitch Showcase

Monday, April 6

This first of its kind event at EB 2020 will feature four outstanding finalists pitching the commercial value of their innovative research. Each finalist will receive:

- Paid registration to EB and up to \$500 travel reimbursement
- One-on-one coaching from a seasoned biotech expert to prepare for the pitch
- Networking opportunity with industry leaders
- Unique visibility and platform to improve their scientific communication
- Opportunity to win competition awards and incentives

If you are a graduate student or postdoctoral trainee wanting to compete in front of a live audience at EB 2020, apply at <https://www.aspet.org/guppytank2019> by November 14th, 11:59pm PST.

#DiversiSci

Tuesday, April 7

This interactive session will provide evidence about the importance of diversity, equity, and inclusion in science. The audience will be presented with case studies that help them identify language and behaviors that have an adverse impact on research productivity and student learning. In addition, this session will also provide strategies for responding appropriately to bias and microaggressions when they occur.

NIH Funding and Other Translational Research Opportunities

Sunday, April 5

Panel members from scientifically diverse offices within the National Institutes of Health (NIH) will provide information on funding opportunities, resources, and institute interests. The panel will discuss how to get NIH funding for EB-related research and other opportunities as well as tips for success. Discussion will focus on both long-standing NIH interests as well as new initiatives in translation. During the session, a significant amount of time will be allotted for questions from the audience, and panel members will be available afterward for further discussions.

Teaching Blitz: Faculty Creativity in Developing Interactive Pharmacology Sessions

Monday, April 6

For faculty who teach pharmacology today, there are unique challenges to engaging the post-millennial student generation in the classroom. In this teaching blitz session, six educators will share their very own unique techniques developed to actively engage Generation Z students. The short 8-10 minute interactive presentations followed by 5 minutes of questions and answers will inspire you to pursue your very own ideas for student engagement. As presenters share a sample of their teaching methods, you will find there is no limit to creativity that can lead to successful instruction.

With more than 90 hours of pharmacology programming, you're sure to find sessions of interest in your area of study as well as easily discover something new. Explore more session descriptions and speakers for these symposia online at www.aspet.org/eb2020-program-sept-tpharm:

- Brain Microglia & Astrocytes in Health and Disease
- Cardiometabolic Diseases: At the Crossroads of Adipose Tissue and Cardiac Health
- Challenges of Academic Drug Discovery in Cancer
- Cross Talk in Metabolism of Xenobiotics and Endogenous Substrates
- Drug Discovery from Bench to Artificial Intelligence: Treating the Rare and Ignored
- Emerging Approaches to Drug Metabolism
- Experimental Approaches for the Treatment of Infectious Disease
- G Protein Signaling in Neuropsychiatric Disorders

- Student–Postdoc Colloquium
- Heavy Traffic: Targeting Diseases through Chemokine Receptor Antagonism
- Immune Mechanisms in Pathogenic Responses to Particles, Nanomaterials, and Nanomedicines
- Journals Workshop
- Methodologies for Integrating Basic and Clinical Sciences in Pharmacology Education
- New Tools in ADME Prediction: Quantitative Omics, Liquid Biopsies, and Modeling
- Novel and Integrated Intestine–Liver Crosstalk on Hepatic Xenobiotic Metabolism
- Precision Medicine Strategies for Treating Cardiovascular Disease
- Recent Progress in Drugging the “Undruggable” RAS Oncogene
- Teaching Institute: Preparing the Next Generation of Scientists to Be Best Practice Educators
- The NLRP3 Inflammasome as a Pharmacological Target in Cardiovascular Disease
- The Use of Chemogenetic Tools to Analyze Behavior in Non-human Primates
- Utilizing Educational Tools to Enhance Student Learning in the Health Sciences
- Yin-Yang of the Prostaglandin-E2 Receptors: Novel Therapeutic Approaches

Explore the full ASPET program at www.aspet.org/eb2020-program-sept-tpharm

Explore the full EB program at www.experimentalbiology.org

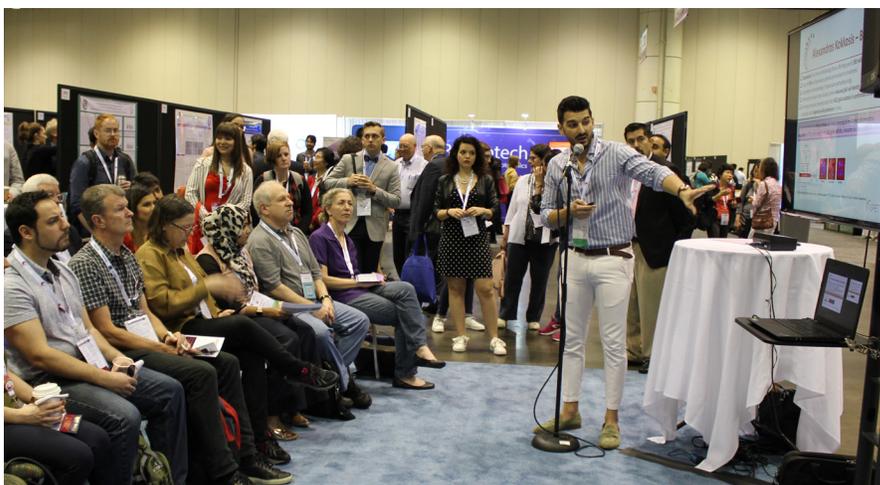
Explore the ASPET program by specialty area at: www.aspet.org/eb2020-topics-sept-tpharm

A Call for Pharmacology Abstracts

Present Your Research at EB 2020

We encourage the submission of abstracts to ASPET topic categories in all areas of pharmacology detailing your latest work. By submitting your abstract, you will:

- Receive feedback on your work
- Be recognized for your recent scientific advances
- Be visible to spur those conversations about collaboration
- Have opportunities to win travel and poster awards (students and postdocs)



ASPET helps bring other scientists to you to discuss your work. Top scoring abstracts are designated as Program Committee Blue Ribbon Picks, are featured at the EB-wide welcome reception, and are selected to give oral presentations at the ASPET daily Datablitz and in division platform showcases.

Submit an abstract of your work by November 14, 2019 www.aspet.org/eb2020-abstract-sept-tpharm

ASPET Abstract Topic Categories

ASPET is specifically seeking abstracts in the following research areas:

- Cancer Pharmacology
- Cardiovascular Pharmacology
- Cellular and Molecular Pharmacology
- Central Nervous System Pharmacology
- Drug Discovery and Development
- Drug Metabolism and Disposition
- Pharmacogenomics and Translational Pharmacology
- Pharmacology Education
- Toxicology
- Pharmacology – Other

Don't find your specialty listed? Search all pharmacology-related topics www.aspet.org/eb2020-abstract-sept-pharm or EB topic categories <https://experimentalbiology.org/2020/Abstracts/Topic-Categories.aspx>.

Networking at EB

In addition to interacting during the Q&A at symposia and during poster sessions, these are other ways ASPET helps you connect:

- The ASPET member lounge for free wifi and coffee, and to network
- Evening mixers for scientists at all career levels within your specialty (i.e. division)
- ASPET meet-up spot within the EB welcome reception
- Trainee events hosted by divisions
- Division annual meetings where you can meet division executive leadership and learn how you can get more involved
- Dance party exclusively for students, postdocs, and other young scientists
- Interact at the popular student–postdoc poster competition. Additional opportunities available to apply to present a poster www.aspet.org/poster-awards-sept-pharm or to volunteer to be a judge.
- Wear your ASPET pride—visit the ASPET booth to purchase logo apparel



Opportunities for Young Scientists

Undergraduates, post-baccalaureate students, graduate students, and postdoctoral scientists are encouraged to submit their abstract and attend EB. In addition to hearing the latest science, presenting their work, and networking, the following opportunities are also available:

ASPET Poster Competition

Application Deadline:

Thursday, November 14, 2019, 11:59 pm PST

Poster awards are offered for outstanding poster presentations by ASPET student and postdoc members at a special evening poster competition on Sunday, April 5.

New Streamlined Application Process! Submit your abstract to EB in an ASPET topic category by November 14. When prompted within the EB submission site, answer “yes” that you want to be considered for the ASPET Poster Competition.

We know many of you like to leave abstract submission to the last possible day. That’s fine, but we strongly encourage you to prepare the following in advance:

- Have your membership ID# handy (it can be found under your member profile at www.aspet.org)
- Be sure your ASPET membership is up to date (or join now)
- Plan to be the first/presenting author
- Determine which ASPET topic category you will use www.aspet.org/eb2020-abstract-sept-tpharm
- Check to be sure that you are eligible here: www.aspet.org/posterawards-sept-tpharm

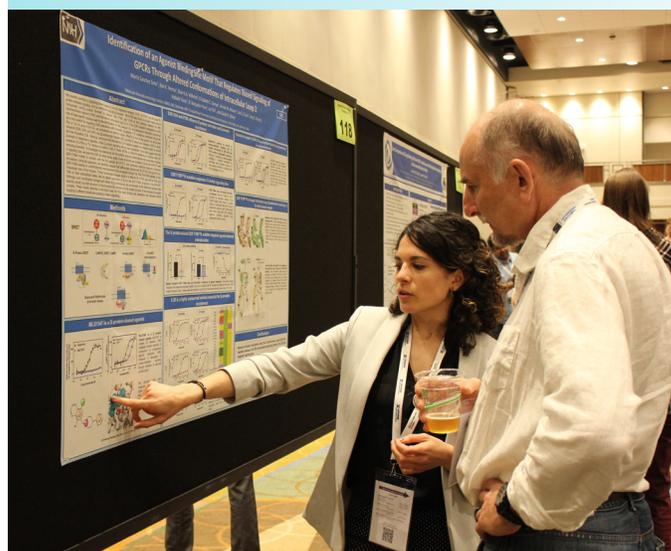
Selected finalists will be announced in January. Presentations will take place at the ASPET Student–Postdoc Poster Competition on Sunday, April 5, 2020 in San Diego where winners will be selected.

For more information, please visit: www.aspet.org/posterawards-sept-tpharm

Submit your abstract and apply for poster awards here: www.experimentalbiology.org

“The best part of the meeting was the ability to showcase my research to a wide audience and receive critical and encouraging feedback.”

—Anonymous survey respondent



Competitors at the 2019 Student–Postdoc Poster Competition

Stay Up-To-Date on Annual Meeting News

Visit the ASPET website at www.aspet.org/eb2020-sept-tpharm to access full information on the meeting program, abstracts, speakers, special events, and sponsorship opportunities. Be sure to bookmark the website and visit often as content is updated frequently.

ASPET Travel Awards

Application Deadline:
Monday, November 18, 2019, 8:00 pm ET

Young scientists are invited to apply for a travel award to help defray the costs of registration, travel, and housing to attend the ASPET Annual Meeting at EB 2020.

Step 1: Submit your abstract to EB in an ASPET topic category by November 14 at www.experimentalbiology.org

Step 2: Complete your ASPET travel award application by November 18 at www.aspet.org/travelawards-sept-tpharm

In addition to the general travel awards, ASPET also offers specialty awards for members of groups underrepresented in the biomedical sciences and for members residing in developing countries.

For more information and to apply for a travel award, please visit: www.aspet.org/travelawards-sept-tpharm.



2019 Graduate Student and Post-baccalaureate Travel Award Winners

Oral Presentations

Abstract Submission Deadline: Thursday, November 14, 2019, 11:59 pm PST

You may be selected for one of a variety of speaking opportunities at this international meeting. Students and postdocs need to submit their abstract to EB in an ASPET topic category by the November 14 deadline. No other application is necessary.

Opportunities include:

- 3-minute Datablitz talks
- Division showcases and platform talks (some include prizes!)
- Talks within the symposia listed above

ASPET Mentoring Network

The ASPET Mentoring Network is a professional development experience that uses career coaching to help participants develop the skills needed to succeed scientifically, professionally, and socially, including discussions about experiences and pressures faced by groups that are underrepresented in the sciences.

This program kicks off at the ASPET Annual Meeting at EB but continues year-round. See page 164 for details.



2019 Mentoring Network Participants at EB 2019

ASPET Washington Fellows

The Washington Fellows Program enables developing and early career scientists interested in science policy to learn about and become more engaged in public policy issues.

Fellows receive paid registration to the ASPET Annual Meeting at EB, but the program runs year-round. See page 161 for details.



2019 Washington Fellows at EB 2019

Career Resources

While in San Diego, take advantage of these opportunities to develop your career in science:

- Individual resume/CV critiques and mock interviews
- Micro-learning hubs with short 10-minute bits of wisdom and quick take-aways
- Open job postings
- NIH funding conversations
- Reps from university doctoral programs
- Poster and oral presentation practice sessions with peer mentoring
- Longer form workshops and symposia on career development topics



Featured career development workshops/symposia:

- Student–Postdoctoral Colloquium
- Journals Workshop: An Interactive Guide to Publishing, Reviewing, and Ethics Issues
- Undergraduate Networking and Career Development Luncheon
- Diversity and Inclusion Breakfast
- Teaching Blitz
- “Guppy Tank” Translational Science Pitch Showcase

Experimental Biology 2023 Update

Consistent with our society's strategic plan, the ASPET Annual Meeting held during Experimental Biology (EB) provides our members with a professional home to advance pharmacology research, exchange knowledge, and increase the impact and influence of our discipline.

Looking ahead to future EB meetings, we wanted to make you aware of a recent decision by one of our partners, the American Physiological Society (APS). The APS recently announced to their membership that they will cease meeting as part of EB starting in 2023. While we will miss the collaborations and camaraderie that we have shared with APS at our joint meetings, this opens up new opportunities for meeting locations, formats, and partnerships that are more closely tailored to our members' needs as were identified in our member survey earlier this summer.

ASPET's goal is and will continue to be to serve our members by holding an annual meeting that is the place to discover and present the highest quality, innovative science in pharmacology and experimental therapeutics.

Please do not hesitate to reach out to membership@aspet.org if you have any questions or concerns.

Don't miss these dates

FRIDAY, OCTOBER 18, 2019

Washington Fellows Program application deadline

THURSDAY, NOVEMBER 14, 2019

EB abstract submission deadline and ASPET Poster Competition deadline

MONDAY, NOVEMBER 18, 2019

Travel award application deadline

MONDAY, NOVEMBER 25, 2019

Mentoring Network application deadline

WEDNESDAY, FEBRUARY 5, 2020

Registration discount deadline

✓ Remember to check ASPET on your form!

Service to the Local Community

ASPET gives back! Arrive a day early in San Diego and give back to the local community.

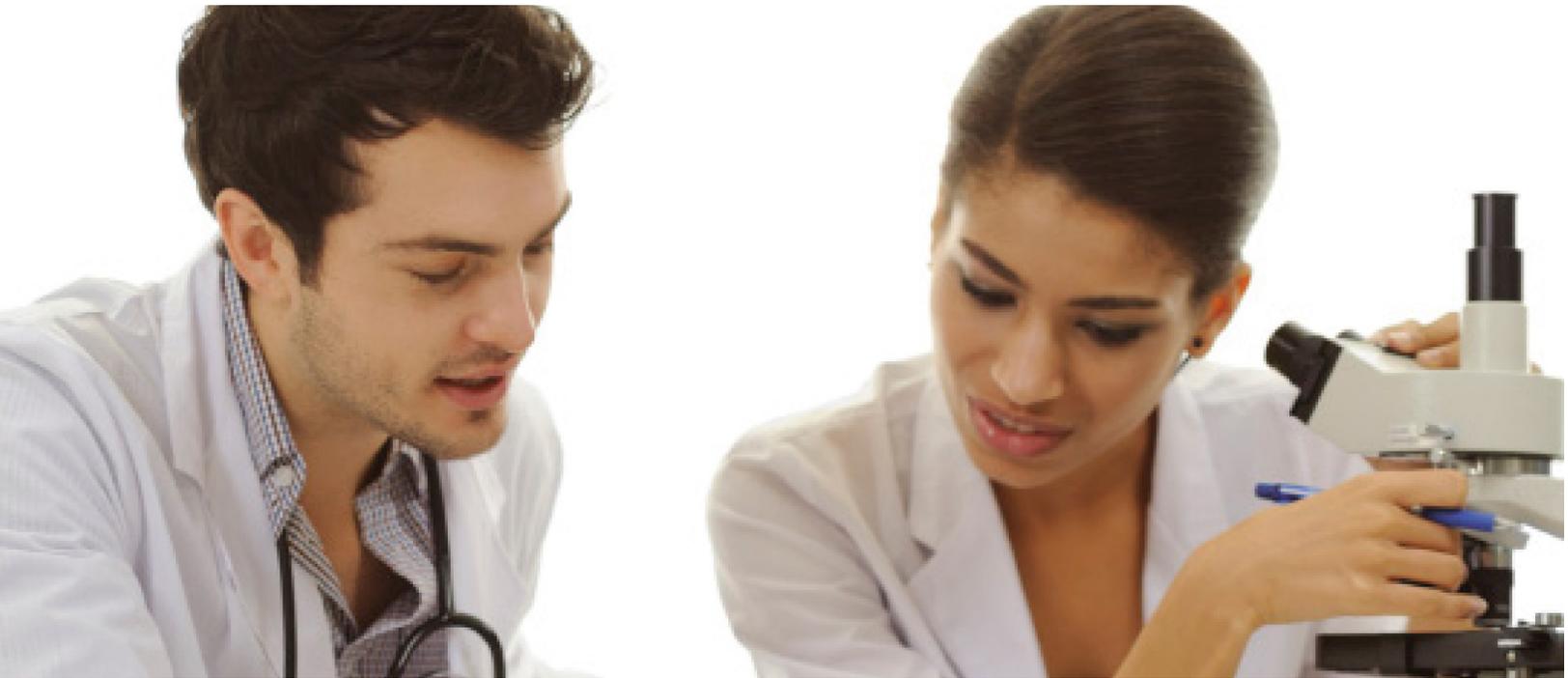
Since 2009, ASPET attendees have given a day of volunteer service in the local communities where we convene. Volunteer activities have included home construction, building maintenance, painting, cleaning, stocking shelves, and food service.

At EB 2020 on Friday, April 3 we will return for a 5th time to Father Joe's Villages, whose mission is to prevent and end homelessness. We will be serving in whatever ways needed to help the dedicated people at Father Joe's provide assistance to San Diegans. Special thanks to the Division for Behavioral Pharmacology for coordinating this volunteer activity.

If you want to volunteer, please contact Charles France at france@uthscsa.edu or (210) 567-6969 at your earliest convenience. Space is limited and further details will be provided to those who volunteer.



VISIT THE **ASPET CAREER CENTER** TODAY!
WWW.ASPET.ORG/CAREERCENTER/



WHAT YOU NEED: **ASPET'S CAREER CENTER** HAS IT

Jobseekers:

- No registration fee
- Advanced search options
- Sign up for automatic email notifications of new jobs that match your criteria
- Free & confidential résumé posting
- Access to jobs posted on the National Healthcare Career Network (NHCN)
- Career management resources including career tips, coaching, résumé writing, online profile development, and much more

Employers:

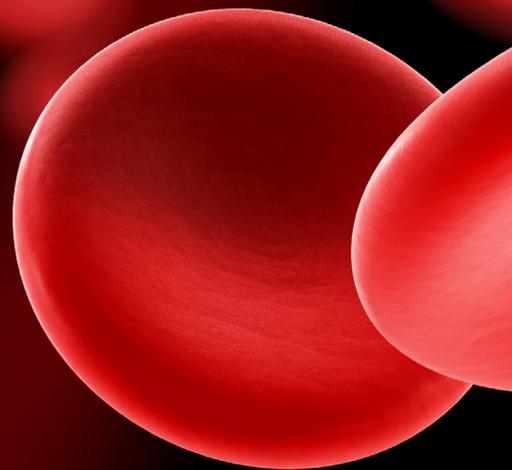
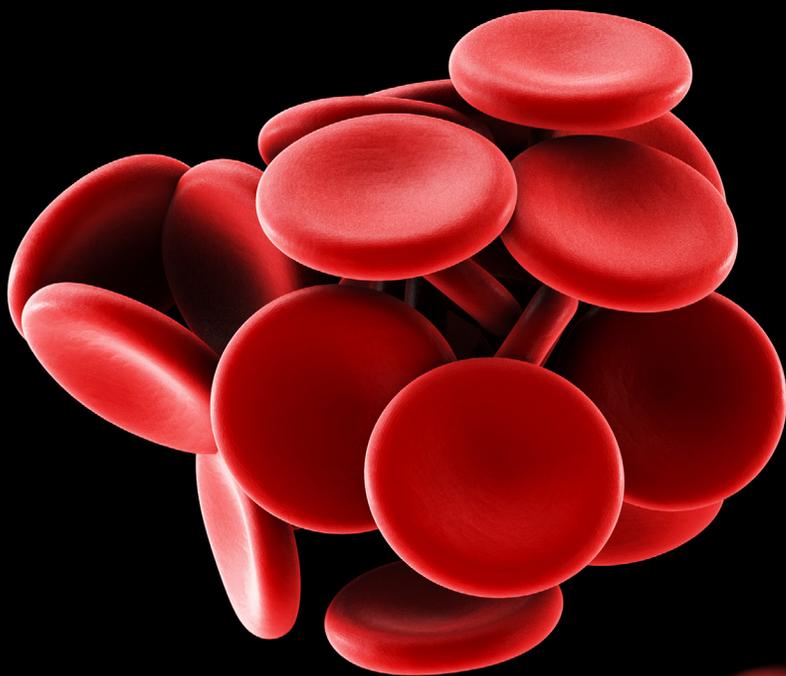
- Searchable résumé database
- Hassle-free posting; online account management tools
- Reach ASPET's Twitter followers (almost 2,000), LinkedIn Members (over 2,000), and email subscribers (over 4,000)
- Post to just ASPET or to the entire NHCN network
- Sign up for automatic email notifications of new résumés that match your criteria
- Job activity tracking

ASPET is committed to your success:

The ASPET Career Center is the best resource for matching job seekers and employers in pharmacology and related health science fields. Our vast range of resources and tools will help you look for jobs, find great employees, and proactively manage your career goals.



1801 Rockville Pike, Suite 210, Rockville, MD 20852-1633
Main Office: 301.634.7060
www.aspet.org



The Discovery and Development of Heparin

Rebecca J. Anderson, PhD

In December 1948, Jay McLean shipped his laboratory notebooks and accumulated reprints to Charles Best in Toronto. The research of medical students is rarely worth archiving, and McLean had difficulty finding a permanent home for his papers (1,2). But, given his own research, which overlapped and greatly extended upon McLean's findings, Best agreed to preserve the documents. Or, maybe, the ever-gracious Best just wanted to get McLean off his back.

Jay McLean grew up in San Francisco and was 15 years old when the great 1906 earthquake destroyed his family's home and his stepfather's place of business (3). He attended UC Berkeley and, after his sophomore year, could have entered medical school at UC San Francisco, as his father and uncle had done. Instead, Jay wanted to go to Johns Hopkins, because at that time, Hopkins was the best medical school in the country for training clinical researchers (3).



Jay McLean

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McLean faced a dilemma. His stepfather was willing to support his medical education in California. But entrance to Hopkins required one more year of undergraduate coursework, and McLean's stepfather was unwilling to finance his third year at Berkeley, as well as the transcontinental expenses to and at Hopkins (3).

So, to pay for his continued education, McLean spent 15 months working in the Mojave Desert gold mines. While completing his final year at Berkeley, in which he took the first-year medical student curriculum, McLean held various part-time jobs. At the college infirmary, he learned to perform urinalyses

and blood counts. But he was most fascinated by his physiology coursework and decided “I wanted to do some research there” (3).

When he received his bachelor of science degree in May 1914, McLean applied to Johns Hopkins, but his funds were depleted. He worked for 15 months drilling oil wells because “manual labor paid so much more than white collar jobs and living costs were lower” (3). The earnings were sufficient for a transcontinental train ticket and one year of medical school.

In the fall of 1915, despite receiving notification that he had not been accepted at Hopkins, McLean traveled to Baltimore anyway. He reasoned that he could work there as well as he could in California. In the meantime, Hopkins had added organic chemistry laboratory as a medical school admissions requirement. He could take that course at Hopkins’ undergraduate campus—but not while working in the oil fields (3).

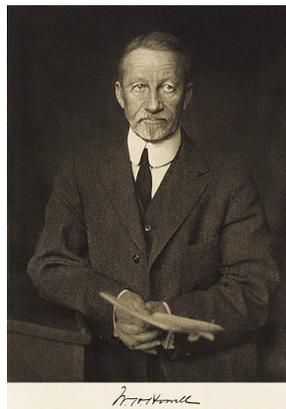
Upon arrival, McLean immediately went to the medical school campus at Hopkins and introduced himself to the dean and registrar. Both of them confirmed that he had not been admitted. But the next day, the dean unexpectedly sent for him and offered a seat, due to a last-minute dropout in the second-year class (3).

McLean then went to see William Henry Howell, the head of the Johns Hopkins Physiology Department. He wanted to train under Howell, who was considered one of the best physiologists in the country. Because his funds would last only through the academic year, McLean asked for a project that he could complete by himself in that time, and his aim was publishable results.

The Calm Crusader

A native of Baltimore, William Howell had earned his bachelor’s and PhD degrees from Johns Hopkins. His doctoral thesis in 1884 was entitled, “The Origin of Fibrin Formed in the Coagulation of Blood” (2). After brief faculty positions at the University of Michigan and Harvard, he was invited back—at age 33—to chair the physiology department in the newly established Johns Hopkins Medical School (2, 4).

Although small in stature, Howell was a giant among physiologists (2). He had written America’s most widely used medical school textbook on physiology, which went through 14 editions in his lifetime. From 1899 to 1911, he served as the medical school dean, in



In the public domain

William Henry Howell

parallel with his teaching responsibilities and his ongoing research program.

Howell had an unhurried style and spoke with a calm, clear command of English (4). His lectures, which were usually accompanied by experimental demonstrations, were often judged the most popular by Hopkins medical students.

Likewise, he delivered numerous invited professional addresses without notes, enunciating sound ideas, logically, clearly, and in simple terms (4).

The same calm, factual style characterized his approach to research. He eschewed grandstanding researchers who competed with each other to produce results just to attract attention (4). Howell’s only motive was to add something new to the state of physiological knowledge, and he was in no rush to do it. Humble and self-effacing, he had no expectation of making any great discoveries, but his contributions were noteworthy and widely acknowledged.

His early research interests were broad, encompassing physiologic studies of nerve conduction, blood flow to the brain, electrolyte balance, and pituitary function. After 1909, Howell conducted research almost exclusively on the topic of his doctoral studies: hemostasis and blood pathology (4, 5).

In 1910, he isolated thrombin (1). In 1912, he established the potent blood clotting activity of cephalin, a substance he extracted from dog brain tissue (4). At the time, cephalin was classified as a phosphatide (now called phospholipid).

An Unexpected Result

When McLean arrived in September 1915, Howell was using cephalin as a tool in his blood clotting experiments. Unfortunately, the cephalin extract was a relatively crude mixture, and it completely degraded in about 3 months, despite air-tight storage (3).

McLean’s assignment was to prepare cephalin in a pure crystalline form, separated from the other substances in the extract. Then, he was to establish definitively whether purified cephalin or one of the extract’s other fractions was responsible for the clotting action (3).

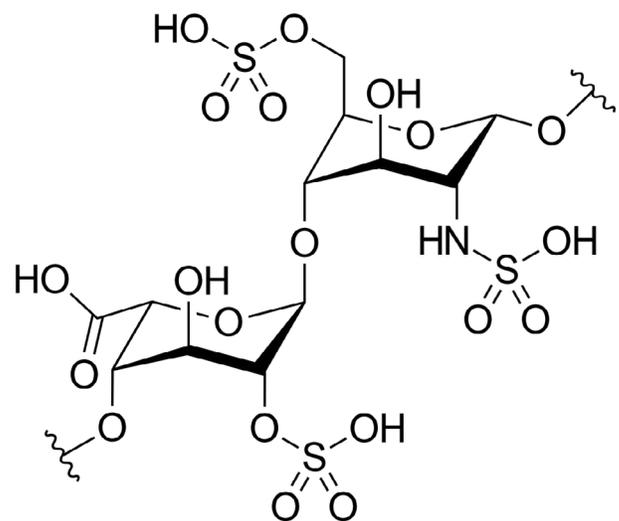
Along with his research project, McLean took an organic chemistry lab course (to satisfy his missing admissions requirement). He also took an advanced course in German so that he could read more about lipids in German chemistry journals (3).

Howell directed a large research group, but that year he spent most of his time in a darkroom peering through a microscope to watch the formation of fibrin precipitates. McLean worked largely unsupervised across the hall. His workspace was “a sink and attached table-drainboard with a shelf over the sink” in an unused physiology student laboratory (3).

Through conscientious effort, including many nights and weekends, McLean completed the first part of his research in December 1915. Unfortunately, he was unable to crystallize cephalin.

While reading the German literature, McLean found articles by Erlandsen and Baskoff, who described procedures for extracting phosphatides from the heart and liver, respectively. McLean thought it might be easier to crystallize cephalin from extracts of those organs, because they have less lipid than the brain. Howell was not familiar with Erlandsen or Baskoff’s work, but he allowed McLean to try (3). McLean successfully extracted cephalin from both heart and liver, and it had the same clotting property as the original brain extract (2, 6).

Following Erlandsen’s procedure, McLean was also able to isolate from heart tissue the phosphatide that Erlandsen called cuorin (7). And following Baskoff’s procedure, he isolated the substance Baskoff



Skeletal formula of heparin

called heparphosphatide from the liver (8). These phosphatides had solubilities only slightly different from that of cephalin, but their clotting activity had never been tested (2).

McLean noted similarities between cuorin and heparphosphatide and suspected that they were the same substance. Furthermore, and to his surprise, they were both powerful anticoagulants (2, 6).

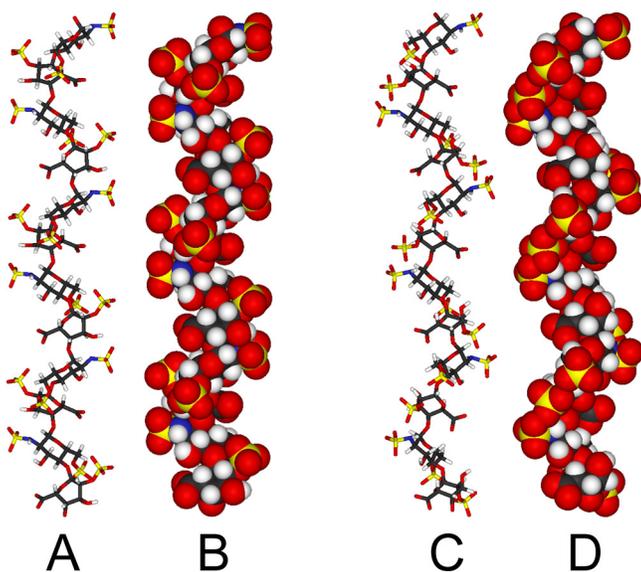
At first, he said nothing to Howell. Finding an anticoagulant was not part of his assigned project, and he needed to be certain of his results. He tested his extracts again and again, and by March 1916, “I was satisfied that an extract of liver (more than heart) possessed a strong anticoagulant action” (3).

He went to Howell and confidently announced, “I have discovered anti-thrombin” (3). Howell was skeptical. So, McLean stirred a batch of the liver extract, “heparphosphatide,” into a small beaker of fresh cat blood, placed it on Howell’s lab bench, and asked Howell to tell him when it clotted. “It never did clot” (3).

The Momentous Compromise

At the end of the academic year, McLean published his findings. He reported that cephalin, which he purified by several different methods, was indeed a substance that clotted blood (6).

McLean wanted to include his observations on the anticoagulant properties of “cuorin” and “heparphosphatide” in his paper, too. But Howell disagreed, because those results were preliminary. He said McLean’s experiments should be repeated and, if the anticoagulant property was confirmed, published



3D Structure of Heparin

in a standalone article (2). They compromised. McLean's anticoagulant observations were included in the body of his cephalin paper, but not mentioned in either the title or conclusions (6).

The important point is that this was the first time any substance with anticoagulant properties was reported in the scientific literature. Unfortunately, McLean's savings were now depleted again.

The Department of Research Medicine at the University of Pennsylvania offered McLean a fellowship, and he moved to Philadelphia, where he resumed his work purifying cephalin (1, 2, 9). At the end of the academic year, he published further results on cephalin and received his MS degree (2).

For the next 6 months, McLean served in the Ambulance Corps in France, returning in October 1917 to begin his third year of medical school at Johns Hopkins. He graduated in 1919 and served his surgical internship and residency at Johns Hopkins Hospital (1, 2). After two years studying in Europe, McLean took a surgical position at Presbyterian Hospital in New York City and then entered private practice (2).

Doing the Hard Work

Meanwhile, Howell undertook the hard work of isolating and purifying McLean's anticoagulant phosphatide. Assisted by another medical student, L. Emmett Holt, Jr., Howell used various extraction methods to improve on McLean's procedure (2, 5, 9).

In April 1917, Howell described the properties of his first purified substance at a Harvey Lecture in New York (2, 10). He acknowledged that isolation of the substance, which he called "antiprothrombin," followed directly from McLean's initial observations.

In October 1918, Howell and Holt published their now-classic paper announcing an anticoagulant phosphatide (10). They had found the substance in various tissues, but it was most abundant in the liver. Howell named it heparin, from the Latin *hepar* (liver). McLean's contribution was again acknowledged.

Howell and Holt's extraction method, "although time consuming and expensive in material, yielded a reliable preparation of heparin" (10). One milligram of heparin would prevent clotting of 1 ml of cat blood for 24 hours (2). This became the standard unit of anticoagulant potency for comparing early extracts.

The "heparphosphatide" prepared by McLean in 1916, the "antiprothrombin" reported in Howell's Harvey Lecture in 1917, and the heparin named by

Howell and Holt in 1918 were obtained by different extraction techniques. They were similar substances but likely not identical to each other (2).

For the next decade, until his retirement in 1930 at the age of 70, Howell, working alone, continued to tweak his extraction and purification procedures. He called each of these new products heparin, which would cause future controversy and confusion (2). For example, in 1923, he changed from ether to aqueous extraction and obtained a new "heparin" with a potency five times greater than the heparin produced in 1918 (1, 2).

Howell licensed this 1923 method to Hynson, Westcott & Dunning, a pharmaceutical company in Baltimore (1, 2, 5). The heparin produced by this method was not intended for clinical use, but rather as an aid to researchers who needed an effective anticoagulant for their laboratory studies (1, 2). Hynson, Westcott & Dunning continued to market heparin internationally until the mid-1930s, sticking with Howell's 1923 method (2, 5, 9). But Howell continued to make improvements. He was not a trained chemist and admitted, "I'd get along faster if I got an expert organic chemist, but it is more fun to do it myself" (4). In 1925, he reported a purer heparin, which was 40-fold more potent than his original 1918 material. And he was enough of a chemist to determine that this substance contained no phosphorus and therefore was not a phosphatide (2, 11). Nevertheless, he still called it heparin (12, 13). And he was quick to point out that this extract still contained not only heparin but also "inert materials of various kinds" (11).

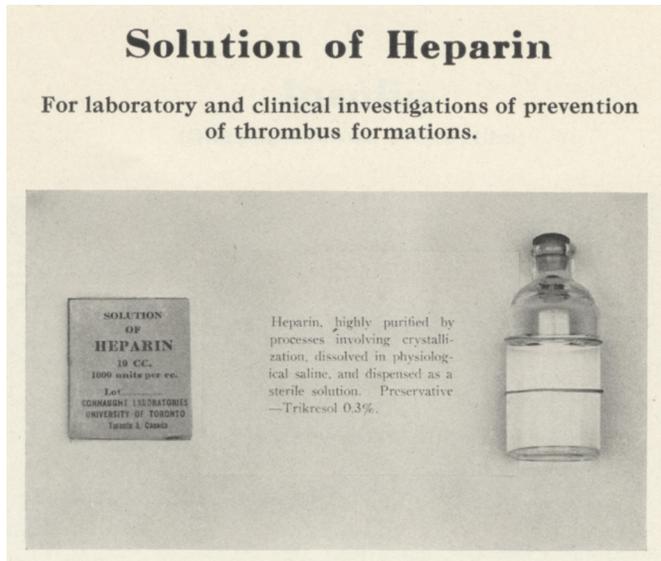
Howell published his last paper on heparin in 1928. This final extract had a potency 50- to 100-fold greater than the 1918 material. He reported that it was a complex carbohydrate containing sulfur—a substance that came close to heparin's actual chemical composition (2).

Disappointing Therapeutics

By this time, Howell recognized the potential clinical value of heparin as a therapeutic treatment for coagulation disorders (9). Although no patient at Johns Hopkins Hospital was directly injected with his carbohydrate, it was used as an anticoagulant in blood that was transfused into six patients. Unfortunately, two of them developed toxic reactions (1, 2).

In 1924, Edward Mason at the Henry Ford Hospital in Detroit had used heparin from Hynson, Westcott, &

Dunning for blood transfusions (2, 5). Those patients also experienced adverse reactions (headaches, fevers, and nausea) (9). Howell was concerned that toxic contaminants would prevent widespread acceptance of heparin, and that concern drove his extensive efforts to purify the substance (5, 9).



Heparin produced by Connaught Laboratories

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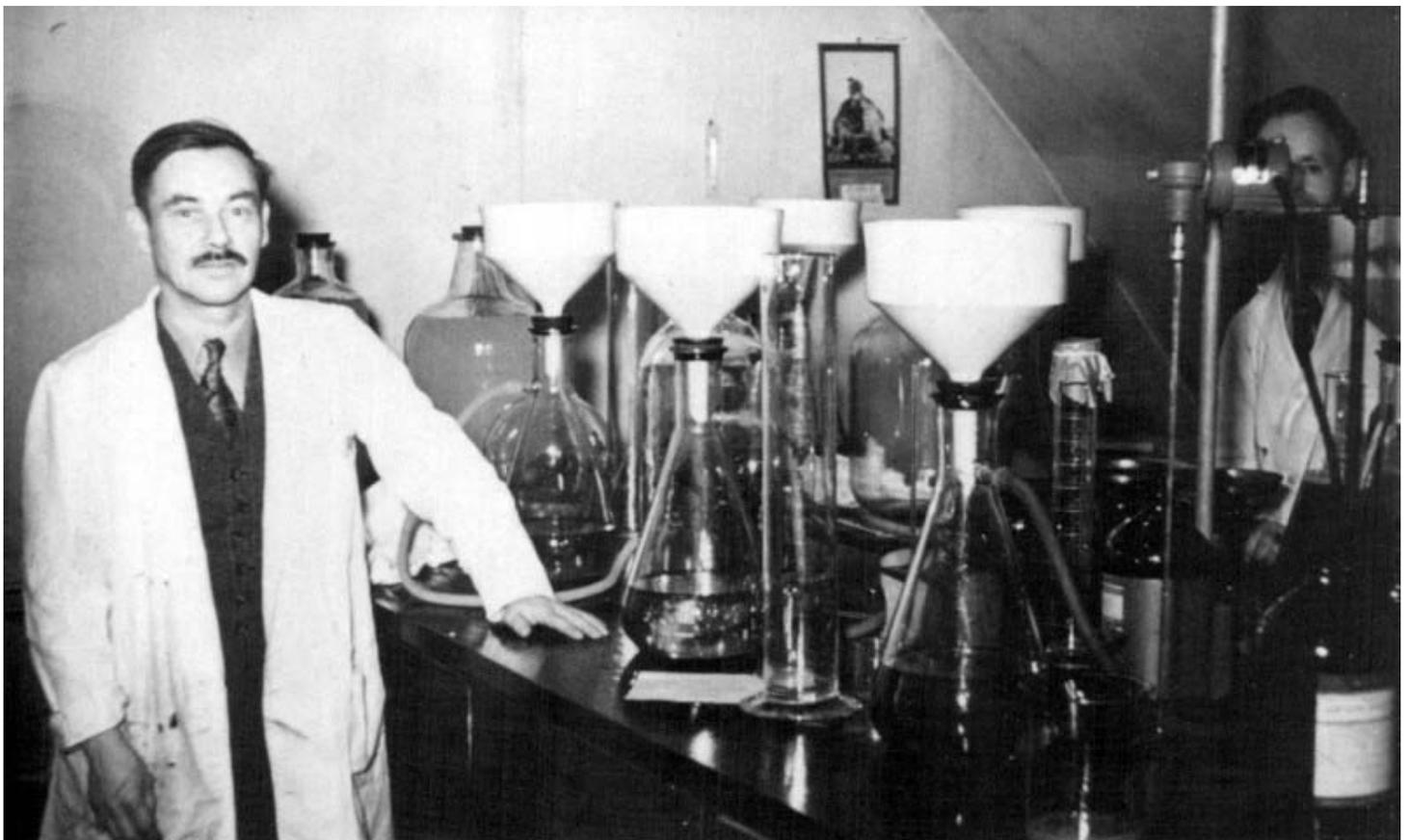
Progress in Toronto

About the same time, Charles Best was thinking about his next big project. He was already famous. While still a master's degree candidate at the University of Toronto, Best had assisted Frederick Banting with isolating and characterizing insulin. When Banting was awarded the Nobel Prize in 1923, Best was a medical student and director of insulin production at Connaught Laboratories, a non-profit research unit of the University of Toronto (14, 15).

In 1925, Best graduated from the University of Toronto Medical School, and as valedictorian, was awarded the Ellen Mickle Fellowship (15). He elected to use the fellowship for postdoctoral research under Henry Dale, head of the National Institute for Medical Research, in London (9, 15).

In Dale's lab, Best encountered annoying problems with blood clotting in his glassware, because "...the crude heparin available was practically useless, and I made up my mind that on return to Toronto I would organize a group and tackle this problem" (2).

Best was awarded a DSc from the University of London and returned to the University of Toronto as



Arthur Charles in his laboratory at Connaught Laboratories

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Production of heparin at Connaught Laboratories, 1949

head of the physiology department in 1929 (15). He envisioned he could advance the heparin field in a manner similar to insulin, with which he had extensive experience (9). Best and a young organic chemist, Arthur Charles, conducted some preliminary studies in the physiology department laboratories.

Then, Best (as assistant director of Connaught Laboratories) arranged for Arthur Charles to work with David Scott, a chemist with extensive experience in insulin production at Connaught Laboratories (14). Going forward, all of Charles and Scott's work on heparin tapped the funds, resources, and equipment at Connaught Laboratories, which were far superior to those available to Howell (2).

Charles and Scott switched from dog to cow liver, which was readily available from local slaughterhouses. In 1933, they published greatly improved methods for preparing and purifying heparin (9, 14). Because of the high cost of cow liver (demand was growing from the pet food industry), Charles and Scott explored other tissues. They found high amounts of heparin in muscle,

intestines, and lung, as well as in liver (5, 13, 14). In fact, the only tissue that contained little or no heparin was blood (5).

Cow lung provided a cheap source of material, and by 1934, they were processing more than 400 pounds of cow lung daily for the extraction of heparin (2). The work was highly complex and unpleasant, because the tissues had to decay naturally before extraction and purification. This smelly process forced them to move their work from downtown Toronto to Connaught's Dufferin "Farm" on the outskirts of the city (14).

By 1936, Charles and Scott had crystallized the sodium salt of heparin, and it was free of the toxic components that had plagued earlier extractions (2, 5, 13). With some effort, they were able to produce a product with a consistent anticoagulant potency, 100-times greater than the product marketed by Hynson, Westcott & Dunning (2, 5, 14).

Best kept Howell informed of the Toronto group's progress. He intended to produce heparin at Connaught Laboratories for sale (2, 9). Howell encouraged those efforts, expressing frustration that

Hynson, Westcott & Dunning had resisted improving its process. He was concerned that the U.S. company might stop production of the expensive product altogether (2, 9).

The availability of Connaught Laboratories' pure, well-standardized heparin greatly accelerated the pace of experimental studies (9). Researchers around the world requested samples.

Physiological Characterization

Leading those experimental efforts was Best's team in Toronto. His coworkers included Louis Jaques (a physiology graduate student), Gordon Murray (a surgeon at Toronto General Hospital), and T. S. Perrett (a surgical fellow at Toronto General).

In 1938, they reported that heparin completely prevented blood from clotting for up to 24 hours as it circulated through tubing—an observation of critical importance to the development of hemodialysis and cardiopulmonary bypass operations (2).

Murray, an expert in vascular surgery, developed lab methods for inducing controlled vascular trauma and blood clotting in vivo. In elegant experiments in dogs, he used this technique to demonstrate the unquestionable value of heparin in preventing arterial and venous thrombosis (2, 5, 9). This opened the way for Murray's pioneering surgical management of arterial disease in patients (2).

The Swedish Connection

Shortly after Best returned to Toronto in 1929, Erik Jorpes, a Swedish physiologist, visited Connaught Laboratories to observe insulin production. During the visit, Best also introduced him to the work on heparin (5).

When Jorpes returned to the Karolinska Institutet in Stockholm, he began his own efforts to isolate and characterize heparin (5, 12, 13). In 1935, he published his findings. Researchers had already determined that heparin was a polysaccharide, consisting mainly of repeating disaccharide units. Jorpes, among other things, established that this polysaccharide contains a high proportion of sulfate groups, making heparin one of the strongest acids in nature (16).

In parallel with Connaught Laboratories in Toronto, the Swedish company, Vitrium AB, began commercial production of heparin in 1936 (12, 13). Purified heparin became available in the US in 1940 (1).

Clinical Milestones

Up to this time, no reports had been published using Connaught's highly purified heparin to prevent blood clots in patients, but this idea was clearly on the minds of everyone working in the field (9). Leading the clinical investigations in Toronto was Gordon Murray.

Murray had spent 6 years training under master surgeons in London and New York before returning to Toronto General Hospital, where he was appointed to the staff in 1929 (2). His extended years of surgical residency not only honed his outstanding surgical technique but also fostered an interest in research and allowed him to develop as a colorful speaker and writer. He was a courtly and kind man, who handled tissues gently and with the confidence gained through meticulous practice (2).

On April 16, 1937, Murray began the first clinical trials with Connaught's purified heparin at Toronto General Hospital (2, 9, 14). He infused a heparin solution into the brachial artery of a subject for two hours. Blood clotting time significantly increased, and the subject experienced no toxic side effects (5, 12).

Murray's classic papers, which introduced heparin to vascular surgeons, were presented at the American Surgical Association in 1938, the Royal College of Surgeons of England in 1939, and the American College of Surgeons in 1940. By that time, he had published results on more than 400 patients (2).

Murray's work was hailed as "opening up an entirely new field of surgery" (2). He achieved unprecedented success in repairing damaged and occluded arteries, as well as with vein grafts. He also used heparin to prevent and treat venous thrombosis and pulmonary emboli and established the optimum dose and duration of heparin administration (2).

In related work, Murray pioneered hemodialysis for acute renal failure and developed an artificial kidney (2). Many surgeons and physicians came to Toronto specifically to consult with him (9).

In parallel with Murray's work, Clarence Crafoord began clinical studies in Stockholm. Crafoord used Vitrium's heparin, purified by Jorpes's method, and it produced no ill effects in patients (9).

McLean Wants Credit

In New York, Jay McLean conducted sporadic experiments using heparin from Hynson, Westcott & Dunning, which caused some toxicities. But his surgical practice took precedence, and he obtained no important results (1, 9). In 1939, McLean moved to

Columbus, Ohio, and turned from surgery to treating cancer patients with radiation (1, 2).

By 1940, heparin's pharmacological properties were firmly established, and most biomedical researchers credited Howell with the discovery (1, 5). Although Howell had acknowledged McLean's original observations as the impetus for his work, McLean was unhappy at not receiving recognition from other researchers (2, 5).

He began a letter writing campaign to prominent physiologists and enclosed a reprint of his 1916 article for their reference. On the reprint's cover, he stamped a statement, claiming his cuorin and heparphosphatid extracts and Howell's antiprothrombin and heparin were different names for the same substance (2).

For the next seven years, McLean collected a trove of reprints of heparin articles, intending to write a definitive review article or monograph that would support his claim as the discoverer of heparin (1, 5). The manuscript was never completed, and his collection of 1,300 reprints, along with his laboratory notebooks, were, in the end, shipped to Best (1, 9). He told Best, "I would like to see this material in the hands of some enduring group or agency" (2). Best deposited the collection in the library of the University of Toronto's Best Institute, where it remained for many years (2).

From the published reports, it is difficult to sort out the specific origin of heparin (12). Some reviewers have concluded that McLean discovered a phospholipid with anticoagulant activity and not the polysaccharides that Howell's and Best's groups subsequently isolated. Others have suggested that McLean and Howell deserve shared credit: McLean's observations prompted Howell to change the focus and course of his research—something they both agreed upon—and those efforts subsequently led to isolation of pure heparin (12).

Commercializing Heparin

Meanwhile, Best continued his studies, and Connaught Laboratories continued to increase the potency and purity of the heparin it distributed (14). Much of the work to improve production was performed by Edith Taylor and Peter Moloney.

Taylor received her PhD in chemistry from the University of Toronto and joined Connaught Laboratories in 1925 (17). Moloney joined Connaught

Worldwide, 100 tons of commercial grade heparin are now produced annually.

Laboratories in 1919. He earned his PhD in chemistry in 1924 from the University of Toronto for research conducted at Connaught on diphtheria toxoids. He also developed methods for concentrating and purifying insulin (18).



Dr. Edith Taylor

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In the 1920s, Taylor and Moloney expedited clinical trials of the diphtheria toxoid vaccine (17, 18). Their efforts led to the vaccine's broad use and the virtual elimination of diphtheria in Canada by the early 1930s.

During World War II, Taylor was put in charge of the diphtheria toxoid, tetanus

toxoid, and gas gangrene antitoxin production team and made contributions to the production of the pertussis vaccine (17). After the war, Taylor and Moloney turned their attention to optimizing heparin production. They found the best sources of heparin were cow lung and cow or pig intestine—particularly the small intestine (19).

Their method, patented in 1952, increased the yield and lowered the cost of purified heparin (5, 12-14, 19). This cheap production method encouraged competition by other producers, and Connaught stopped selling heparin in the early 1950s.

Pharmaceutical grade heparin consists mainly of repeating disaccharides in polysaccharide chains ranging from 5,000 to 40,000 Daltons (16). It is still commonly extracted from animal tissues, primarily pig intestine, because intestines are plentiful, cheap, and of no other commercial use (14, 16).

Although the commercial processes are proprietary, manufacturers seem to follow the general extraction and purification methods developed by Taylor and Moloney. Some producers use the



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Dr. Peter Moloney

intestinal mucosa scraped from pig intestine, while others use the whole intestine (“hashed pork guts”) (16). The disaccharide composition of these heparins differs, depending on the subspecies of pig, mast cell content of the intestinal tissue, and the animals’ diet and breeding environment.

Worldwide, 100 tons of commercial grade heparin are now produced annually (16).

Advancing Clinical Practice

As a result of the efforts by Best’s team, purified, nontoxic heparin became widely available. The crystalline sodium salt facilitated hundreds of complex surgical cases in which heparin played an essential and often dramatic, life-saving role (9, 14). Without heparin, surgeon Ronald Baird said, “there would be little vascular surgery, even less [open-heart] surgery, no hemodialysis, and no organ transplantation” (2).

Pulmonary embolism is a common complication of abdominal, thoracic, or urological surgery and can kill patients within 30 minutes (20). Clinical trials in the 1970s showed that low-dose heparin was highly effective in preventing fatal pulmonary embolism and did not produce serious bleeding (21). The standard of care in these cases is now a low dose of heparin 2 hours before surgery and then every 8-10 hours for about a week postoperatively (20).

In the late 1970s and early 1980s, low molecular weight heparins (LMWHs) broadened anticoagulant use. LMWH is a 4,000-5,000 Dalton fragment of the heparin polysaccharide (22). Compared to unfractionated heparin, LMWH has less nonspecific binding to plasma proteins, a longer plasma half-life, better bioavailability, and a more predictable anticoagulant response (22).

Because they can be administered subcutaneously rather than intravenously and without the need for routine lab monitoring, LMWHs progressively replaced

Without heparin, surgeon Ronald Baird said, “there would be little vascular surgery, even less [open-heart] surgery, no hemodialysis, and no organ transplantation”

unfractionated heparin. LMWHs were the preferred drug for prevention and initial treatment of thrombotic disorders until the next-generation oral anticoagulants became available (5, 22).

Toxicity Returns

In January 2008, US public health officials received the first reports of allergic reactions in hemodialysis patients (23). Investigators from the Centers for Disease Control and Prevention quickly excluded contamination in the filters and intravenous tubing used in dialysis and focused on heparin as the common denominator in all of these cases.

In February, Baxter Healthcare, which distributed the tainted product, withdrew all of its heparin batches. Unfortunately, allergic reactions continued to occur, along with the first reports of fatalities (23). Patients undergoing cardiac surgery were also affected. By March, allergic reactions and anaphylactic shock were reported in Europe and Japan, where authorities also recalled the drug. Altogether, several thousand patients were affected and nearly 100 Americans died (16).

Baxter and other distributors had purchased heparin from Scientific Protein Laboratories (SPL) in Changzhou, China (23, 24). The U.S. Food and Drug Administration (FDA) immediately took steps to ensure that all heparin entering the US was stopped and tested for contamination (24).

SPL bought its supplies from two organizations called consolidators, and the consolidators in turn obtained crude heparin from a network of small Chinese workshops. Many of those workshops were unregulated family-owned businesses (24).

Although FDA inspectors found deficiencies in SPL’s facilities and purification procedures, they concluded that the contaminant was not introduced during the manufacturing process (23, 24). Baxter investigators confirmed that the contamination was already present when the heparin supplies were delivered to SPL.

The investigators turned their attention to the consolidators and workshops that extracted and handled the crude material. Unfortunately, Baxter's investigators were denied access to them. FDA officials were hesitant to say how the contamination occurred. But the contaminant made up as much as half of the active ingredient in SPL's final product, suggesting that it was added intentionally (24).

In April 2008, the FDA joined the pharmaceutical industry and a consortium of international laboratories to identify the contaminant. They concluded it was "oversulfated chondroitin sulfate," a semi-synthetic polymer obtained by chemically sulfonating chondroitin sulfate (16, 23).

Chondroitin sulfate is an inexpensive dietary supplement used to treat osteoarthritis. It is extracted from pig cartilage and sells for a fraction of the cost of heparin (16, 24). Chemical conversion to oversulfated chondroitin sulfate is also inexpensive, and some chondroitin sulfate producers in China also sold heparin. Interestingly, a virulent pig virus had swept through China in 2007 substantially reducing the availability of the starting materials needed to make heparin (24).

Chondroitin sulfate is not an anticoagulant, but the oversulfated analog mimics the anticoagulant effect of heparin (16, 23). Unfortunately, oversulfated chondroitin sulfate also activates the kallikrein-kinin pathway to generate bradykinin, which causes an allergic response. It also activates factors that trigger anaphylaxis (16, 23).

To ensure the safety of heparin in the US, the FDA asked manufacturers to test their heparin products with two screening methods that could detect and differentiate contaminants like oversulfated chondroitin sulfate from heparin: capillary electrophoresis and proton nuclear magnetic resonance (25). In June 2008, those test methods were included in the US Pharmacopeia and, going forward, were required for all heparin products intended for the US market (23, 25).

With more pharmaceutical companies sourcing all or part of their manufacturing operations overseas, this incident served as a reminder of the importance of Good Manufacturing Practices. According to international guidelines, to which the FDA and the European Medicines Agency are signatories, pharmaceutical manufacturers are fully responsible for qualifying all of their suppliers through on-site audits, testing, and regular communications.



Heparin sample

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Found and Lost

After Jay McLean's death in 1957, his wife, who was in financial difficulties, began an intensive campaign seeking recognition for his "discovery" of heparin (2, 5). She eventually managed to get Upjohn to award Jay McLean a \$6000 cash prize, payable to her, and a bronze plaque recognizing his discovery at Johns Hopkins (2).

Medical school officials at Johns Hopkins held extensive discussions regarding an appropriate size and wording of the plaque. The medical school dean said, "The contribution made by Dr. McLean to the discovery of heparin has been somewhat of a controversial issue...and we at Hopkins have not been altogether happy about some of the implications" (2).

The final engraved plaque was unveiled at Johns Hopkins on May 3, 1963 commemorating Jay McLean "in recognition of his major contribution to the discovery of heparin in 1916, as a second-year medical student in collaboration with Professor William H. Howell" (2, 5, 13).

In Toronto, university officials made changes after the death of Charles Best in 1978. The Best Institute merged with the adjoining Banting Institute to form the Banting and Best Diabetes Centre and was relocated to new facilities. The original Institute buildings then housed the Banting and Best Department of Medical Research until 2005. Now called the Donnelly Centre, those buildings currently accommodate entrepreneurial startups and other commercialization partner tenants. In the midst of these changes, McLean's collection of notebooks and reprints was lost (2).

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Biosketch:



Rebecca J. Anderson holds a bachelor's 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 share the story of warfarin.

Don't miss the December issue.



Science Policy News

Washington Fellows Address Policy Concerns

In late spring, the 2019 class of Washington Fellows traveled to Washington, DC, to advocate for increases to funding for biomedical research and to educate lawmakers and staff on the necessity of animal research. Following their return home, fellows were asked to write an op-ed that drew on their experiences in DC. The op-ed could be on a topic they learned about during their fellowship, a topic related to science that is in the news, or a science policy topic to which they felt a personal connection. Three articles were selected from this year's class to highlight different facets of ASPET's public affairs work. The first op-ed, on the benefits of science to rural economies, touches on one of ASPET's core issues: funding for biomedical research. The second, on the damage to science posed by our nation's immigration policies, highlights an emerging issue to which ASPET has recently devoted resources. And the third, on the need for scientists to become stronger communicators, encourages scientists to become more involved in the public discourse and share their expertise. ASPET anticipates a bright future for its 2019 fellows and looks forward to assisting them in their science policy advocacy throughout their careers.



Nick Warren

Dartmouth College
**Science Benefits
 Rural Economies**

With the presidential primary season heating up in my state of New Hampshire, there has been plenty of discussion about candidates'

visions for how to best boost the American economy. Many different proposals have been floated, but there is a notable missing exception: investing in science. Here in rural New Hampshire, federal investment is a core driver of our economy. According to the Federation of American Societies for Experimental Biology, New Hampshire's 2nd congressional district received over \$126 million in research funding in 2018. This directly supports the salaries of approximately 1,000 research scientists at Dartmouth College alone. However, the benefits do not stop there.

According to *Business NH Magazine*, there are over 200 biotech companies in New Hampshire, which cumulatively provide over 7,000 high-quality private sector jobs in a state with a population of only 1.4 million. Many of these small biotech businesses got their start from federally funded breakthrough discoveries at Dartmouth College and Dartmouth

Hitchcock Medical Center (DHMC). These small start-ups then often attract private funding from larger pharmaceutical companies. For example, ImmuNext, a local biotech company founded by a Dartmouth scientist, has signed partnerships totaling over \$1 billion with pharmaceutical giants like Eli Lilly, Johnson & Johnson, Roche, and Sanofi to help commercialize new treatments for cancer and autoimmune disorders. Federally- and privately-funded clinical trials also improve the prestige of DHMC, the largest employer in the state, by allowing physicians to bring state-of-the-art therapies directly to the clinic. None of this economic activity would have happened in a rural setting without the initial investment by the federal government to pursue basic science.

The president's 2020 budget request proposes to cut funding for nearly all of the largest science agencies, according to *Science Magazine*: the National Institutes of Health would be cut by 12%, the National Science Foundation by 13%, the Department of Energy by 17%, and the Environmental Protection Agency would see a drastic 40% cut. However, Congress has the final say on spending levels and has rejected recent proposed cuts to science for the 2018 and 2019 budgets. This spring, I visited Capitol Hill to promote the benefits of science funding and ask what our representatives thought the final funding levels

might look like this year. The House of Representatives has passed most of the appropriations bills with significant increases to science spending, including an extra \$2 billion for the National Institutes of Health. However, a final budget has yet to be approved by the Senate. It has been widely reported that a tentative deal was reached in late July by congressional leaders and the president to significantly increase military and domestic spending, but the deal is awaiting Senate approval and does not include finer details of agency funding levels. Any discrepancies in the details between the final Senate and House appropriations bills would need to be reconciled. If both houses of Congress and the president are unable to find a compromise, or extend the current budget, the government will shut down on October 1st for the fourth time since the beginning of 2018.

Out of a crowded 2020 field with over 20 candidates, only three presidential hopefuls have mentioned their desire to increase investment in science: Elizabeth Warren, Joe Biden, and Beto O'Rourke. However, all three only briefly mention it as part of their plan to develop new green technologies to help fight climate change. Addressing climate change is certainly a noble cause to help avoid the worst of that ecological disaster. But, it is just the tip of the melting iceberg. We should be simultaneously looking forward to other challenges our society faces, like the opioid epidemic, cancer, the spread of deer ticks and Lyme disease, cybersecurity, and ensuring the US stays on the forefront of digital technology. In addition to driving economic growth, science helps us better understand the greatest challenges we face and helps provide means to address them.

This summer marks the 50th anniversary of the first landing on the moon. When President Kennedy challenged us to go to the moon, he knew that doing something never done before was inherently worthwhile. He knew that aggressively challenging ourselves, exploring the unknown, and investing in science would yield incalculable and unimaginable benefits for society. With science, you never truly know where the next major discovery will come from. The technology we have and the society we live in today are far more complex than President Kennedy imagined in the early 1960s. The success of the space race demonstrated our global technological superiority and helped make America the center of the digital revolution.

Science is not partisan. It is simply the best system humanity has developed to uncover the reality of how our complex universe works. Science has created over a thousand high-quality jobs and attracted billions of dollars in private investment here in rural New Hampshire. Increasing federal investment in science would boost our rural economy and help us continue to attract bright individuals from all over the world. We should continue to expand this model in other struggling rural economies in America. Support for science is also not partisan. I have personally had enthusiastic conversations with the offices of both Republican and Democratic members of Congress about funding research; the increases to research funding in the last two federal budgets could not have happened without support from both parties. Enormous benefits to rural communities, the national economy, quality of life, and broad support in Congress should make science an ideal issue to promote for the many presidential hopefuls.



Julie Meade

Virginia Commonwealth University

10,000 Bright Minds Going to Waste: Fatal Flaw of *The Fairness for High-Skilled Immigrants Act of 2019*

In 2016, opioid addiction killed more Americans

than motor vehicle accidents. To combat the opioid epidemic, we must recruit and retain skilled scientists

from around the world. Even the president sees the value of diverse minds working together to solve the nation's problems. In *The National Security Strategy of the United States of America (December 2017)*, President Trump declared that America "will remove barriers to the full use of talent...We must create easier paths for the flow of scientists, engineers, and technologists." Echoing this sentiment, there are several bills in the 116th United States Congress at this time that would make it easier for international scientists to immigrate to America to do research. For example, *The Fairness for High-Skilled Immigrants Act*

of 2019 seeks “to eliminate the per-country numerical limitation for employment-based immigrants,” such as scientists, and *STEM Opportunities Act of 2019* provides “grants to institutions of higher education to recruit, retain, and advance STEM faculty members from underrepresented minority groups,” such as scientists from developing and newly industrialized countries. The National Interest Waiver (EB-2), which is a type of green card for a “foreign national who has exceptional ability,” is yet another mechanism to facilitate the flow of scientists into America to help solve our nation’s problems, opioid epidemic, and otherwise. On first glance, these initiatives appear to be tailored to the needs of Dr. Wisam Botros Toma, a veterinary pharmacologist from Mosul, Iraq, who currently holds a postdoctoral position in the Department of Pharmacology and Toxicology at Virginia Commonwealth University (VCU) in Richmond, Virginia. However, these pro-immigrant initiatives have a fatal flaw: they do not account for contract-imposed barriers that make retention of immigrant scientists in America all but impossible.

Case in point: Dr. Toma had signed a contract with the Higher Committee for Education Development (HCED) of Iraq, agreeing to do research at the University of Mosul for 10 years following completion of his HCED-sponsored training at VCU. If an employer pays for education, the student can’t just take that education and run. They have a responsibility to fulfill. However, students returning to war-torn countries are fundamentally unable to fulfill their contracts, by virtue of the inadequacy of the facilities in that country. Even prior to the destruction of the University of Mosul by ISIS in 2014, the infrastructure of Mosul was in tatters from a decade of unrelenting terrorist attacks: “There were no basic research facilities. No consistent electricity, water...No equipment,” Dr. Toma said. “We didn’t have vendors to even purchase animals,” he explained. If he needed research animals during his veterinary studies at the University of Mosul, Dr. Toma had to catch wild dogs in the street. “I was always dreaming to come to the United States to do research because of the technology and research facilities,” Dr. Toma said. At VCU, Dr. Toma is a key member of a team of researchers that identifies and tests non-addictive, opioid-free pain relievers, with the goal of preventing pain patients from accidentally transitioning

to opioid addicts. Dr. Toma’s US-honed research skills would languish at the University of Mosul.

The Fairness for High-Skilled Immigrants Act of 2019 is a baby step in the right direction for increasing the flow of immigrant scientists to America, albeit impotent in the case of contract-imposed barriers by home countries that aim to retain their US-trained citizens by cruel and unusual means. For example, if Dr. Toma reneges on his contract, it will cause his impecunious Iraq-residing siblings to suffer; the Iraqi government will confiscate their possessions, evict them from their dilapidated homes, garnish their paltry wages, seize their meager savings accounts, and put them at high risk of corporal punishment, until the full cost of Dr. Toma’s tuition is recovered: \$323,219. When Dr. Toma and I reached out to the office of Senator Mark Warner (D-VA) for legislative help that would give immigrant scientists the full support of the US government to renegotiate contracts with home countries, Senator Warner dismissed the issue, suggesting that “Mr. Botros [*sic*] can certainly contact HCED directly to make the payment in full.” For immigrant scientists who do not have an extra \$323,219 lying around to buy out contracts with home countries, the legislation on the House and Senate floors during the 116th Congress will fail to retain these skilled individuals in US research institutions. It’s simply not good enough.

The scope of these contract-imposed barriers to the retention of skilled immigrant scientists is not limited to the isolated case of Dr. Toma. According to HCED, 10,000 Iraqi students signed similar Faustian contracts over the last five years. Like Dr. Toma, these students are obligated to abandon their work in state-of-the-art, well-funded laboratories, and are expected to do meaningful research in subpar labs in Iraq, paying for research supplies out of their own pockets. That is 10,000 bright minds going to waste that could have helped America fight the opioid epidemic. This inability to fight contract-imposed barriers is an unexpected shortcoming of the proposed bills, waivers, and presidential decrees, which should all work together in synergy, to improve the science and technology of our nation. Hopefully, future legislation will address this unmet need of immigrant scientists, particularly those from Iraq. But until then, Dr. Toma’s colleagues in the Department of Pharmacology and Toxicology are trying to buy his freedom, one bake sale fundraiser at a time.



Joseph Flores-Toro

Univ. of Florida

Science in the Age of Social Media

Good news everyone—Joe Biden is going to cure cancer! While it sounds great, statements like these

often do more harm than good. To be clear: I know his intentions are noble, and his efforts organizing the 2016 Cancer Moonshot and the Biden Cancer Initiative represent meaningful steps forward. This is personal for him. However, claims like these place impossible expectations on the scientific community. If Biden is elected, the inevitable failure to “cure cancer” directly following would further erode public trust in science and medicine, enabling the use of misinformation to more easily influence how people make important health decisions. We are living in the social media age where anyone can post pseudoscience online, falsely spin legitimate studies, or support debunked research. To illustrate the problem, I’d like to tell a story about how misinformation in media is actively affecting public health and offer my thoughts on a solution.

The year is 1998: gas is \$1.15, Google is the hot new website, and *The Lancet* publishes a study examining 12 children who previously received the MMR (measles, mumps, and rubella) vaccine. The author, former physician Andrew Wakefield, would claim that 9 of those children were later diagnosed with autism. This study sparked the ongoing fight over the safety and efficacy of the MMR vaccine, and vaccination in general. It was later discovered that Wakefield had been paid by a law firm looking to support their case in a law suit filed against the vaccine manufacturer. An investigation would conclude that most of his data were false and relied on illegally obtained samples (apparently buying blood samples at your son’s birthday party is frowned

upon). As a result, he lost his medical license and *The Lancet* retracted his study, stating:

“...the claims in the original paper that children were ‘consecutively referred’ and that investigations were ‘approved’ by the local ethics committee have been proven to be false.”

Despite the retraction, rebuke by the scientific and medical community, and subsequent studies proving the MMR vaccine is safe, skepticism persists. Spurred on by celebrities, politicians, and social media, the anti-vax movement is driving the current measles outbreak. According to the CDC, as of July 18, 2019 there have been a reported 1,148 confirmed US measles cases this year, the most since 1992. During the pre-vaccine era (1960’s) roughly 500 people/year would die and nearly 50,000 would be hospitalized due to measles. As the US population has nearly doubled since then, there is greater risk of disease transmission, increasing the potential for harm. The measles outbreak is a potent example of how a few influential people can use that mistrust to sway public opinion.

So what can be done? The long term fix is likely rooted in better STEM education. A more informed public will be less likely influenced with misinformation and make better health decisions. In the short term, we scientists need to tell people about our science and how we do it. We need to be proactive in public outreach, political advocacy, and education. However, these interactions are not emphasized in typical graduate education. Some of my most rewarding and impactful work has been speaking about my research with members of Congress, Florida teachers and high school students, and members of the Oak Hammock retirement community. Unfortunately, I have had to seek these opportunities out. I feel they should be mandatory. Only through communication can we start rebuilding trust. So, let’s talk, but in the meantime, vaccinate your kids.

Note: A version of this article was published in *The Gainesville Sun* on July 24th.



2020 Washington Fellows Program

Submit your application by October 18, 2019

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 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 increased federal support 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 Congress. ASPET will cover transportation costs, hotel, and other reasonable expenses that follow ASPET's reimbursement policy.
- **Become Advocates in their Home Districts:** Washington Fellows will have the opportunity to meet with members of Congress in their home districts, act as a conduit to inform colleagues within their departments/institutions about federal legislative matters, and write op-ed pieces to local papers on current science policy issues. These activities will be undertaken with the support and advice of ASPET.
- **Attend the ASPET Annual Meeting at Experimental Biology 2020:** ASPET Fellows will receive paid registration to attend the 2020 ASPET Annual Meeting in San Diego, CA.

Who Should Apply?

The ASPET Washington Fellows Program is open to any graduate student, postdoctoral trainee, or researcher no more than four 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 2020. Fellows serve one-year terms.

All applications must be submitted by **11:59 PM ET on October 18, 2019** online at:

www.aspet.org/washingtonfellowsprogram.

Incomplete applications or applications received after October 18, 2019 will not be considered.

Please feel free to contact publicaffairs@aspet.org with any questions.

"After all our meetings on the hill, I felt truly inspired to get involved in advocacy as a component of my career and make this a significant part of my future."

*-Raghav Tripathi,
2017 Washington Fellow*



For more info:

www.aspet.org/washingtonfellowsprogram

(301) 634-7060

publicaffairs@aspet.org

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ASPET.ORG



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Plush Donkey

Plush 9" donkey in ASPET t-shirt
Members: \$10.00 + Shipping



T-shirt with ASPET Logo

Gray cotton with logo on front left pocket and across back
Adult Sizes: S, M, L, XL, XXL
Members: \$15.00 + Shipping



Baseball Cap

Gray hat with embroidered ASPET logo - one size fits all
Members: \$10.00 + Shipping



Einstein T-shirt

Black cotton with Albert Einstein quote
Adult Sizes: S, M, L, XL, XXL
Members: \$15.00 + Shipping



6-Pack Cooler Lunch Bag

Gray cooler bag - use as a lunch bag or fit up to six 12 oz beverage cans
Members: \$10.00 + Shipping



Cooligraphy T-shirt

Black cotton with stylized ASPET design in red and gold
Adult Sizes: S, M, L, XL, XXL
Members: \$15.00 + Shipping



Upright Lunch Bag

Gray and black upright lunch bag with side mesh pocket
Members: \$10.00 + Shipping



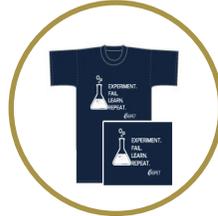
Explore Pharmacology T-shirt

White cotton with cartoon design
Adult Sizes: S, M, L, XL, XXL
Members: \$15.00 + Shipping



Mug

Gray mug with ASPET logo
Members: \$10.00 + Shipping



Experiment T-shirt

Navy blue cotton with Experiment. Learn. Fail. Repeat design
Adult Sizes: S, M, L, XL, XXL
*Child sizes available in light blue
Members: \$15.00 + Shipping



Travel Mug with Lid

Tall khaki travel mug with silicone lid
Members: \$12.00 + Shipping



Keep Calm T-shirt

White cotton with Keep Calm and Study Pharmacology design
Adult Sizes: S, M, L, XL, XXL
Members: \$15.00 + Shipping



Journals Mug

White mug with ASPET journal covers
Members: \$10.00 + Shipping



Toddler T-shirt/Onesie

White cotton with Genius design
Toddler Sizes: 2T, 3T, 4T, 5T, 6T
Onesie: NB, 6M, 12M, 18M, 24M
Members: \$10.00 + Shipping



Men's Tie

Gray silk tie with ASPET logo
Members: \$25.00 + Shipping



Women's Scarf

Beige silk scarf with ASPET logo
Members: \$30.00 + Shipping



Education News

Graduate Students and Postdoctoral Scientists: Apply to Join the ASPET Mentoring Network



ASPET Mentoring Network participants at the ASPET Annual Meeting at EB 2019.

The ASPET Mentoring Network is a professional development program designed to supplement the training that graduate students and postdoctoral trainees receive through their universities. The ASPET Mentoring Network focuses on developing skills needed to succeed scientifically, professionally, and psychologically, including discussions about experiences and pressures faced by groups that are underrepresented in the sciences. As a professional development experience, the program uses a coaching model to help participants develop success skills for a variety of careers.

Graduate students and postdoctoral scientists accepted into the 2020-2021 program will attend several events in association with Experimental

Biology 2020 in San Diego, CA. These will include training, guided discussions, an informal reception on Friday, April 3, and a half-day interactive program on Saturday, April 4. During this time, trainees will meet the coaches, other students and postdocs and become part of a six-person coaching group. Each trainee will also meet individually with their coach during the EB 2020 meeting and participate in virtual group meetings throughout the year, typically held as monthly conference calls or webinars. Group events will be tailored to the specific needs of each coaching group but may focus on work/life balance, interview skills, networking, grant writing, and other topics frequently identified as important to growth as a professional.

Who Is Eligible?

Graduate students and postdoctoral scientists who are members of ASPET in good standing are eligible to apply. If you're not a member, it's easy to join! Please visit <https://www.aspet.org/membership/>.

What Support Is Provided?

Applicants are strongly encouraged to apply for an ASPET travel award at www.aspet.org/travelawards-sept-tpfarm. A limited number of travel awards will be available through the Mentoring Network to help

defray travel expenses for those with significant financial need who do not have other support. You will be able to indicate your interest in one of these special travel awards during the application process.

What Is Required to Participate?

You must attend and participate in all Mentoring Network programming during EB 2020 and be an active participant with your coaching group for the year following. We are not able to accept participants who cannot attend EB 2020 or who are only available for a portion of the programming.

What Do Previous Participants Have to Say about the Program?

“Our group instantly connected with each other, and it was amazing to see how much we all had in common. We support each other and plan monthly goals, which motivates us to achieve them. Most importantly, sharing each other's experiences helps us gain valuable insights.”

“Participating in the ASPET Mentoring Network has significantly expanded my network in the ASPET community and has provided me with wonderful mentors and fellow mentees that support each other both professionally and personally. I've enjoyed hearing stories and getting career advice from a diverse group of people who are at different stages of their careers with varied experiences.”

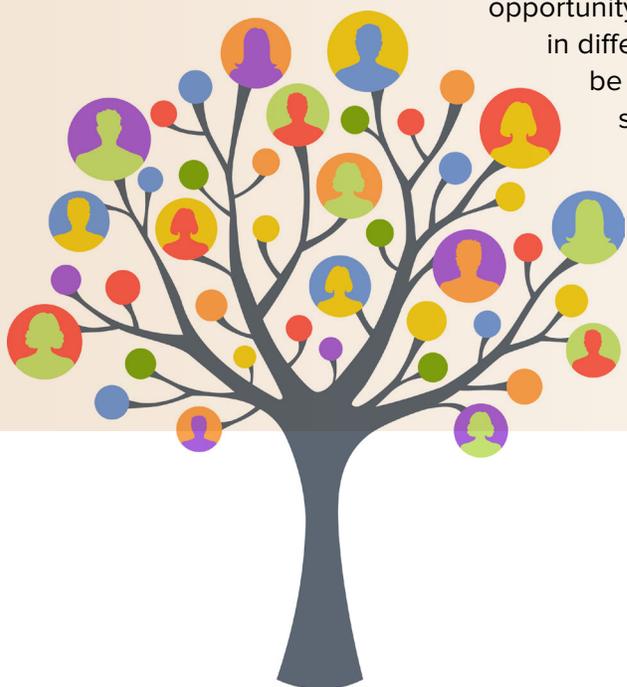
“I credit the Mentoring Network with helping me get my dream job in industry. The support of my coach and group members during the job application and interview process was invaluable.”

“One memorable feature of the ASPET Mentoring Network is that it provides an open forum in which to discuss the ways our lives fit in and around science. Even though our discussions have been adeptly facilitated by established pharmacologists as mentors, of value to me has been the opportunity to interact with and learn from my peers. Despite many of us being in different pharmacology-focused fields, it is these relationships that will be most valuable as we all transition towards becoming independent scientists. I recommend participating in this program enthusiastically and without reservation.”

“This served as an amazing support system for me. My group was a great sounding board for someone who works in a very small lab. I also feel like the activities at EB gave me a great tool kit to work with my PI to improve upon our mentor/mentee relationship.”

How Do I Apply?

Applications for the ASPET Mentoring Network will open in early October. Please visit https://www.aspet.org/Education/ASPET_Mentoring_Network/ for additional details. For more information contact Catherine L. Fry, PhD at cfry@aspnet.org.



Volunteer to Be a Coach for the ASPET Mentoring Network

The **ASPET Mentoring Network** is looking for volunteers to train as coaches who will work with a group of six mentees in developing broad-based career skills. Coaching responsibilities include the following:

Prior to EB

Coaches will participate in coach training sessions with our Mentoring Network facilitators, including a one-hour conference call ahead of EB and an in-person session on Friday morning, April 3. The training is designed to introduce our coaching model, highlight facilitation approaches and strategies, and prepare coaches to navigate conversations with a diverse group of mentees.

During EB

Coaches will participate in programming at EB 2020 starting on Friday morning (April 3) and concluding with lunch on Saturday (April 4), just prior to the start of EB 2020 in San Diego, CA. During the rest of EB, coaches are expected to meet individually with each trainee.

After EB

Coaches will participate in monthly virtual group meetings throughout the year. Group meetings will be tailored to the specific needs of each coaching group, but may focus on work/life balance, interview skills, communication, networking, and other topics frequently identified as important to growth as a professional.

Why Become a Coach?

Prior coaches have responded positively about their own experiences, overwhelmingly agreeing that the program was worthwhile. Many coaches have also emphasized how much they learned from interacting with their groups. According to one previous coach: "I learned to see life through their eyes, which was very educational for me. The idea of discussing differences in a non-threatening and supportive environment was excellent." Don't miss the opportunity to get involved with mentoring at ASPET!

Coaches will be reimbursed for one hotel night (up to \$300) and advance registration for EB 2020. Meals will be provided on Friday (lunch and evening reception) and Saturday (lunch).

To apply to be a coach, please send your CV and a short statement of interest (maximum 250 words) to Catherine Fry (CFry@aspnet.org) by Friday, November 8, 2019.

Health Professions Week 2019

ASPET is pleased to once again participate in Health Professions Week (HPW), November 16-21, 2019. HPW is a free, week-long virtual outreach event for high school and college students interested in learning more about careers in the health professions. ASPET joins 20 other professional societies in educating students about different health-related career paths.

Promoting pharmacology to the general public and the broader health community to increase public awareness of pharmacology as a discipline and the contributions of pharmacologists is a major goal in ASPET's long-term strategic plan. By participating in HPW, ASPET will be educating young students about

Schedule of Events

The events planned for the 2019 include:

- **HealthTalks:** A panel of dynamic speakers will inspire students on their path to a health care career
- **Online Treasure Hunt:** students will visit the participating societies' websites for a chance to win prizes
- **Wellness and Self-care:** Panelists will share advice on maintaining mental well-being during the pursuit of careers in the health professions
- **Shadowing conversation on Instagram:** students will receive tips on job shadowing and learn about its potential for professional growth

Help Us Spread the Word about HPW 2019

In order to make this a successful week, ASPET needs your help in spreading the word about HPW 2019. This is a FREE event for high school and college students, their teachers, and counselors. Help promote pharmacology and this important event by spreading the word to your community and beyond. Tell your neighbors, friends, colleagues, and family about this event and encourage them to register to learn more about pharmacology,

Volunteer at the Virtual Fair

ASPET is seeking volunteers to participate in the virtual fair. Volunteers will be responsible for logging into the virtual booth and answering attendee questions through a chat



pharmacology and its sub-disciplines, different career paths in pharmacology, and the steps they are advised to take to pursue a career in pharmacology. Last year's event attracted over 11,000 registrants from all 50 states and 37 countries.

- **Financial Literacy:** A panel of experts will discuss financing options to prepare for an education in the health professions
- **Virtual Fair:** Students will have the opportunity to chat and network with ASPET volunteers about careers in pharmacology

Learn more about HPW 2019 and the scheduled events at www.aspet.org/hpw-2019

Register for FREE at <https://explorehealthcareers.org/hpw/>

the important work that pharmacologists do, and how to pursue a career in research. A great way to get the word out is by posting information about this event on Facebook, Twitter, Instagram, and LinkedIn.

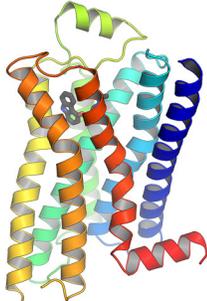
Download an HPW 2019 flyer at <https://bit.ly/2Mf2niE> to post in your department. Contact ASPET's marketing department at sthompson@aspnet.org to obtain additional promotional materials (flyers, emails, etc.).

room. One-hour volunteer slots will be available for Thursday, November 21. If you would like to participate, please contact ASPET's education department at cfry@aspnet.org.



Meeting News

Colloquium on G Protein-Coupled Receptors: *Evolving Insights from Pharmacology to Physiology*



**Colloquium on G Protein-Coupled Receptors:
*Evolving Insights from Pharmacology to Physiology***

**Friday, April 3 - Saturday, April 4, 2020
San Diego, CA**

This is a satellite meeting to Experimental Biology 2020.  *Separate registration fee required.*

Co-Chairs:

Tracy M. Handel—Univ. of California, San Diego
Paul Insel—Univ. of California, San Diego
Jennifer Pluznick—Johns Hopkins Univ. School of Medicine

Schedule at a Glance

FRIDAY, APRIL 3

2:00 pm – 4:00 pm

Symposium I: Systems Biology Approaches to GPCR Physiology and Pharmacology

Speakers:

Mark Knepper—NHLBI
Nina Wettschureck—Max Plank
Kirill Martemyanov—The Scripps Research Institute
Sriram Kosuri—Univ. of California, Los Angeles

4:00 pm – 5:00 pm

Keynote: Brian Kobilka—Stanford University

5:00 pm – 7:00 pm

Poster Presentations and Reception

SATURDAY, APRIL 4

8:00 am – 10:00 am

Symposium II: GPCR Structural Biology and Drug Discovery

Speakers:

Chris Tate—Cambridge Univ.
Bryan Roth—Univ. of North Carolina
Minghong Ma—Univ. of Pennsylvania
Laura Wingler—Duke Univ.

10:00 am – 10:30 am

Refreshment Break

10:30 am – 12:30 pm

Symposium III: GPCRs in Pathophysiology and Pathobiology

Speakers:

Jerold Chun—Sanford Burnham Prebys
Kathleen Caron—Univ. of North Carolina
Willis (Rick) Sampson—St. Louis Univ.
Lora Heisler—Univ. of Aberdeen

Posters

Poster presenters for the colloquium will be selected from abstracts submitted by **November 14** to EB 2020 specifically within the GPCR Colloquium topic category (#3016-ASPET). Accepted posters will be presented at both the colloquium on Friday, April 3rd and scheduled to present during one the main EB poster sessions on Sunday-Tuesday.

Registration

This is a satellite meeting to EB 2020. The registration fee will be in addition to your EB registration fees. To register, visit www.aspet.org/gpcr-colloquium-2020 and add a GPCR Colloquium ticket to your EB registration. Space is limited. Be sure to register in advance.

Sponsors

Support for the GPCR colloquium is being provided by the ASPET Division for Molecular Pharmacology, the American Physiological Society, the ASPET Division for Neuropharmacology, and the ASPET Division for Drug Discovery and Development.

Learn how your organization can support the colloquium. Contact meetings@aspet.org or (301) 634-7060. Visit the GPCR Colloquium webpage for updates www.aspet.org/gpcr-colloquium-2020

Annual British Pharmacological Society Meeting: Pharmacology 2019

December 15-17, 2019
Edinburgh, UK



ASPET is pleased to be a guest society at the British Pharmacological Society's (BPS) annual meeting Pharmacology 2019 in Edinburgh, UK.

Program

The meeting will include a selection of topical symposia, plenary lectures, oral presentations, and poster sessions covering the whole spectrum of pharmacology. The ASPET/BPS Joint Symposium, **Precision Medicine: Progress and Challenges**, will be held on Monday, December 16.

The identification and application of genomic information to the prediction, diagnosis, and treatment of specific human diseases has been variously referred to as precision, personalized, stratified, or targeted medicine. The complete sequencing of the human genome at the turn of the century led many biomedical researchers and clinicians to expect that genetic-based diagnosis and appropriately targeted therapies would rapidly become the standard of care for many diseases. Over the last two decades improvements in pharmacogenomic analysis of serious drug reactions and the development of highly effective therapies for some cancers and rare diseases have been realized. However, a broader application of precision medicine approaches has been hindered by

issues of pathogenic DNA penetrance and polygenic risk factors associated with many common diseases. This symposium will provide an overview of the state-of-art for precision medicine approaches and highlight some current successes and limitations.

Co-Chairs:

Michael Jarvis, AbbVie
Andrew Lawrence, Florey Inst.
David MacEwan, University of Liverpool

Speakers:

- **Kenneth Thummel, University of Washington**, *Implementing Precision Medicine: Overview of Progress*
- **Bhagwat Prasad, University of Washington**, *Quantitative Proteomics in Precision Medicine*
- **Sir Munir Pirmohamed, University of Liverpool**, *Pharmacogenomics of Adverse Drug Reactions*
- **James Thaventhiran, University of Cambridge**, *Learning about the Pharmacological Targeting of Immune Checkpoints in Rare-Patients*
- **Steve Cunningham, University of Edinburgh**, *The Development and Clinical Impact of CFTR Modulators in Cystic Fibrosis*

ASPET Leadership

In addition, there will be a number of social events offering networking opportunities so attendees can build their connections with both ASPET and other international members. Be sure to catch one of the ASPET leaders in attendance to learn more about how you can get involved in ASPET.



Wayne L. Backes, PhD
ASPET President



Edward T. Morgan, PhD
ASPET Past President



Charles P. France, PhD
ASPET President-Elect



Mary E. Vore, PhD
Chair, Board of
Publications Trustees



Emily E. Scott, PhD
Chair-Elect, Board of
Publications Trustees



Judith Siuciak, PhD, CAE
ASPET Executive Officer

Booth

Stop by ASPET's booth (#15) to learn more about ASPET initiatives, programs, and member benefits.

Travel Awards

ASPET is pleased to provide young scientists with travel awards to Pharmacology 2019. Award winners will be notified by mid-October 2019.

Registration

ASPET members are eligible for reduced affiliate registration rates. Register now at <https://bit.ly/33fRwun>.

ASPET will be exhibiting at the following meetings this fall:

- **AACR-NCI-EORTC Molecular Targets and Cancer Therapeutics Conference**
Boston, MA
October 26-30, 2019
<https://www.aacr.org/Meetings/Pages/MeetingDetail.aspx?EventItemID=184>
- **Annual Biomedical Research Conference for Minority Students (ABRCMS)**
Anaheim, CA
November 13-16, 2019
<http://www.abrcms.org/>
- **Health Professions Week**
Online Virtual Meeting
November 16-21, 2019
<https://explorehealthcareers.org/hpw/>
- **Pharmacology 2019**
Edinburgh, UK
December 15-17, 2019
<https://www.bps.ac.uk/news-events/events/2019/pharmacology-2019>



Journals News

Dr. Emily Scott Named Next BPT Chair



ASPET's Council approved during a conference call on June 20 the nomination of Dr. Emily Scott to serve as the next chair of the Board of Publications Trustees. Dr. Scott will succeed Dr. Mary Vore, who will have served as chair for six years when

her term ends on December 31. Dr. Scott's first term as chair is for 2020 through 2022; she is eligible for reappointment to a second three-year term.

Dr. Scott is professor in both the Department of Pharmacology and the Department of Medicinal Chemistry at the University of Michigan. She previously held academic appointments at the University of Kansas, Lawrence. She received her bachelor's degree from the Department of Marine Biology at Texas A&M University in Galveston and her PhD degree from the Department of Biochemistry and Cell Biology at Rice University, where her mentors were John S. Olson and Quentin H. Gibson. Dr. Scott was a postdoctoral fellow at Rice and then at the Department of Pharmacology and Toxicology at the University of Texas Medical Branch, Galveston. She was the recipient of an NIH MERIT Award in 2015.

Dr. Scott brings a wealth of editorial experience to the position. She has been a member of the

Board of Publications Trustees since 2016. She has served or still serves on the editorial boards of the following journals: *Journal of Biological Chemistry*, *Drug Metabolism Reviews*, *Drug Metabolism and Disposition*, *Toxicology and Applied Pharmacology*, and *Pharmacological Reviews*. She served on the Faculty of 1000 for pharmacology and drug discovery and toxicology.

She has published 50 journal articles, a book chapter, and holds two US patents. Dr. Scott has made 43 invited presentations at meetings and presented 64 invited seminars at companies and academic institutions.

A member of ASPET since 2002, she has served on the committee for the James R. Gillette Best Paper in *DMD* Award, the Early Career Achievement Award Selection Committee, the Brodie Award Committee, and the Program Committee. Dr. Scott was elected secretary/treasurer and then chair of the Drug Metabolism Division. She has also been an active member in the AAAS and ISSX where she has held elected and appointed positions.

In the nomination materials for Council, Dr. Vore noted that Dr. Scott "has the scientific credentials and relevant experience with the journals that together with an excellent leadership style, will make her an outstanding leader of the BPT."

Molecular Pharmacology Highlighted Trainee Authors

Congratulations to Joseph C. Galley, Kinsie E. Arnst, and Gajanan P. Shelkar for being selected as the Highlighted Trainee Authors for the June, July, and August 2019 issues, respectively.

Joseph Galley is a pre-doctoral trainee in the University of Pittsburgh Molecular



Joseph C. Galley



Kinsie E. Arnst



Gajanan P. Shelkar

Pharmacology Training Program. His mentor is Dr. Adam C. Straub. Dr. Arnst is a postdoctoral fellow at the University of Texas Southwestern Medical Center; the work presented in her article was done at the Department of Pharmaceutical Sciences at the University of Tennessee Health Science Center where her graduate mentor was

Dr. Wei Li. Dr. Shelkar is a postdoctoral research associate in Creighton University's pharmacology and neuroscience program, and his mentor is Dr. Shashank M. Dravid.

Read about their areas of research, current projects, and the anticipated impact of their work at <https://bit.ly/2yX1YeH>

JPET and DMD to Add Highlighted Trainee Authors

The October issue of *The Journal of Pharmacology and Experimental Therapeutics* and the November issue of *Drug Metabolism and Disposition* will include the launch of each journal's Highlighted Trainee Author program. One trainee author (defined as an undergraduate student, graduate student, or postdoc) from each issue will be highlighted with his or her photograph on the journal's homepage image carousel. The image will be linked to information about the author such as the trainee's areas of research, current projects, the anticipated impact of the research, and interests outside the lab. A link to the author's paper will also be provided. Highlighted trainee authors will receive a certificate that notes their selection for this honor.

Trainee authors may be nominated by a coauthor or be self-nominated. The selection process for *JPET* is managed by Dr. Joe Blumer, the journal's minireviews editor. The *DMD* editor, Dr. Jeff Stevens, will initially oversee the process for his journal. Each honoree will be noted on social media and through other means in addition to the information posted on the website.

The Highlighted Trainee Author program was first launched by *Molecular Pharmacology* in October 2017 as a pilot program. Its success has resulted in *JPET* and *DMD* following suit. ASPET is pleased to draw attention to the research of additional exemplary trainee authors by expanding the program to these two journals.

ASPET Journals Seeking Images

For many years, the cover of each ASPET journal has featured an image from an article inside the issue. With very few exceptions, the cover images exactly matched a figure in the article except perhaps for some cropping and enlarging. The journals now welcome more creativity in their cover graphics.

Authors are invited to submit for consideration by the editor a separate cover image based on their article. It can be a composite of multiple images from the article, or it can be a new image, similar to a visual abstract. The cover image still has to be based on an article in the issue, and all cover images must be in color.

For information about image specifications and the submission process, see the Instructions to Authors for any of ASPET's four self-published journals:

- *DMD* — <https://bit.ly/30ptue9>
- *JPET* — <https://bit.ly/32eYBeg>
- *Molecular Pharmacology* — <https://bit.ly/30qhEAw>
- *Pharmacological Reviews* — <https://bit.ly/2XV5gLh>

New *JPET* Editorial Advisory Board Members

In June, the Board of Publications Trustees approved Dr. Piyali Dasgupta and Dr. M.N.V. Ravi Kumar to serve on the *JPET* Editorial Advisory Board.

Dr. Dasgupta is an associate professor with the Department of Biomedical Sciences, Joan C. Edwards School of Medicine, Marshall University, Huntington, WV. She has been an ASPET member since 2009 and received the ASPET-Astellas Award for Translational Pharmacology that year.

Dr. M.N.V. Ravi Kumar is a professor with Texas A&M University in College Station. Dr. Kumar is the guest editor of the September *JPET* special section on drug delivery technologies. The special section includes minireviews and original research articles totaling 34 manuscripts.



Dr. Piyali Dasgupta



Dr. M.N.V. Ravi Kumar

The Board of Publications Trustees welcomes these newest editorial board members and thanks them for their service to *JPET* and the Society.

Plan S Update

As noted by Dr. Backes in his Message from the President, the implementation date for Plan S was changed to January 1, 2021—a year later than originally planned. On May 31, cOAlition S released its revised implementation guidance on Plan S. This revised version was approved by all coalition members and followed a feedback period. None of the original principles behind Plan S have changed.

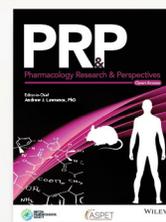
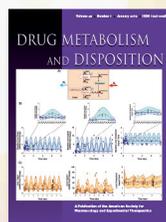
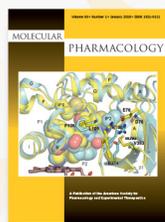
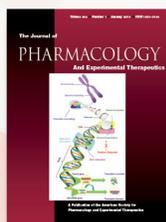
A summary of changes provided on the Plan S website includes: “Greater clarity is provided about the various compliance routes: Plan S is NOT just about a publication fee model of Open Access publishing. cOAlition S supports a diversity of sustainability models for Open Access journals and platforms.” The site also states: “We offer a clear route for those who wish to work within a

subscription model, by utilizing deposit of the AAM [author accepted manuscript] or VoR [version of record] in a repository as already mentioned.”

Therefore, it appears that depositing the “Fast Forward” or author accepted manuscript version of an article in an acceptable repository with no embargo and under a CC BY license will allow Plan S-funded authors to continue to publish in ASPET’s journals. However, open-access fees (also called article publication charges or APCs) will not be paid by Plan S funders for these articles.

There are technical details to resolve, and some of these may increase costs for ASPET. But the extended deadline provides more time to decide on next steps and to develop solutions to the challenges presented by Plan S.

Submit Your Next Paper to an ASPET Journal



Visit us for more information: www.aspet.org/asp/journals

ASPET Supports Peer Review Week



September 16-20, 2019 marks the 5th Annual Peer Review Week. This year's theme is "Quality in Peer Review." Peer Review Week is a global event celebrating the essential role that peer review plays in maintaining scientific quality. Look for more information on ASPET's website and in the journals' social media posts. We asked each editor of ASPET's journals a question related to quality in peer review:



*Eric L. Barker, Editor,
Pharmacological
Reviews*

What are the key things you are looking for in quality peer review?

"Pharmacological Reviews has a mission to publish comprehensive and authoritative reviews in important areas relevant to therapeutic agents. Quality peer review by leading subject matter experts allows us to achieve reviews of this caliber.

Knowledgeable reviewers who can balance broad expertise with an emphasis on critical evaluation of the literature provide the feedback to our authors that ensure we continue to meet the high expectations of our readership. In addition, due to the comprehensive nature of our manuscripts, many may be quite long so we are very grateful to our peer reviewers for accepting these challenging assignments."



*Kenneth D.
Tew, Editor,
The Journal of
Pharmacology
and Experimental
Therapeutics*

What steps do editors take to ensure quality peer review?

"Peer review resembles democracy in that, 'democracy is the worst form of government except for all those other forms that have been tried from time to time,' a quotation secondarily ascribed to Churchill. Scientists frequently conclude that reviewers of their work have abject qualities, but, for the most part, peer review works because editors monitor the

process and intercede where necessary. Upon receipt, a manuscript is viewed by the editor in chief (EIC) and assigned to an associate editor (AE) on the basis of expertise. The AE selects qualified referees and adjudicates acceptability, conveying back to the EIC, who can ratify, or modify, this decision. Editor requests for further qualifying data are designed to enhance subsequent revisions. With the help of referees, a primary role for an editor is to encourage an ultimately publishable study. Avoiding conflict of interest, authors can select an AE to handle the submission, but after a negative decision, they should contact the EIC to identify injustices, understanding that editors endeavor to maintain quality feedback at every level. Despite time constraints, experienced scientists should participate in manuscript reviews in order to lessen the chance that peer review ends up as 'the best form of government'."



*Michael F. Jarvis,
Deputy Editor,
Pharmacology
Research &
Perspectives*

What is the editor looking for when someone reaches out to be a reviewer for the journal?

"Independent and objective peer review by field experts is absolutely critical for achieving rigorous science and impactful publications. Editorial boards are highly dependent and grateful for the timely and thoughtful feedback peer reviewers provide to authors for improving their manuscripts. When

seeking new peer-review opportunities, successful publication in the journal of interest is the best way

to demonstrate the scope and depth of a potential reviewer's scientific expertise. New peer reviewers should also leverage mentoring interactions with established reviewers and editorial board members to identify mutual interests and to further develop their critical thinking and reviewing skills."



Jeffrey C. Stevens, Editor, Drug Metabolism and Disposition

How does someone who has never been a reviewer get trained to be a reviewer?

"The most important training toward becoming a reviewer for a leading journal is gaining subject matter expertise during graduate and post-graduate research. There is no substitute for following the current literature and participating in an active research project in a particular field. This

combination will allow the scientist to assess whether the experimental techniques and associated results described in a paper support the hypothesis, and, on a larger scale, to objectively rate the impact of the paper under review relative to other current research. Journal clubs, where group discussions critique published work, are excellent forums for building reviewer skills. With this training, an aspiring reviewer should then work with a more senior investigator or editorial board member to gain access to a journal – ideally a journal where both have published and are familiar with the expected scientific rigor and review process. Mentorship can often occur within the online review system, and a junior reviewer can request feedback from the associate editor around the first decision. Successful reviewers will balance criticism,

objectivity, and clear direction to the authors for improving the manuscript."



Kathryn E. Meier, Editor, Molecular Pharmacology

How does statistical review work?

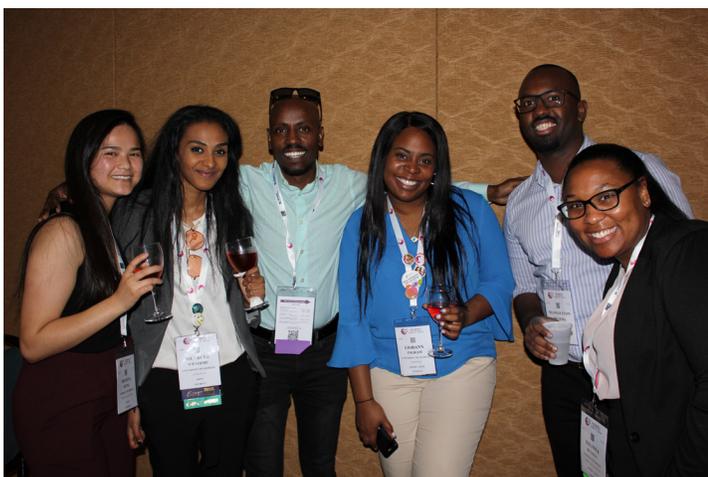
"The statistical review policies for *Molecular Pharmacology* arose from the efforts of the previous editor-in-chief to apply rigorous standards to all papers published in the journal. The approach has expanded under the current EIC, and currently involves three statistical reviewers appointed as associate editors. Critical to the enterprise is the selection of these reviewers, who are all familiar with the types of data submitted to the journal, and who confer with each other to develop consistent standards that can be conveyed to the authors. These reviews address reproducibility along with statistics. At this time, all manuscripts that receive a preliminary decision of "revision requested" are assigned a statistics reviewer. In this way, the two scientific reviews and the statistics review are presented to the authors simultaneously with the decision letter. Authors are asked to address the concerns of all three reviewers. The statistics reviewers strive to be educational and helpful in their comments to the authors. As this procedure has evolved, the need to provide guidelines to prospective authors has become apparent. This has resulted in publication of articles in the journal explaining 'best practice,' and in pending revision of the Instructions to Authors for all of the society journals."

If you are interested in becoming a reviewer, plan to attend the Journals Workshop: An Interactive Guide to Publishing, Reviewing, and Ethics Issues at ASPET's Annual Meeting in San Diego next April. ASPET's editors will explain the peer review process and how to review journal articles.



Membership News

Renew Your ASPET Membership for 2020



Thank you for choosing to be a member of ASPET! We hope you are enjoying all the great membership benefits as much as we appreciate having you as a member.

Continuing your membership is important to the success of ASPET and the pharmacology community. Don't forget to renew your membership soon so that you don't miss any exciting opportunities to grow your connections and advance your career.

Everyone at ASPET headquarters works to fulfill the Society's mission of promoting pharmacology and to provide our members with the necessary tools to enhance their careers, expand their networks, and share their important research to transform discoveries into therapies. Hear directly from some ASPET members about the value belonging to the Society:

The Value of ASPET Membership



Ryan Staudt is a graduate student from the University of Pittsburgh. He joined ASPET in 2017.

Why did you join ASPET?

RS: A friend in my pharmacology program joined ASPET early in his research career and spoke positively of the Young Scientists Committee and the various conference and networking opportunities made available to him through his ASPET membership. He encouraged me to join and introduced me to the ASPET Washington

Fellows program after learning about my professional interest in science policy.

What ASPET membership benefit has been the biggest help to you since joining?

RS: The best part of joining ASPET has been the opportunity to join professional committees as it has rapidly expanded my scientific network beyond my institution and immediate collaborators. Through my participation in the Young Scientists Committee, the Science Policy Committee, and ASPET-specific programming at EB, I've been fortunate to build connections with researchers from around the country that I never would have met otherwise.

What is your favorite part of the ASPET Annual Meeting at EB?

RS: Every year I'm blown away by the diversity of ASPET research at the Annual Meeting and find myself wandering, amazed, through ASPET-led posters, presentations, and symposia. Although we are united by a common thread of pharmacologically improving human health, there is such a variety in expertise and perspectives between ASPET researchers that becomes very evident during the meeting itself. Within each bit of programming during the meeting lies the opportunity to learn something fascinating and completely new.

What advice would you give to students who are interested in pursuing pharmacology?

RS: When choosing a research lab, the most important thing is to find a lab and mentor that will help you thrive professionally and emotionally. You can learn new and unfamiliar techniques, and you can find something exciting within the heart of a project that initially seems uninteresting. But identifying a management style and lab environment that match your personality and communication style is essential to getting the most out of your academic research career.



Brad Andresen is an associate professor in the College of Pharmacy at Western University. He joined ASPET in 2002.

Why did you join ASPET?

BA: I joined ASPET in my second year of my PhD in a pharmacology department. At the time, I was already a member of the APS and had attended two EB meetings. Additionally, my thesis work was a classical pharmacological study with many drugs and concentration-response curves. ASPET was the natural scientific venue to present my thesis work and network for postdoctoral fellowships. My mentors also played a role in getting me to apply.

How has membership in ASPET benefitted your career?

BA: ASPET membership has allowed me to network with many scientists, and I have formed life-long friendships through ASPET. Such a network is vital to

a career in science as it provides easy collaborations and people to ask for advice. Moreover, ASPET connections led to being appointed to an AHA study section as well as the JPET Editorial Advisory Board. Through being an active member, I also became involved in other committees. Such "outside work" is essential for promotion and tenure in academics. Without my ASPET connections, I would not have been on most of the service committees I have served upon, and I would not have my current academic position.

Why do you think it is important to attend the ASPET Annual Meeting at EB?

BA: Attending the annual meeting is crucial. The networking that occurs at the meetings, as I have discussed above, is essential to advance your career. Additionally, EB gives the attendee the chance to view a wide range of science that one may not find in a more focused PubMed search, and you can talk to those doing the work in most cases. In fact, I have used poster sessions to troubleshoot assays in my lab when I see a poster that has similar data.

What advice would you give members who want to get more involved in ASPET?

BA: There is the Nike slogan, and then there is the reality that a young scientist can perceive barriers that lay in front of them. For established researchers, getting involved may be just do it, but for the young, at least in my case, there may be perceived barriers to getting involved. I have three pieces of advice to deal with commonly perceived barriers. First, find a mentor. My ASPET mentor that I believe launched my career in many aspects I have never worked with academically. Second, do not doubt yourself and articulate your views clearly. Your experiences plus your training give you a unique viewpoint that adds value to discussions. Lastly, we are all busy, and you will be surprised to find that the workload of volunteering with ASPET will not be as burdensome as you may believe. Granted, this also depends on what you choose to do, but the keyword here is "choose."

What advice would you give to someone who is interested in a career in pharmacology?

BA: Pharmacology is a much broader discipline than I envisioned as a graduate student. Thus my first question to you is, "what is your passion?" Once

you have identified your passion, find a mentor that can help you cultivate that passion into a career. This mentor may not be your academic advisor/PI. Also, search for experiences in the area of your passion. Lastly, network. At meetings talk to people that are in the field that you are passionate about.

However, I cannot end my advice on what to do, as one must also be sober about the job outlook. Many ASPET members are academics focused on research,

and the academic research landscape has changed drastically in my career and will likely continue to evolve. This may make it difficult to find an academic research career. However, there are many options for pharmacology experts, as most health care fields require training in pharmacology. Therefore, one must not only look to their passion but also look at what path will allow them to pursue their passion.

How to Renew

Be sure to watch your email for your 2020 dues renewal notice later this month. Don't want to wait for the email? You may complete your renewal online by visiting www.aspet.org/renew or by contacting Member Services at 301-634-7060.

Thank you for your valued support of ASPET.
We look forward for another amazing year!

New Members

Regular Members

Nasir A. Afsar, Jinnah Medical & Dental College, Pakistan
David Askew, Univ of Cincinnati, OH
Caroline A. Austin, Newcastle Univ, UK
Mark Baccei, Univ of Cincinnati, OH
Jonathan Baell, Monash Inst of Pharmaceutical Sciences, Australia
Maria Brown, Mount St. Joseph Univ, OH
Vincent J. Davisson, Purdue Univ College of Pharmacy, IN
Amro Hamdoun, Univ of California, San Diego

Blaine Jacobs, UIW Sch of Osteopathic Med, TX
Barry C. Jones, Pharmaron UK Ltd
Kin Sing Stephen Lee, Michigan State Univ
Michaele Manigrasso, New York Univ
Kushal Shah, Vertex Pharmaceuticals, MA
Serge-Emile Simpson, Albert Einstein Medical Center, PA
Tanchun Wang, Drexel Univ, PA

Postdoctoral Members

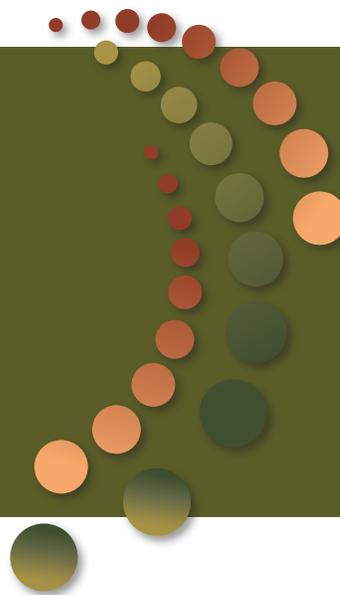
Ewa Galaj, NIDA IRP, MD
Mirhan Makled, Univ of Alabama
Ranran Zhang, Rutgers Univ, NJ

Affiliate Members

Jeffrey A. Koenig, USAMRICD, MD

Graduate Student Members

Ahmed A. Abdalla, Iowa State Univ
Olumuyiwa A. Adejumobi, Univ of Ibadan, Nigeria
Malik Appleton, Univ of Kentucky
Morgan Carson-Marino, Univ of Florida
Brian David, I, Univ of Illinois at Chicago
Joanne T. deKay, Johns Hopkins Univ, MD
Mary T. Doan, Drexel Univ, AJ Drexel Autism Inst, PA
Nina Marie G. Garcia, Duke Univ, NC



Jill Hattaway, Duke Univ, NC
 Kristi N. Lorelli, Saint John's Univ, NY
 Gianni V. Martino, Mercer Univ, GA
 Jaquelyn N. Sanchez, Univ of Michigan
 Shruthi R. Shetty, Ohio State Univ
 Nada Tawfeeq, Florida A&M Univ
 Alec G. Trub, Duke Univ, NC
 Emilia Zywt, Univ of North Carolina

Post-Baccalaureate Members

Sinibaldo R. Romero Arocha, Mayo Clinic, MN
 Shayda Abazari, Stanford School of Med, CA
 Isabella Blanco, Univ of Virginia
 Ping Chen, Univ of Kansas Med Center

Undergraduate Student Members

Halle C. Adair, Ohio State Univ
 Charles H. Adams, Kenyon College, OH
 Stephanie Akanoh, Univ of Maryland
 Fayssal Alqudrah, Rutgers Univ, NJ
 Chase A. Amos, Univ of Virginia
 Steven Angtuaco, Washington Univ in St Louis
 Nurul A. Azhar, Michigan State Univ
 Felipe E. Becerril Castillo, Pomona College, CA
 Matthew J. Benedek, Xavier Univ, PA
 Anna J. Benton, Smith College, PA
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 Ameera Billings, Yale Univ, CT
 Joseph D. Brenner, Hillsdale College, OH
 Abigail Buckley, Univ of Pittsburgh, PA

Raleigh Butler, Middle Tennessee State Univ
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 Victoria E. Cespedes, Emory Univ, GA
 Talia Cheifetz, Binghamton Univ, NY
 Toria Chukwuemeka, Xavier Univ, LA
 Emily Chung, Rutgers Univ, NJ
 Bradley D. Clegg, Univ of Michigan
 Sarah Colon Plaza, Florida International Univ
 Briana Cooper, Roger Williams Univ, NH
 Alyssa Cozzo, San Diego City College, CA
 Noah H. Croasdill, Michigan State Univ
 Alexander H. Cunningham, Western Colorado Univ
 David D. Davila, University of Miami
 Carter A. Davis, Jr, Univ of California, San Diego
 Henry N. De Hoyos, Univ of Texas HSC San Antonio
 Jordan S. Dean, Univ of Rhode Island
 Katie Deck, John Brown Univ, KS
 Kat Ebert, Michigan State Univ
 Joel Ennin, St. John's Univ, NY
 Herika M. Fernandez, Univ at Buffalo, NY
 Douglas E. Ferrell, Louisiana Tech Univ
 Maya Fletcher, Gonzaga Univ, WA
 Alexis Garcia, Univ of California, San Diego
 Gwenth Gasper, Univ of Notre Dame, WI
 Taylor Gatesman, Westminster College, PA
 Raeann K. Goins, Univ of Kentucky
 Veronica A. Gonzalez, Dallas Baptist Univ, TX
 Sara Green, Univ of Mississippi

Katelyn Grenell, Case Western Reserve Univ, OH
 Rachel Grewette, Stevenson Univ, MI
 Emma M. Gusman, Pacific University, OR
 Clifton Haacker, Baylor Univ, TX
 Cooper J. Halliday, Center for Biologic Imaging, PA
 Usman Z. Hamid, Univ of Kentucky
 Minseon Han, Rutgers Univ, NJ
 Logan Harper, Univ of Wisconsin
 Nicholas R. Harris, Tulane Univ, LA
 Travis J. Heitz, Univ of Cincinnati, OH
 Nathaniel P. Hernandez, Duke Univ, NC
 Elizabeth Hewitt, Univ of Mississippi
 Gillian Hughes, San Diego City College, CA
 Martina S. Hunt, Washington State Univ
 Angelica A. Jang, Denison Univ, OH
 Sumer Jasmine, Duquesne Univ, PA
 Aleasha H. Jay, Univ of Texas HSC San Antonio
 Maris K. Kamalu, Pomona College, WA
 William J. Kastroll, Boston College, MA
 Julia Kathman, Ohio Univ
 Benjamin R. Kessler, Michigan State Univ
 Zain Khera, Vanderbilt Univ, TN
 John Kim, Vanderbilt Univ, TN
 Joseph D. Kim, Stony Brook Univ, NY
 Ipsita Krishnamurthy, Reed College, OR
 Anirudh Krishnan, Rutgers Univ, NJ
 Sahil Kumar, Univ of Pittsburgh Med Ctr, PA
 Hamdi Lababidi, Rutgers Univ, NJ
 Becky Lin, Univ of Pittsburgh, PA
 Gregory R. Lombana, Duke University, NC

- Adam Louie, Pacific Univ, OR
 Sebastian Maletz, Univ of Florida
 Everette L. Martin, III, Rhodes College, AR
 Marissa S. Martinelli, Univ of Michigan
 Lilia Masterson, McKendree Univ, MO
 Abby Matheny, Williams College, PA
 Nadia McBean, Spelman College, GA
 Alexis J. McCalla, Univ of Oklahoma
 Natalie McMyn, Univ of Michigan
 Adrian D. Mendez, Chaffey College, CA
 Matthew Murdock, Univ of Maryland
 Justine T. Murphy, Bay Path University, NH
 Katherine M. Nowak, Univ of North Carolina
 Veronica S. O'Connor, Hillsdale College, MI
 Meri Okorie, California Polytechnic Univ
 Ciara Phares, Univ of Cincinnati, OH
 Tate Poplin, Rice Univ, TX
 Elizabeth Price, Binghamton Univ, NY
 Shikha Puri, Univ of Pittsburgh, PA
 Mikayla Quigley, Univ of Miami, FL
 Brenda Quinones, Univ of Puerto Rico
 Kiana Rahimi, Univ of Florida
 Kaydee Anne Ramos, Pacific Univ, OR
 Dante E. Reyna, Univ of Texas at El Paso
 Rocío Rivera Rodríguez, Univ of Puerto Rico
 Raider E. Rodriguez, John Jay College-CUNY
 Catherine M. Rojas, Stockton University, NJ
 Darling P. Rojas, Rutgers Univ, NJ
 Veronica V. Samojedny, Tulane Univ, LA
 Brandon S. San, Univ of Washington
 Luke A. Scherz, Univ of Pittsburgh, PA
 Lauren Schnitkey, Ohio State Univ
 Jasmine Scott, Spelman College, GA
 Kevin M. Scott, Elon University, NC
 Madison T. Sewick, Michigan State Univ
 Ryan N. Sheehy, Univ of Notre Dame, IN
 Elizabeth Shelby, Tennessee State Univ
 Emily Shockley, Xavier Univ, OH
 Simeon Simmons, Univ of Central Arkansas
 Juliana P. Simpson, Univ of Texas HSC San Antonio
 Olivia Sirpilla, Walsh Univ, OH
 Sarah N. Steiner, Cornell Univ, NY
 Laura K. Stewart, Gonzaga Univ, WA
 Samantha N. Stewart, Rutgers Univ, NJ
 Devon J. Stuart, Amherst College, MA
 Lauren M. Styczynski, Univ of Cincinnati, OH
 Anna L. Tabet, II, Univ of the Incarnate Word, TX
 Salena R. Tannouri, Pacific Univ, OR
 Christina Taragjini, New York Univ
 Jaylen E. Taylor, Eastern Michigan Univ
 Abby L. Tescher Chem, Pacific University, OR
 Matthew Thompson, Montana State Univ
 James C. Tilley, Univ of Arkansas
 Lauren D. Todor, SUNY
 Linh Tram, Univ of Texas HSC San Antonio
 Allegra VanderWilde, Univ of Portland, OR
 Andrea E. Vargas, Univ of North Carolina at Chapel Hill
 Nikhil Vasireddi, Case Western Reserve Univ, OH
 Ana Vitantonio, Univ of Pittsburgh, PA
 Mark J. Ware, American Univ, DC
 Alaina M. Wojciechowski, Univ at Buffalo, NY
 Michelle Yeung, Rutgers Univ, NJ
 Sophia A. Zabul, Univ of Texas at Austin
 Margaret Zhang, Rutgers Univ, NJ

IN SYMPATHY

ASPET notes with sympathy the passing of the following members.

Joel G. Hardman
 Louis S. Harris
 Jeremy G. Richman

Raymond W. Ruddon
 Elwood O. Titus
 Paul Vanhoutte

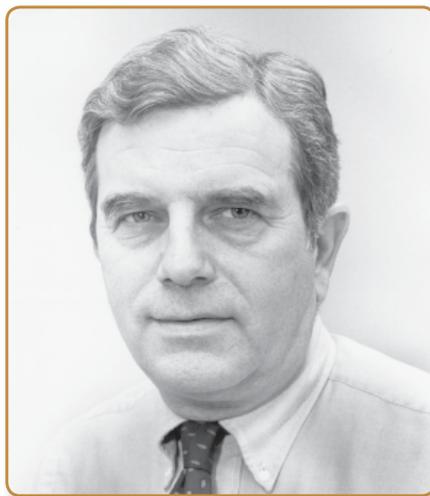
A Tribute to Joel G. Hardman, PhD

Submitted by Lee Limbird

Joel Hardman, PhD, an internationally recognized scientist and educator who chaired the Department of Pharmacology at Vanderbilt University School of Medicine from 1975 to 1990, died June 30, 2019 in Hoosick Falls, NY, after a lengthy illness. He was 85. Dr. Hardman served as president of ASPET from 1993-1994, after contributing to ASPET in a number of leadership roles on Council beforehand.

A native of Colbert, GA, Dr. Hardman earned his bachelor's and master's degrees in pharmacy from the University of Georgia, and his PhD in pharmacology from Emory University in 1964. That year Dr. Hardman came to Vanderbilt to do postdoctoral work with Earl Sutherland, MD, who won the Nobel Prize in medicine in 1971 for his discovery of cyclic AMP. In 1967, Dr. Hardman was named assistant professor of physiology, and in 1972 he was promoted to full professor. He served as chair of pharmacology at Vanderbilt from 1974-1990. He later served as associate vice chancellor of health affairs for Vanderbilt Medical Center, with a focus on enhancing research infrastructure. At his retirement, the Joel G. Hardman Endowed Chair in Pharmacology was established to recognize his expansive contributions to the rigorous research and training culture he established at Vanderbilt.

Joel Hardman's identification during his postdoctoral research of guanylyl cyclase as the enzyme responsible for synthesizing cyclic GMP from GTP led to the appreciation that cGMP, like cAMP, can serve as an intracellular second messenger in cellular regulation. Much of the fundamental knowledge of guanylyl cyclase and cyclic nucleotide phosphodiesterases, which synthesize and degrade cyclic GMP, respectively, is a result of Dr. Hardman's early research. John Exton, who was a colleague of Joel Hardman at Vanderbilt and collaborated with him on several projects concerning cyclic GMP, commented



about the depth of his knowledge of pharmacology and the rigor of his experimental approaches and their interpretation. He was profoundly honest and trustworthy in all aspects of his career and, in this way, was a role model to all his students and colleagues.

After a sabbatical in the Department of Physiology at the University of Oxford, and as a visiting professor at the Free University of Brussels, Dr. Hardman returned to Vanderbilt in 1974 to succeed Allan D. Bass, MD, as chair of pharmacology. In this role, he cultivated the department as a premier place for research and training in pharmacology nationally. He was a gifted educator who nurtured the careers of numerous students, postdoctoral fellows, and young faculty members. A colleague notes: "The fact that two of his very few trainees, (the late) David Garbers, PhD, and Joseph Beavo, PhD, were elected to the National Academy of Sciences affirms Joel's insistence on focusing on important problems with critical inquiry." Students remember his emphasis on pharmacology as a *hybrid* discipline, one that broadly included the study of *all* chemical agents and how they affected living organisms. He defined our discipline in the broadest possible terms.

Joel Hardman had a particular interest in the development of students. As director of the medical school course in pharmacology, he was an ever-present attendee at lectures, with constructive feedback to faculty whose session with the students he might have deemed "sub-optimal." His teaching of graduate students demanded their rigor and their creativity in using the content he shared to solve new problems. Jeffrey Conn, former head of neuroscience at Merck and founding director of the Vanderbilt Center for Neuroscience Drug Discovery recalled that "Joel was a truly great man and such an example and mentor to so many young scientists. I was fortunate to be a graduate student when he was

chair of pharmacology and will always be indebted to him for the energy and thoughtfulness that he invested in each of the students in his department. He met with the first-year students weekly in his office, and I learned so much from those meetings about the aspects of science that you never learn in a class, such as research integrity, focusing on research that has a true impact, scientific writing, and research funding. What an amazing opportunity to study under his guidance.”

Joel also was a natural leader and someone whose leadership strengths were worthy of modeling. For example, an early faculty recruit, Peter Reed, PhD, later became pharmacology’s director of graduate studies and dean of the Vanderbilt University Graduate School. Elaine Sanders-Bush, PhD, another faculty colleague, became director of the Vanderbilt Brain Institute, a trans-institutional interdisciplinary research and training center, and director of the Neuroscience Training Program at Vanderbilt. Elaine Bush shared: “As a young faculty member, I was fortunate to have Dr. Hardman as my chair - his door was always open to provide insightful critique and unwavering support. He was truly an exceptional person who made a positive and lasting impact on all of us around him.”

For much of the 1990s, Dr. Hardman served with Lee Limbird, PhD as co-editor-in-chief of Goodman and Gilman’s *The Pharmacological Basis of Therapeutics*. He also served as editor of *Molecular Pharmacology*. “There simply are not words to describe my gratitude to Joel Hardman for bringing me to Vanderbilt, and continually mentoring me with exacting but supportive input,” said Limbird, who joined the Vanderbilt faculty in 1979 and who succeeded Dr.

Hardman as chair of pharmacology in 1991. “There simply could not be a better mentor and boss.”

Joey V. Barnett, PhD, vice chair of pharmacology, director of the Office of Medical Student Research and assistant dean of physician-researcher training, acknowledges that “I was lucky enough to be a PhD student in the department while Dr. Hardman served as chair. He set high standards for us and worked to provide opportunities and resources that enabled us to meet those standards. All the while he was approachable and supportive. Dr. Hardman’s commitment to mentoring shaped the training program that Vanderbilt has today.”

Dr. Hardman is survived by his wife of 64 years, Georgette Hardman of Shushan, NY; children Pam Hardman of Bellingham, WA; Fran Goldstone (Jeff) of Cambridge, NY; Mary George Hardman of Troy, NY; Joel Hardman (Laurie Puchner) of Edwardsville, IL; and grandchildren Jacob Goldstone, Gregory Goldstone, Luke Puchner-Hardman, Maggie Puchner-Hardman, Emelissa Vandenbosch and Alice Hardman.

In 1992, the Joel G. Hardman Student-Invited Pharmacology Forum was established to recognize Dr. Hardman’s sustained interest in training young scientists. The annual forum covers topics ranging from gene therapy to America’s opioid epidemic. In honor of Dr. Hardman, donations may be given in support of the Joel G. Hardman Student-Invited Pharmacology Forum. Checks may be made out to Vanderbilt University with the words “Hardman Forum” in the memo line, and sent to the Vanderbilt University Department of Pharmacology, 476 Robinson Research Building, Nashville, TN, 37232-6600.

With admiration and affection, Joel’s former Vanderbilt students and colleagues

Do you know someone who is not yet a member of ASPET?



Help ASPET stay strong by recruiting your fellow colleagues, students, and friends! A growing ASPET means greater recognition for the field of pharmacology, more resources and support for our members, and a louder voice with policy makers.

Tell them to apply online at www.aspet.org

What Snaps Your Socks – A Tribute to Dr. Raymond (Ray) W. Ruddon

Submitted by John S. Lazo and Alan F. Lau

We are very sad to announce that our mentor and dear friend, Raymond (Ray) W. Ruddon, MD, PhD, passed away on April 26, 2019 in Ann Arbor, MI. At the time he was professor emeritus of pharmacology at the University of Michigan Medical School. Ray was a rare scientist who held significant successful positions in academia, industry, and government. From 1964 until 1976 he was on the faculty in pharmacology at the University of Michigan. Until 1981, Ray served on the staff of the National Cancer Institute and then returned to Michigan to chair the Department of Pharmacology. Ray served as director of the Eppley Cancer Center, University of Nebraska, from 1990-1997, then was named corporate vice president for science and technology at Johnson & Johnson. He returned to Michigan in 2004 as professor of pharmacology and senior associate dean for research and graduate studies in the medical school. Ray was an ASPET member for 51 years and authored more than 100 scientific papers and five books, including the widely used oncology text, *Cancer Biology*. This exceptionally diverse scientific career reflects Ray's willingness to explore everything with a curious spirit. Ray was principled, down to earth, and possessed a keen sense of humor. These were qualities we were blessed to experience and emulate as his graduate students.

Ray and his beloved wife, Lynne, adopted us as family. We remember wonderful days at their summer "cottage" on Portage Lake, sailing, grilling, and enjoying each other's company. In addition to his remarkable scientific accomplishments, Ray was an avid classical music lover, book collector, and loyal University of Michigan Wolverines fan. He also was a poet, publishing four volumes of poetry. To paraphrase Edwin Land of Polaroid fame, Ray thought we should all strive to be at the interface of science and art.

Last October, we visited Ray after the death of Lynne, a marriage that spanned 56 years. It was a remarkable event for us, stimulating many wonderful



memories about how much he had influenced us and so many other individuals. And, it was particularly touching to realize that Ray loved and appreciated us. Ray had this gift of making you feel as if you could do anything. He was full of stories and aphorisms. When someone would ask him what they should study, Ray would almost instantly say "*Whatever snaps your socks.*" This usually forced the bewildered questioner to walk off and rethink the question. That

was Ray's way of getting you to probe your motivation deeply. To be successful and happy, Ray believed one needed curiosity, passion, imagination, serendipity, love of poetry, history, music, and literature, along with at least one great love in your life. We encourage you to visit the University of Michigan Faculty Memoir Project (<https://www.lib.umich.edu/faculty-memoir/faculty/raymond-w-ruddon>) and view his many contributions.

Some of Ray's early philosophical guides are:

1. Praise youth and they will prosper
2. I never met anyone I didn't learn something from whether they be auto mechanics, custodians, animal care takers, faculty, students, or administrative staff. So listen up. You need them all to be part of the team and their success depends on you. If they are successful, so will you be.
3. Talk to the "people in the trenches" who are doing the real work, ask them what needs to be done, and do it.
4. Develop a "to do" action list before you start the job, modify it as you go, and develop an annual strategic plan with bench marks, responsibilities for implementation, and deliverables.

We miss Ray dearly. Ray is survived by friend Adella Blain and daughters: Kathryn Therese Ruddon, Jennifer Ruddon Kircher, and Marjorie Ruddon Gurnik. He has six grandchildren: Lindsey and Kristen Kircher, Natalie and Holly Gurnik, Annika and Ian Moore.



Members in the News

Achievements, Awards, Promotions, and Scientific Breakthroughs

V. Craig Jordan, CMG, OBE,
PhD, DSc, FMedSci

*University of Texas MD Anderson
Cancer Center*



On June 7, 2019 it was announced by Buckingham Palace that Her Majesty Queen Elizabeth II had appointed Professor V. Craig Jordan, OBE as Companion of the Most Distinguished Order of St. Michael and St. George (CMG) for services to women's health.

The symbols of the Order are warrior saints. Professor Jordan is advanced from the Order of the British Empire (OBE), which is ninth in priority of the active orders of chivalry to CMG, which is seventh in priority. He also has increased in rank within the order. The award is rare and select as only 1,750 CMGs total are permitted.

The award recognizes Jordan's discovery of selective estrogen receptor modulators (SERMs) as the first multifunctional medicines for women that can treat several diseases simultaneously. These medicines switch on or switch off estrogen target tissue sites around a woman's body to treat or prevent osteoporosis and breast cancer.

The CMG recognizes extraordinary leadership and exceptional accomplishment in the diplomatic service, security services, or overseas service by British citizens in foreign countries. To read more about this achievement and Dr. Jordan's work, please visit: <https://www.aspet.org/aspet/news/news/2019/08/08/members-in-the-news-v-craig-jordan>

Dr. Jordan has been a member of ASPET since 1981 and is a member of the **Divisions for Molecular Pharmacology, Drug Discovery and Development, Drug Metabolism and Disposition, Pharmacology Education, Toxicology, and Translational and Clinical Pharmacology.**

Dr. Gary C. Rosenfeld

University of Texas - McGovern Medical School



Dr. Gary C. Rosenfeld is this year's recipient of the Edward Patrick Finnerty Lifetime Achievement Award from the International Association of Medical Science Educators (IAMSE). The award is given to an individual who has demonstrated a sustained

involvement in, and commitment to, the advancement of the IAMSE through many types of service to the organization at the highest levels of performance.

Dr. Rosenfeld has served for more than 20 years as assistant dean and associate dean for educational programs. He has won many awards during his career including IAMSE's Early Career Award for Excellence in Teaching and Innovation in 2008 and, in 2017, the AAMC Southern Group on Educational Affairs (SGEA) Career Educator Award and the AAMC Group on Educational Affairs (GEA) Merrell Flair Award. Among his many educational achievements, Dr. Rosenfeld is the founding chair of the Division for Pharmacology Education (DPE) of ASPET, the founding chair of McGovern Medical School's Academy of Master

Educators, and the founding director of the school's Scholarly Concentrations Program. In 2018, he was honored with a STAR Award for 45 years of service with the medical school.

Dr. Rosenfeld has been a member of ASPET since 1977 and is a member of the **Divisions for Pharmacology Education, Behavioral Pharmacology, and Neuropharmacology**.

Dr. Kelly M. Quesnelle

Western Michigan University



Dr. Kelly M. Quesnelle, PhD, is this year's recipient of The Early Career Award for Excellence in Teaching and Innovation from the International Association of Medical Science Educators (IAMSE). The Early Career Award for Excellence in

Teaching and Innovation honors an IAMSE member who has made significant innovations to the field in the short time they have focused their careers toward enhancing teaching, learning, and assessment.

Dr. Quesnelle is an associate professor of biomedical sciences at the Western Michigan University Homer Stryker M.D. School of Medicine (WMed). Dr. Quesnelle earned her BS from the University of Michigan and her PhD from the University of Pittsburgh School of Medicine (Pitt). She completed a postdoctoral fellowship in the Vascular Medicine Institute at Pitt, including training at the U.S. Food and Drug Administration. In 2014, Dr. Quesnelle joined WMed as a founding faculty member where she currently serves as the pharmacology discipline director and the basic science director of the hematology and oncology course. Dr. Quesnelle's educational research focuses on assessment outcomes and innovation in the undergraduate medical classroom.

Dr. Quesnelle has been a member of ASPET since 2014 and is a member of the **Division for Pharmacology Education**.

Dr. Edilberto Raynes

Tennessee State University



Dr. Edilberto Raynes, associate professor in the Department of Physical Therapy at Tennessee State University, received the Leadership in Research and Faculty Scholarship Award from the Center for Innovation in Research and Teaching (CIRT)

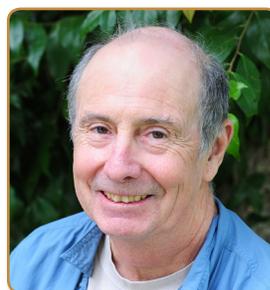
at Grand Canyon University in June 2019.

Dr. Raynes obtained his doctor of medicine degree from the University of the City of Manila in 1991 and was a practicing pediatrician prior to migrating to the United States. He earned his PhD in public health with a concentration on epidemiology from Walden University in Minneapolis in 2013. He has been a health disparity fellow from the University of North Texas at Fort Worth, a fellow of the Texas' Steps Toward Academic Research (STAR) program, and a fellow in a Minority Serving Institution from the American Evaluation Association. Now at Tennessee State University in Nashville, Dr. Raynes is a member of the Institutional Research Board.

Dr. Raynes has been a member of ASPET since 2015 and is a member of the **Divisions for Pharmacology Education, Behavioral Pharmacology, Cardiovascular Pharmacology, Drug Discovery and Development, Drug Metabolism and Disposition, Molecular Pharmacology, Neuropharmacology, and Translational and Clinical Pharmacology**.

Dr. Bruce Hammock

University of California, Davis



Dr. Bruce Hammock, distinguished professor of entomology at the University of California, Davis, has received a \$6 million, eight-year "Outstanding Investigator" federal grant for his innovative and visionary environmental health

research. The award is part of the Revolutionizing Innovative, Visionary Environmental Health Research (RIVER) Program of the National Institutes of Environmental Health (NIEHS). This award is based on a track record of innovation and a “visionary” proposal to address serious problems in environmental health. The award will be used to study ER stress as an underlying mechanism of neuropathic pain.

Dr. Hammock has been a member of ASPET since 2003 and is a member of the **Divisions for Toxicology, Cardiovascular Pharmacology, Drug Metabolism and Disposition, Molecular Pharmacology, and Neuropharmacology.**

Dr. Paul Czoty

Wake Forest School of Medicine



Paul Czoty, PhD was promoted to full professor in the Department of Physiology and Pharmacology at Wake Forest School of Medicine. Recently, Dr. Czoty received a five-year grant from the National Institute on Drug Abuse (NIDA) to study how

long-term ethanol drinking alters the abuse-related effects of cocaine and vice versa in nonhuman primate models of substance use disorders. Dr. Czoty’s lab focuses on the use of behavioral pharmacology and noninvasive brain imaging techniques to assess the effects of drugs of abuse on neurobiological targets associated with cocaine and alcohol use disorders, with the overall goal of identifying new pharmacotherapies for clinical populations with polydrug use. Dr. Czoty is also serving as director of the integrative physiology and pharmacology PhD program and as chair of Wake Forest’s Institutional Animal Care and Use Committee.

Dr. Czoty has been a member of ASPET since 2001 and is a member of the **Divisions for Behavioral Pharmacology and Neuropharmacology.**

Dr. Richard van Rijn

Purdue University



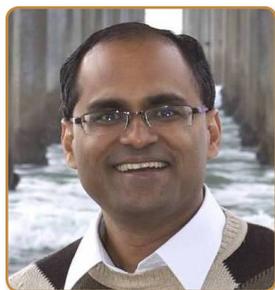
Dr. Richard van Rijn took on the position of associate professor with tenure in the Department of Medicinal Chemistry and Molecular Pharmacology at Purdue University in August 2019. He received an integrated bachelor/master degree in

biopharmaceutical sciences from Leiden University and a PhD degree in molecular pharmacology from Vrije Universiteit Amsterdam. His postdoctoral training in behavioral neuropharmacology was performed at the Ernest Gallo Clinic and Research Center at the University of California San Francisco, studying opioid receptor function related to substance use disorder and pain transmission. In 2013, he joined the Department of Medicinal Chemistry and Molecular Pharmacology at Purdue University as a tenure-track assistant professor. His lab studies mechanisms by which opioid receptors modulate alcohol use, pain, and mood to aid drug discovery efforts in his lab to create novel treatment options with reduced side effect profiles. His research has a strong focus on the role of beta-arrestin proteins in mediating opioid effects. He has received multiple NIH awards from NIAAA, NIDA, and the Brain and Behavior Research Foundation.

Dr. van Rijn has been a member of ASPET since 2012 and is a member of the **Divisions for Molecular Pharmacology, Behavioral Pharmacology, Drug Discovery and Development, Neuropharmacology, and Pharmacology Education.**

Dr. Manoranjan S. D'Souza

Ohio Northern University



Manoranjan S. D'Souza, MD, PhD, was recently promoted with tenure to associate professor in the Department of Pharmaceutical and Biomedical Sciences, Raabe College of Pharmacy, Ohio Northern University. Dr. D'Souza's research focuses on understanding the

neurobiological mechanisms that mediate the rewarding effects of nicotine, and in identifying specific neural circuits that play a role in the learning and extinction of nicotine-associated environmental cues using a combination of behavioral, molecular, and neurochemical techniques in rodent models

Dr. D'Souza has been a member of ASPET since 2008 and is a member of the **Divisions for Behavioral Pharmacology, Drug Discovery and Development, Neuropharmacology, Pharmacology Education, and Translational and Clinical Pharmacology.**

Dr. Razaz A. Felemban

King Saud bin Abdulaziz University



Dr. Razaz A. Felemban was promoted in July to assistant professor in the Pharmaceutical Sciences Department at King Saud bin Abdulaziz University in Jeddah, Saudi Arabia. Dr. Felemban has worked on finding a new therapy for amyotrophic lateral sclerosis

(ALS) in collaboration with the Zarnescu and Khanna labs at the University of Arizona. The work used a small molecule targeting TDP-43's RNA recognition motifs to reduce locomotor defects in a *Drosophila* model of ALS. She will continue furthering this work in her new position.

Dr. Felemban joined ASPET in 2019 and is a member of the **Divisions for Neuropharmacology, Drug Discovery and Development, Molecular Pharmacology, Pharmacology Education, and Translational and Clinical Pharmacology.**

Share your achievements, awards, and scientific breakthroughs with fellow ASPET members. Send your news to your division's communications officer:

Behavioral Pharmacology:

Alison Wakeford at alison.wakeford@emory.edu

Cancer Pharmacology:

Mark Leggas at mark.leggas@uky.edu
or Megan Zavorka Thomas at zavorkathomas.1@osu.edu

Cardiovascular Pharmacology:

Dave Averill at daverill@som.geisinger.edu

Drug Discovery and Development:

Craig Beeson at beesonc@muscc.edu
or Donald Button at dbutton@adamaspharma.com

Drug Metabolism and Disposition:

Fernando Estada at dfestrada@buffalo.edu
or Michael Espiritu at Mespiri2@pacificu.edu

Molecular Pharmacology:

Jason Davis at jedavi0062@icloud.com
or Jennifer Cash at cashjn@umich.edu

Neuropharmacology:

Luisa Torres at lft9@cornell.edu

Pharmacology Education:

Helmut Gottlieb at gottlieb@uiwtx.edu

Toxicology:

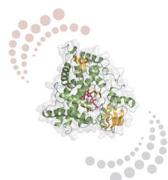
Alison Harrill at harrill.alison@gmail.com

Translational & Clinical Pharmacology:

Brandi Wynne at bwynne@emory.edu



Division News



Division for Drug Metabolism and Disposition

Interview with an ASPET DMDD Member - The Career of Dr. James Halpert: A Pioneer in P450 Selectivity

Submitted by Michael Espiritu



Dr. James “Jim” Halpert earned his BA in Scandinavian Languages from the University of California at Los Angeles, his PhD in biochemistry from Uppsala University, and his MS in toxicology from the Karolinska Institute.

After 15 years on the

faculty at the University of Arizona, he assumed the position of professor and chair of the Department of Pharmacology and Toxicology at the University of Texas Medical Branch in 1998. There he also served from 2003-2008 as director of the NIEHS Center and interim director of the Sealy Center for Environmental Health and Medicine. He also held the Mary Gibbs Jones Distinguished Chair in Environmental Toxicology. In 2008, Jim joined UC San Diego’s Skaggs School of Pharmacy and Pharmaceutical Sciences as professor and associate dean for scientific affairs. From 2014-2019 he served as dean of the University of Connecticut School of Pharmacy.

Jim’s research for the past 40 years focused on the structure and function of cytochromes P450 of the 2B and 3A subfamilies and was supported continuously by the National Institutes of Health for 33 years, including a MERIT Award. Jim is the author of 208 peer-reviewed publications with an H-index of 63 and >14,200 citations and has given >60 invited talks at major national and international meetings. Ten of his former trainees hold independent faculty positions.

In 2010, he was the recipient of the ASPET Bernard B. Brodie Award. In 2016, Jim received an Award in Excellence from the PhRMA Foundation. Highlights of professional service include: member and chairman of the NIH Pharmacology Study Section; editor of *Drug Metabolism and Disposition*; secretary-treasurer and president of ASPET; treasurer of ISSX; member of the International Advisory Committee for the 14th through 23rd Symposia on Microsomes and Drug Oxidations.

For our readers, can you summarize your career journey and highlight some of the milestones along the way?

JH: As a member of the chemistry set generation and product of the Sputnik era, it was natural for me to choose chemistry as my major when I enrolled as an undergraduate at UCLA. Being named Outstanding Freshman Chemistry Student and receiving a summer fellowship from the National Science Foundation put me on the fast track for an academic career in chemistry. The need to get out of my comfort zone by seizing the opportunity to study abroad in Sweden during my junior year changed everything. I fell in love with Scandinavia and spent eleven years all told in Sweden, where I received both my Ph.D. in biochemistry, working on protein-structure function, and an M.S. in toxicology, working in drug metabolism. During my post-doctoral fellowship at Vanderbilt University, I combined these two interests and began what turned out to be my life’s work, namely determining the structural basis of cytochrome P450 selectivity. During my 15 years at the University

of Arizona (UA) I was fortunate to receive a Faculty Development Award from the PhRMA Foundation and a Research Career Award from the NIH. I also became interested in leadership through service as chair of the NIH Pharmacology Study Section and deputy director of a new environmental health sciences center at UA. The leadership path took me to the University of Texas Medical Branch as department chair, UCSD as associate dean, and the University of Connecticut as dean.

As an academic scientist in the field of drug metabolism, you have likely experienced a few hurdles in your career. Which challenges would you consider most significant and what did you do to overcome them? What advice do you have for young scientists who might experience these or similar challenges?

JH: The toughest initial challenge for me was figuring out exactly what aspect of P450 I wanted to work on as an independent scientist. I had strong credentials and a wealth of ideas but little confidence that any of my ideas were viable in the long run. Baring my soul to senior scientists in the field and soliciting candid advice was essential. I sought to develop a niche for myself in a field that was expanding rapidly at the time. That niche was selective P450 inhibition, which protected me from undue competition and ensured that other scientists would be interested in my work. A perennial challenge has been how to renew grants every four to five years, which we have accomplished by incorporating the most sophisticated technologies necessary to pursue the work optimally. This led us into a variety of areas far beyond my own expertise including recombinant DNA technology, chemical synthesis, 3D protein modeling, X-ray crystallography, calorimetry, and advanced spectroscopic methods. Numerous talented post-doctoral fellows, visiting scientists, and research faculty enabled that journey. Identifying the right people, recruiting them enthusiastically, and supporting them wholeheartedly was key to our success. I am proud that 10 former trainees now have independent faculty positions in the US or abroad.

In addition to being a highly successful academic scientist, you have established working relationships with many pharmaceutical companies where some of your former students have gone on to pursue careers. What advice do you have to students and young scientists who are interested in working in industry or those who may be unsure about which path to pursue?

JH: All of my 10 Ph.D. students and 2/3 of the 30+ post-doctoral fellows went into the pharmaceutical or biotechnology industry. I really did not substantially vary the training and mentoring provided based on where the trainee would eventually find employment. Rather I always emphasize developing critical thinking and writing skills along with proficiency at the lab bench. My advice is that a trainee strive to emerge as a “complete scientist” capable of thinking of a problem, performing pilot experiments, formulating and testing a hypothesis, collecting publishable data, and writing, submitting, and revising manuscripts. Above all, the ability to get the job done in a timely fashion is instrumental in subsequent success in academia or industry. A hugely important skill is developing appropriate persistence, i.e., the sense not to give up on a thorny problem too soon nor stick with an impossible one too long.

You have been highly involved with ASPET/DMD. What do you feel have been the most rewarding aspects of being involved with the Society and what advice do you have for new members?

JH: Involvement in ASPET has been a terrific way to help influence a field, get to know other scientists outside of my area of expertise, help the next generation, and develop leadership skills. My involvement with ASPET/DMD started slowly with no real long-term goal. Given the nature of my research and first faculty position in a pharmacology and toxicology department, both ASPET and the Society of Toxicology (SOT) were of interest. Because most of the other faculty in the department were focused on SOT, I decided to put my energy into ASPET. The fact that DMD had a platform session of short talks taken from abstracts by trainees was a major attraction.

I simply started attending the annual meeting and the business meetings of the society and division on a regular basis and made sure to talk to people there. As opportunities arose to get involved, I took them and strove to do each task promptly and successfully. When there was a crying need for a chair of DMD, which had almost shrunk to oblivion, I stepped up. Fortunately, that was at a time when ASPET programming became more division-based, which provided a great opportunity to rebuild DMD. Later nominations to serve as secretary-treasurer and president-elect were something I appreciated very much but did not really pursue actively. In contrast, my eventual appointment as editor of *Drug Metabolism and Disposition* was the result of more focused effort on my part. As a new assistant professor, I chose four journals of particular interest and made sure to be among the reviewers with the most reviews per year and shortest turnaround times. Having established my commitment, I was not shy about speaking with associate editors about appointment to editorial

boards or later with editors about appointment as an associate editor.

As someone who has been in the field a long time, you have witnessed the growth and change that has come along with it. What new frontiers are you most excited about for the coming decade?

JH: When I began to study drug-metabolizing enzymes, so little was known. Now this is undoubtedly a mature field, and a few years ago, I was concerned that it might be drying up. However, at the recent International Conference on Cytochromes P450 in Brisbane, I was gratified to encounter a new generation of scientists with many innovative ideas. There is much more work to be done in the area of use of natural and engineered P450 enzymes as biocatalysts for green synthetic chemistry. In addition, I am still convinced that information inherent in our knowledge of human P450 structures has yet to be harnessed effectively to design drugs with optimal metabolic properties.

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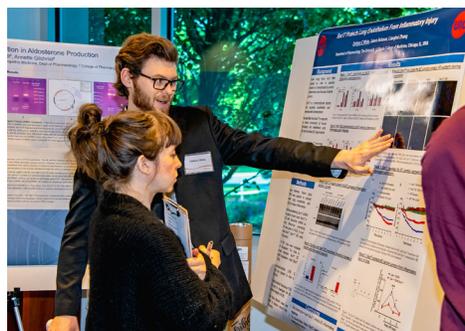
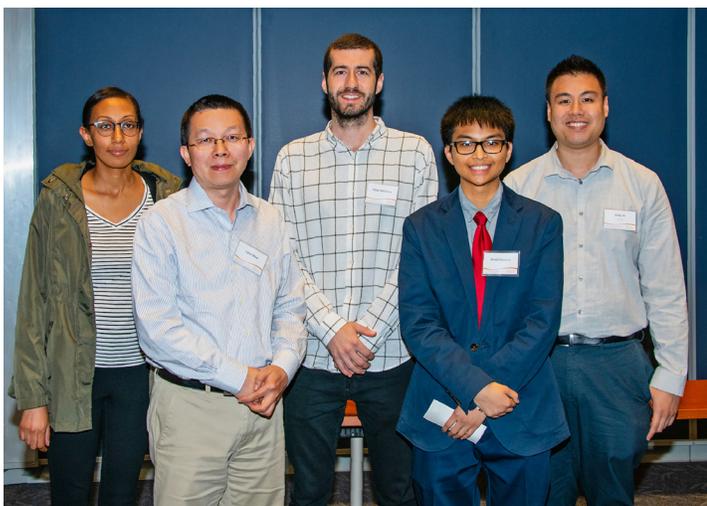
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Chapter News

Great Lakes Chapter GLC 2019 Annual Meeting in Review

Submitted by Phillip Kopf



Attendees and speakers at the GLC 2019 meeting

The Great Lakes Chapter (GLC) hosted its 32nd annual scientific meeting on June 21, 2019 at Northwestern University in Downers Grove, IL. The longstanding mission of GLC's annual meeting is to foster interactions among pharmacologists in the Great Lakes region and to provide a forum for learning and exchanging ideas in all fields of pharmacological science. This year the meeting had a very exciting program that focused on the microbiome.

Our morning poster session/competition focused on an important aspect of the annual meeting, which is to provide students and postdoctoral fellows an opportunity to present their work and network with their fellow trainees, as well as senior scientists. During the lunch break, trainees participated in a longstanding favorite tradition of our annual meeting, the Lunch and Learn Career Workshop. This workshop gives students and postdoctoral fellows an opportunity

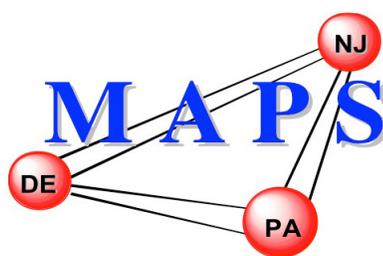
to enjoy lunch and conversation with a variety of accomplished scientists from diverse career paths.

Our symposium was comprised of five internationally recognized scientists highlighting their work in the field of the microbiome. Susan Erdman, DVM, MPH, of the Massachusetts Institute of Technology, was the keynote speaker for the symposium where she presented her research, entitled *Harnessing Our Microbiome for Healthful Longevity*. In her keynote address, Dr. Erdman described her studies examining the beneficial effects of probiotics containing *Lactobacillus reuteri*, which centered on higher systemic levels of oxytocin along with improved immune system function and more rapid wound repair.

Other engaging presentations of the symposium were delivered by Ali Keshavarzian, MD, of Rush University (*Gut Microbiota-Brain Axis in Neurological*

Disorders), Brad McRae, PhD, of AbbVie (*Tapping Into the Microbiome for the Treatment of Human Disease*), David Klumpp, PhD, of Northwestern University (*Microbiota of Pelvic Pain*), and John Baker, PhD, of the Medical College of Wisconsin (*Intestinal Microbiota are Promising Targets to Treat Heart Disease*).

Additionally, three young investigators presented their research at the symposium: Kristina Martinez-Guryn, PhD, of Midwestern University (*Small Intestine Microbiota Regulate Host Digestive and Absorptive Responses to Dietary Lipids*), Judith Behnsen, PhD, of the University of Illinois—Chicago (*How the Host, Microbiota, and Mycobiota Influence the Ability of Salmonella to Colonize the Gut*), and Hemraj Dodiya, PhD, of the University of Chicago (*Sex-Specific Effects of Microbiome Perturbations on Cerebral Abeta Myloidosis and Microglia Phenotypes in an Alzheimer's Transgenic Mouse Model*).



Mid-Atlantic Pharmacology Society

2019 ASPET Regional Chapter Annual Meeting

Therapeutics for Neurodegenerative Disorders

October 3, 2019

Temple University, Student Faculty Center

3340 North Broad Street, Philadelphia, PA

Online registration and abstract submission* information:

www.aspet.org/MAPS2019

**accepting abstracts across all areas of pharmacology*

The MAPS Annual Meeting will include a keynote presentation, invited speakers, research poster competition (with awards for postdoctoral, graduate, and undergraduate presenters), and a Biotech roundtable discussion with local companies. Two trainees will be selected for oral presentations from submitted abstracts.

KEYNOTE SPEAKER: Richard Silverman, PhD Northwestern University

INVITED SPEAKERS:

Domenico Praticò, MD

Matthew Butchbach, PhD

Mali Cosden, MS

Lewis Katz School of Medicine, Temple University

Nemours Biomedical Research, Alfred I. duPont Hospital for Children

Discovery Neurodegeneration, Merck and Co. Inc.

CSPT 2019 Annual Conference

Submitted by Eddie Morgan, PhD

As president of ASPET, I was invited by the Canadian Society of Pharmacology and Therapeutics (CSPT) to attend their annual meeting in Calgary, Alberta and deliver a scientific presentation. The meeting was held on June 12-14 at the University of Calgary Foothills Health Sciences Center, about a mile from the main university campus. A pharmacogenomics workshop on Tuesday preceded the main meeting, which ran from Wednesday morning to Friday lunchtime. Scientific foci on Wednesday were the ontogeny of drug metabolism and pharmacogenetics; and pain and inflammation. Plenary sessions as well as parallel basic science and clinical symposia provided excellent opportunities for investigators and trainees alike to sample cutting-edge research and clinical insights in these areas. On Thursday the topics shifted to clinical toxicology, ion channel pharmacology and practical pharmacology; and on Friday morning there were two sessions on diabetes and vascular disease: targeting the endothelium. As would be expected, there was a

big focus on trainees, with poster sessions at lunchtime on the first two days, as well as a platform session for oral presentations of the top 10 abstracts. ASPET staff exhibited at the meeting, promoting membership, the journals, and various other programs. There was also a wonderful annual dinner at the Boundary Ranch in the foothills of the Rocky Mountains at Kananaskis, where we got to go on a horse-drawn wagon ride and sample a great barbeque and some local beverages.

Our Canadian chapter were most gracious hosts, especially President Michael Rieder, President-Elect Kerry Goralski, Local Organizing Committee Chair Alistair Cribb, and Scientific Program Committee Chair Donald Miller. I had the opportunity to welcome CSPT to the ASPET community and to tell the membership how excited we are to have this connection. By all indications, the CSPT membership are also very enthusiastic about this new relationship, and I think we can look forward to productive collaborations going forward.

Photo Credit: Images courtesy of Kerry Goralski



Right: Western University graduate students enjoying the welcome reception at the Alma Hotel



Conference Dinner at the Boundary Ranch, Kananaskis, Alberta



The traditional Calgary Donning of the White Hat. Recipient Michael Rieder (left), Western University and CSPT president and conference chair with Alastair Cribb (right), University of Calgary



Trainee poster session, Vivek Venu (left), University of Calgary and Ryan Takahashi (right), Genentech



Welcome Reception at the Alma Hotel: From left to right: Micheline Piquette-Miller, University of Toronto; Catherine Fry, ASPET; George Dresser, Western University; Eddie Morgan, Emory University and ASPET president; and Michael Rieder, Western University and CSPT president



Suzie Thompson and Catherine Fry at the ASPET booth



Timothy Pollak, University of Calgary; Adrienne Lindblad, University of Alberta; and Edward Morgan, Emory University - presenters in the pain and inflammation - clinical track

GET TO KNOW...

your ASPET Council

Newly elected Council members took office on July 1, 2019. You may know these colleagues professionally, but can you guess who's who by just their picture or a fun fact? Try to match the pictures and facts to each Council member:



**Wayne Backes,
President**

FUN FACT: PICTURE:



**Charles France,
President-Elect**

FUN FACT: PICTURE:



**Edward Morgan,
Past President**

FUN FACT: PICTURE:



**Jin Zhang,
Secretary/Treasurer**

FUN FACT: PICTURE:



**Mike Wood, Chair,
Program Committee**

FUN FACT: PICTURE:



**Mary-Ann Bjornsti,
Secretary/Treasurer-Elect**

FUN FACT: PICTURE:



**Margaret Gnegy, Past
Secretary/Treasurer**

FUN FACT: PICTURE:



**Alan Smrcka,
Councilor**

FUN FACT: PICTURE:



**Judith Siuciak,
Executive Officer**

FUN FACT: PICTURE:



**Kathryn Cunningham,
Councilor**

FUN FACT: PICTURE:



**Namandjé Bumpus,
Councilor**

FUN FACT: PICTURE:



**Mary Vore, Chair, Board
of Publications Trustees**

FUN FACT: PICTURE:



**Catherine Davis, FASEB
Board Representative**

FUN FACT: PICTURE:

Answer Key: Wayne Backes, President (D.3); Charles France, President-Elect (B); Jin Zhang, Secretary-Treasurer (A); Jin Zhang, Secretary-Treasurer (A); Jin Zhang, Secretary-Treasurer-Elect (E); 9); Margaret Gnegy, Past Secretary-Treasurer (L); 6); Alan Smrcka, Councilor (M); 13); Kathryn Cunningham, Councilor (H); 8); Namandjé Bumpus, Councilor (K); 5); Mary Vore, Chair of the BPT (I); 7); Catherine Davis, FASEB Board Representative (F); 2); Mike Wood, Chair of the Program Committee (J); 11); Judy Siuciak, Executive Officer (C); 12)

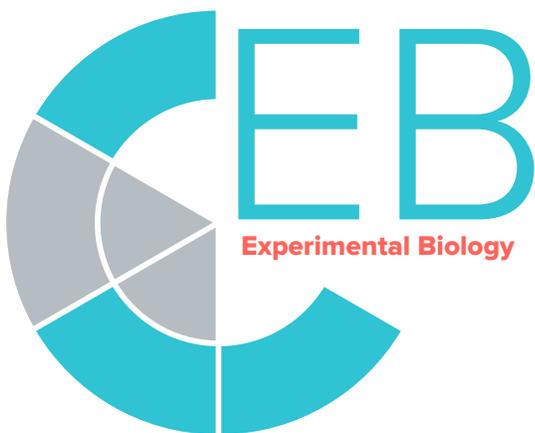
1. I competed in track and field and was a silver medalist in heptathlon in college.
2. I have completed two Olympic-distance triathlons (1.5k swim, 40k bike ride, 10k run) in St. Petersburg, FL and Washington, DC. Yes, I swam in the Potomac River!
3. I started playing guitar in college. Decided that I wanted to be in a rock band. My mom and dad were very relieved when I decided to go to graduate school – but I still enjoy playing guitar.
4. I love to disco dance.
5. I have been a competitive athlete for most of my life. I won my first national medal in track and field at the age of 12, have completed two marathons and up until a couple of years ago played basketball in an adult women's league.
6. I love to play the piano and still take lessons.
7. I was born and raised in Guatemala, and went back last month with our church to help build a house for a family. I learned how to chop cement blocks in half using a machete.
8. I rewarded myself with a new Yamaha RD400 two-stroke motorcycle when I graduated with my PhD.
9. I grew up in a Norwegian neighborhood in Brooklyn, thinking that Norwegian Independence Day (May 17th) was a national holiday celebrated by everyone.
10. I started playing music professionally when I was 13 and had my own band when I was 15. Had I not received a music scholarship, I would not have been able to attend college.
11. My first car was a used "exploding" 1972 Ford Pinto. Bubbled rust under the vinyl roof inspired my friends to dub it The Toadmobile.
12. My dad had a polka band and I grew up playing the accordion.
13. I am an avid squash player and hiker.



Call for Abstracts

Deadline: Thursday, November 14, 2019, 11:59 PM PST

Submit Your Abstract:
www.aspet.org/eb2020-abstract-sept-tpharm



SAN DIEGO
2020
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