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Death by Poison

INSIDE

- 2021 Annual Meeting
in Review
- 2021 ASPET Bylaws
Revisions
- Meet the 2021-2022
Council



POISON



CAUTION

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THE PHARMACOLOGIST

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Message from The President

Dear Fellow ASPET Members,

It is with both disappointment and relief that I write to you for the last time as president of ASPET. My disappointment stems from not having an in-person annual meeting and, therefore, not having the opportunity to re-connect with ASPET friends and colleagues. I also regret not having the privilege of introducing the 2021 ASPET scientific award winners in person at the annual meeting. Despite my disappointment, I was honored to be able to introduce the award winners virtually – congratulations to all of the winners and thanks for your outstanding lectures.

My relief comes from the fact that the Society has weathered the challenges of the last year and that it is as strong or perhaps even stronger now than before the beginning of the pandemic. Many of our members, along with ASPET staff, worked tirelessly over the past year to keep the Society on course, financially sound, and laser-beam focused on hosting a high-quality annual meeting while continuing to serve members with innovative programs. For example, over the past year more than 1,200 registrants from 30 countries attended over 20 virtual Focus on Pharmacology sessions hosted by ASPET.

Beyond surviving the challenges brought about by COVID-19, ASPET has launched new initiatives while modifying many existing programs and policies, all as part of the ongoing implementation of our strategic plan. In reviewing and updating the governance of the Society, Council initiated a comprehensive and long overdue review of our bylaws. In many respects, the bylaws are antiquated and in need of updating to be consistent with best practices for governing a non-profit society. At the business meeting, I introduced two proposed amendments to the bylaws, one that addresses the manner in which amendments are introduced to and voted on by the members, and one that clarifies the role of Council in oversight of the Society's publications. Council also created a new task force on diversity, equity, and inclusion that will work to ensure that ASPET is a welcoming mentoring, networking, and professional hub that promotes, advances, and supports a diverse pharmacology workforce. Martha Dávila-García is chairing this important new initiative. The Society continues to recognize its distinguished members through the ASPET Fellows Program that was launched in 2019. Thanks to the oversight and insight of the Investment Subcommittee, the Finance Committee, and Council, the Society is strong financially and can continue investing in programs to support its members and advance the discipline.

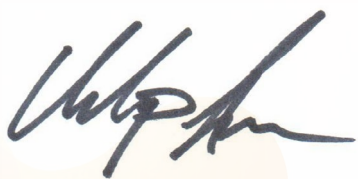
For those who “attended” EB 2021, you know that it was an outstanding meeting with many excellent lectures and symposia as well as opportunities to interact virtually with poster presenters and others. We owe a special thanks to the Program Committee and to ASPET staff who did a tremendous job in planning the annual meeting under very difficult circumstances. Planning is underway not only for 2022 (I look forward to seeing many of you in person at EB 2022 in Philadelphia), but also for the exciting opportunity we have to host our own meeting in 2023. There is a lot of excitement among our members as we create a new, independent meeting that will address the needs of ASPET.

Finally, I want to acknowledge outgoing and incoming Council members. Wayne Backes (Past President) and Jin Zhang (Past Secretary/Treasurer) are leaving Council while Kathryn Cunningham is changing roles from Councilor to Secretary/Treasurer Elect. Michael Jarvis and John Traynor were elected recently to Council as President Elect and Councilor, respectively. Please join me in thanking these individuals as well as the other

dedicated ASPET members who serve on various division and Society committees and task forces. ASPET is only as strong as the participation and commitment of its members to the Society and to the discipline of pharmacology. Please volunteer to serve on a committee, submit a symposium for the annual meeting, suggest a special topic for online programming, nominate someone for an ASPET award, and submit your manuscripts to ASPET journals. This is your Society – make it work for you.

It has been the honor of a lifetime to serve as president of the Society that I consider my scientific home. While I soon will pass the gavel to the very capable hands of Peggy Gnegy, I look forward to working with Council as we further improve the services ASPET provides to its members and to the discipline.

Respectfully yours,

A handwritten signature in dark ink, appearing to read 'C. France', with a stylized, flowing script.

Charles P. France, PhD
ASPET President



2021 Annual Meeting in Review



From April 27-30, 2021, ASPET, in conjunction with Experimental Biology, held our first ever virtual annual meeting. Over 7,300 scientists, including 1,182 attendees who registered under pharmacology, participated in the virtual Experimental Biology 2021 meeting. Over the course of four days, attendees participated in live scientific symposia, workshops, and lectures, visited virtual posters, held video chats with presenters and exhibitors, and networked in the ASPET virtual member lounge and other video sessions. Sessions were recorded and made available on-demand to all registered attendees until May 31.

ASPET Business Meeting

As part of EB 2021, ASPET held both the annual business meeting and the presentation of our 2021 awards virtually on April 27th, 2021. A brief summary of the meeting is included below. The meeting was well attended with over 250 participants.

Dr. Charles France, ASPET President, opened the meeting by welcoming everyone to the virtual event and noting the newly-elected ASPET Council members. The **2021 ASPET election** closed on February 10th, 2021. Dr. Michael Jarvis (President-elect), Dr. Kathryn Cunningham (Secretary/Treasurer-elect), and Dr. John Traynor (Councilor) will begin their terms on July 1, 2021. We had a record voter turnout, with over 18% of eligible members participating.

The business meeting also provides an opportunity to recognize ASPET members celebrating their **25th and 50th year membership anniversaries**. There are 37 members celebrating their 25th anniversary with ASPET and 41 members who have been part of ASPET for 50 years (see page 130). We are greatly appreciative of their dedication to ASPET.

Dr. France acknowledged the passing of ASPET members and colleagues, all of whom have contributed significantly to the field of pharmacology. Our thoughts and prayers are with their families,

friends, and colleagues. We hope you had the opportunity to read the tribute articles which have been published in *The Pharmacologist* over the past year. You will also find ASPET member obituaries on our website (<https://www.aspet.org/aspnet/news/all-news/member-obituaries>).



In 2017, ASPET Council announced the development of a **strategic plan** that highlighted the approaches that the Council saw as necessary to keep pharmacology at the cutting edge of biomedical research. The strategy was designed to enhance the core functions of the Society in a way that is consistent with ASPET's vision and mission. The plan identified six overarching goals and ASPET's leadership, committees, and staff have made great strides during the past several years toward implementing many of the identified strategies toward achieving these goals. Each year the business meeting is utilized to highlight a few key strategic plan activities. Dr. France mentioned several initiatives including the ASPET Code of Conduct, the ASPET Fellows Program, and the ASPET Partnerships Committee, as well as the ongoing governance review effort.

ASPET is committed to providing a safe, welcoming environment for everyone, and creating an environment where the exchange of scientific ideas, open communication, and equal opportunity can occur free of harassment and discrimination. ASPET Council adopted a **Code of Conduct** policy which is applicable to all Society activities including programs, meetings, ancillary events, and official and unofficial social gatherings. This Code of Conduct is intended to promote a culture of inclusion, respect, and professionalism and to remind our members to be cognizant of the fact that they are always representing ASPET. You can access the ASPET Code of Conduct at www.aspet.org/code-of-conduct.



In 2019, ASPET announced plans for a new **ASPET Fellows (FASPET) Program** aimed at honoring ASPET members who have demonstrated distinction and peer recognition in pharmacology.

Fellows are recognized for their efforts to advance pharmacology through their scientific achievements, mentorship, and service to the Society. The 2020 Fellows were highlighted in the awards presentations following the business meeting. Dr. France discussed the call for nominations for the 2021 class of Fellows and encouraged nominations that reflect the diversity of the

Society's membership. You can learn more about this program at www.aspet.org/faspet.

ASPET is an international organization with members in over 76 countries and Council has identified a need for developing programs and activities to increase value for our global members as well as managing existing and future partnerships. In 2019, Council initiated a Global Partnership Task Force to begin developing a global strategy for the Society. That year we also welcomed our first international chapter, the Canadian Society of Pharmacology and Therapeutics.



Based on the recommendation of the task force, a standing **Partnerships Committee** with former President Dr. Eddie Morgan as chair, was recently established to ensure continued efforts in this important area. The Partnerships

Committee aims to raise awareness of the international role of ASPET, increase international membership, identify priority global issues and manage domestic and international partnerships. Dr. France thanked our international members who responded to the recent survey initiated by the Partnerships Committee; your feedback was greatly appreciated.

Council initiated an extensive **governance review effort** to ensure the governance structure, function, and policies of the Society are designed to support and



promote effective stewardship and model best practices. During ongoing discussions, Council has identified opportunities to add or adjust existing governance practices to strengthen the Society for the future. Recent discussions have focused on diversity, equity, and inclusion efforts as well as a comprehensive legal review of the ASPET Bylaws. As a direct result of this latter effort, Dr. France presented two amendments to the ASPET Bylaws. Additional information on the amendments to the ASPET Bylaws can be found on page 99.



ASPET is committed to providing a welcoming mentoring, networking, and professional hub to promote, advance, and support a diverse pharmacology workforce. In listening to our members and learning from our 100+-year history, we understand that achieving this culture will require consistent and purposeful action. Earlier this year, Council established a **Diversity, Equity and Inclusion (DEI) Task Force** with Dr. Martha Dávila-García from Howard University as Chair. The goal of the task force is to guide the development of a strategy and action plan to help ASPET better support a diverse membership that reflects the larger pharmacology community. Additional information on the Task Force can be found on page 98.

Dr. Judy Siuciak, ASPET Executive Officer, provided an update on the ASPET Annual Meeting held during EB 2021. For the first time in ASPET history, the Society offered an entirely virtual meeting experience which we hope was easy to access and informative. She recognized the efforts of the ASPET Program Committee,

chaired by Dr. Mike Wood, for their amazing work this year and extended a warm welcome to our guest societies and their members that were attending the meeting. Dr. Siuciak briefly reviewed the highlights of the program, including the GPCR colloquium scheduled as an EB 2021 satellite meeting on May 10th and 11th.

ASPET, an organization over 100 years old, has had an annual meeting that has changed considerably over time. For almost 75 years, ASPET met with several other societies as part of the FASEB meeting. For part of that time, ASPET also held separate annual fall meetings. These stand-alone meetings were always remembered by the attendees as small, intimate gatherings that were focused on pharmacology. In 1993, Experimental Biology (EB) was formed.

The EB host societies recently announced that the Experimental Biology meeting will no longer be held after next year's meeting in 2022. While participating in the EB meeting, partnership with other societies has been a great experience, we appreciate that scientific meetings are dynamic events that need to adapt to evolving member needs, advances in technology, or even a global pandemic. Holding an independent ASPET Annual Meeting provides a real opportunity for the Society to design a more focused, creative, and flexible meeting for our members.

The ASPET Council has begun a strategic planning process that includes working with an experienced consulting group which has conducted individual interviews, focus group discussions, and an online survey to help the society get input from members when designing our future annual meeting. Appreciation was expressed to the over 700 ASPET members who provided their feedback during this process.

Several recurrent themes were found in the member comments to the online survey, including:

- A strong message about the importance of diversity and inclusion
- The need for innovative, high-quality, and interdisciplinary content
- The desire for the meeting to connect people and topics in a way that cultivates a strong pharmacology community
- Delivering valuable experiences that sustain the growth and success of ASPET and the field of pharmacology

Stay tuned for more information on the ASPET annual meeting.



Everyone was disappointed by the cancellation of last year's meeting and ASPET recognized the need to provide our members with a way to connect with one another and participate in scientific exchange during the pandemic. ASPET was pleased to offer two new benefits during this challenging time, the first of which was the **Focus on Pharmacology virtual meeting series** launched in the summer of 2020. Over the past 11 months, ASPET hosted a total of 21 virtual sessions with over 1,400 registrants from 30 countries on a variety of important and innovative topics in pharmacology. These sessions have been very well received and we are pleased to be able to continue this important member benefit as we move forward. If you missed any of the previous webinars, recordings of virtual sessions are available on demand in the Focus on Pharmacology community library in *ASPETConnect*.



The second new initiative rolled out in 2020 was an online member community called *ASPETConnect*. *ASPETConnect* is easy to access using your existing ASPET member login. Information and the link can be found on the ASPET website or via <https://connect.aspet.org>. *ASPETConnect* has spaces for our divisions, committees, young scientists, and the Focus on Pharmacology webinar series and provides an opportunity for you to network with members, ask questions, and hold discussions. During the EB 2021 meeting, members utilized the virtual ASPET Member Lounge on *ASPETConnect* to discuss interesting sessions and participate in raffle discussions and games. We hope our members will continue to take advantage of making connections on *ASPETConnect*. Learn more about the community at <https://www.aspet.org/about-connect>.

Every member, volunteer, chair, editor, and Council member has played a huge role in ASPET's success

this year and every year, and we are grateful for their significant contributions. There are many ways for our members to get more involved in their Society including:

- ASPET leadership
- ASPET Annual Meeting and awards
- Divisions
- Committees
- Science Policy
- Education
- Journals

For more information, check out our "How to Get Involved" webpage (<https://www.aspet.org/aspet/membership-community/aspet-member-benefits/how-to-get-involved-in-aspet>) or contact us as membership@aspnet.org.

Dr. Mary-Ann Bjornsti, Secretary/Treasurer, provided a financial update during the business meeting. During 2020, ASPET's revenue totaled \$4,522,670 from sources such as membership dues, interest and dividends from the reserves, contributions, and publications. As the annual meeting was canceled, ASPET did not earn income from the annual meeting. Expenses in 2020 totaled \$4,596,963 as ASPET supported its programs such as publications, awards, meetings, education, and member services, as well as management and general expenses for office operations. While Covid-19 presented many challenges, the Society has a healthy investment reserves that ensure a secure future for the organization, and allows the organization to invest in new initiatives, including DEI and career development, and ASPET's new meeting experience beginning in 2023. Dr. Bjornsti thanked the donors and sponsors of the Society and its programs, which help provide for many critical activities, such as travel awards, the SURF program, scientific achievement awards, lectures, and the continuing operations of the Society.

Dr. Bjornsti offered a special thank you to all our **individual donors and institutional partners**. It is through their generosity that we can provide quality programs and services to our members. She commended those in our membership who not only provided financial donations but gave their time and effort to the Society by participating on Council, a leadership role in the divisions, and our many committees. The names of individual donors can be found in the December 2020 issue (https://issuu.com/aspetpublications/docs/v62_n4_12_2020) of *The Pharmacologist*.

Thank you

to our 2021 Annual Meeting Sponsors:



Tax-deductible donations to ASPET support research, travel awards, science advocacy, and career development for scientists. Donating is a great way to demonstrate your commitment and support to the future of ASPET and pharmacology. We appreciate that our members keep ASPET in mind as a home for their charitable donations. Make a contribution at www.aspet.org/donate.

Dr. Emily Scott, the chair of the Publications Committee, provided an update on ASPET publications. ASPET expressed gratitude to all those who review for the journals and serve on editorial boards. The success of the journals is due to their dedication and hard work. Dr. Scott thanked Dr. Jeffrey Stevens, *Drug Metabolism and Disposition (DMD)* editor from 2018 to 2020, and Dr. Beverley Greenwood-van Meerveld, a member of the BPT from 2018 to 2020, for their service. While Jeff and Beverley are stepping down, she welcomed Dr. Xinxin Ding from the University of Arizona as *DMD* editor and Dr. Adriano Marchese to the BPT.

At the end of this calendar year, both Dr. Ken Tew and Dr. Eric Barker will complete their two allowed 3-year terms as editors of *the Journal of Pharmacology and Experimental Therapeutics (JPET)* and *Pharmacological Reviews*. ASPET has open searches for both Editor positions and is seeking individuals with the experience and desire to join the BPT in making these journals successful.

Drs. Young Jeong, Mahmood Mozaffari, and Angeline Lyon were recognized as top reviewers for *DMD*, *JPET* and *Molecular Pharmacology (MolPharm)*, respectively. If you are interested in becoming a reviewer, keep an eye out for our new reviewer training program led by Kay Meier, Editor of *MolPharm* in collaboration with the Young Scientists Committee. The “ASPET Reviewer Academy” will allow trainees to work with associate editors of these three journals to review a live paper.

Highlighted Trainee Authors



Molecular Pharmacology launched the **Highlighted Trainee Author program** with its October 2017 issue to spotlight one trainee author in each issue. *JPET* and *DMD* joined the program in October and November 2019, respectively. Undergraduate students, graduate students, and postdoctoral researchers may be nominated for the issue in which their article is published. Congratulations were expressed to the 64 early career researchers who were selected to be Highlighted Trainee Authors in 2020 (see more on the Highlighted Trainee Authors on pg. 124).

Despite the challenges of operating in an unprecedented global pandemic, ASPET has continued to provide programs, activities, and important services to our members. We have worked on many new initiatives, created brand new virtual experiences, and dived into creating a stronger pharmacology community. Throughout it all, our

mission remains to serve our membership and be your professional home.

The ASPET booth in the exhibit hall had many visitors with over 750 views. We ran a special EB edition of the ASPET Member-Get-A-Member (MGM) campaign and recruited 5 new members. Congratulations to Judith A. Cole, winner of the MGM grand prize. This year, the booth debuted our new membership video. If you didn't get a chance to check it out, view it online at www.aspet.org/membership. Be sure to forward it to anyone you know who is interested ASPET membership!

The virtual member lounge was hosted on ASPETConnect and provided an area for members to take a break from sessions and participate in discussions, raffles, and games. Each day, we posted a fun virtual poll, a raffle discussion to win prizes, and "brain breaks," which included trivia games, puzzles, relaxation videos, and more. Congratulations to our raffle discussion winners Amit Pandey, Cheryl Rockwell, Evan Reeder, and Eddie Morgan!

Congratulations to

Scientific Achievement Award Winners

aspet.org/2021AwardWinners

ASPET Fellows

aspet.org/2020Fellows

Washington Fellows

aspet.org/2021WashingtonFellows

Travel Award Winners

aspet.org/poster-award-winners



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Joint Colloquium on G Protein-Coupled Receptors:
Evolving Insights from Pharmacology, Biochemistry, and Physiology

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Silver Level Support



Bronze Level Support



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ASPET Division for Neuropharmacology

Poster Hall

The virtual poster hall was open from April 13 – May 31, 2021 and registered attendees were able to visit the posters 24/7. Poster presenters uploaded PDF posters and recorded short audio presentations, while attendees could leave questions or request video chats with presenters.

(R3368) Discovery of Small Molecule Modulators targeting Secretin Receptors

Sponsored by: ASPET Division for Molecular Pharmacology

Presenting Author(s): Daniela Dengler, Postdoctoral Scientist, SBP Medical Discovery Institute, La Jolla, California, United States

DISCOVERY OF SMALL MOLECULE MODULATORS TARGETING SECRETIN RECEPTORS

Daniela Dengler, Katarzyna G. Harkness, Laurence J. Miller, and Edward A. Sargus

Association between diabetes education and diabetes management in an under resourced community

Erin Vitas OMS-III, Gina Roggenbue OMS-III, Rachel Eaton OMS-III, Gary Willyerd, G.L. DO, FACOEP, FACDME, Carolina B. Restin, PharmD, PhD

My favorite aspect to the virtual format is the increased access to the posters. Normally, I have an hour or two to catch presenters at their posters. However, in the virtual format, I can post a question at any time and can take as much time as I like to go through the posters.

-Cheryl Rockwell

2021 Student/Postdoctoral Poster Competition

The 2021 Student/Postdoctoral Poster Competition gave undergraduate students, post-baccalaureates, graduate students, and postdocs an opportunity to present their work and compete for cash prizes. To find out the division award winners, please turn to the Division News section on page 136.

Dolores C. Shockley Competition Winners

The 2021 Dolores Shockley Competition took place during EB in the virtual poster hall. Dr. Shockley was the first African-American woman to earn a PhD in pharmacology and the first to be appointed to chair a pharmacology department in the US.

Undergraduate

1st Taylor Quintana

Graduate and Post-baccalaureate

1st Arryn Blaine

2nd Caroline Hernandez-Casner

3rd Loyda Morales-Rodriguez

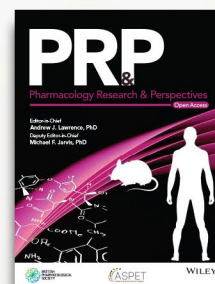
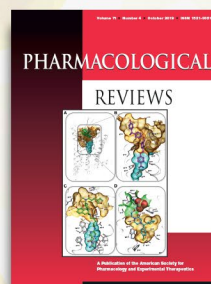
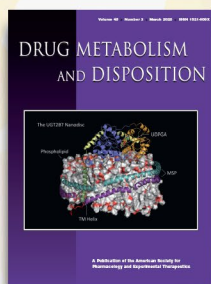
Postdoctoral

1st Karina Pena

2nd Eric Rodriguez

3rd Andrew Robles

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www.aspet.org/aspet/journals

EB 2021 by the Numbers

1,182

Pharmacology attendees

Pharmacology speakers
in ASPET sessions
were rated
4.5 OUT OF 5



Pharmacology posters
in ASPET sessions
were rated
4.4 OUT OF 5



The top-rated sessions:

Intracellular
GPCR
Signaling:
Cell Biology,
Pharmacology
and Physiology

G Protein
Signaling in
Regulation of
Metabolism and
Diabetes

NIH Funding
and Other
Translational
Research
Opportunities

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

EB draws scientists from around the world!

ASPET attendees at EB represented

39
DIFFERENT COUNTRIES



Largest non-US contingents coming from
Canada, United Kingdom, Australia, Japan, and Mexico.

Annual Meeting Program Highlights

ASPET Presidential Symposium - It's Not Just an Opioid Epidemic: A Translational/Real World Perspective on the Substance Use Epidemic

Submitted by Charles France, PhD

Substance use disorders are among the many mental health disorders that have increased in frequency and severity during the COVID-19 pandemic. While the opioid epidemic is most prominent in the media, in many places (including San Diego and Australia) the more difficult challenge is the misuse of stimulant drugs. Overdose deaths attributed to stimulant drugs alone or in combination with other drugs (e.g., opioids) have increased dramatically over the past several years, although there are no FDA-approved treatments for stimulant overdose, stimulant use disorders, or co-abuse of stimulants and opioids. In fact, the opioid epidemic continues despite the availability of FDA-approved medications for treating opioid overdose (naloxone) and opioid use disorder (methadone, buprenorphine, and naltrexone) that are effective in some patients. In the ASPET Presidential Symposium, three experts provided an overview of and update on the challenges facing researchers and clinicians on the front lines developing, testing, and using medications to treat substance use disorders. The presentations spanned basic preclinical mechanistic studies to clinical laboratory studies and treatment of patients.

“Molecular neurobiology of psychostimulant and opioid use disorders” - Dr. Jean Lud Cadet, a senior investigator and chief of the Molecular Neuropsychiatry Branch, Intramural Research Program, National Institute on Drug Abuse in Baltimore USA, presented data on the neuroepigenetic changes, including DNA hydroxymethylation, observed in rats self-administering methamphetamine. During methamphetamine self-administration, a subset (43%) of rats was resistant to the punishing effects of electric shock, and Dr. Cadet identified neuroepigenetic differences between that subset and rats who self-administered methamphetamine and were sensitive to electric shock. For example, changes occurred in mRNA expression of voltage- and calcium-activated



potassium channels in the nucleus accumbens of rats that were sensitive to electric shock; however, similar changes were not evident in rats that were resistant to shock. Dr. Cadet further suggested that changes in potassium channels could promote abstinence from drug taking in this animal model of addiction. In a second series of studies, Dr. Cadet found that rats with long access to oxycodone self-administered significantly more drug compared with rats that had shorter access to oxycodone. He further showed that expression (e.g., pERK1/2) as well as phosphorylation (MSK2) of kinases were increased significantly in rats that self-administered more oxycodone. He concluded by suggesting that epigenetic changes play a significant role in vulnerability to abuse stimulant and opioid drugs.

“Evidence-based pharmacological treatment of substance use disorders” - Dr. Nadine Ezard, director of the National Center for Clinical Research on Emerging Drugs and conjoint professor at the National Drug & Alcohol Research Centre in Sydney, Australia, discussed the wide-spread abuse of amphetamine-like stimulant drugs in Australia (0.6% of the population of Australia compared with 0.1% worldwide) and the various approaches being evaluated to treat stimulant use disorders. Based on the success of agonist-based treatment for other substance use disorders (e.g., smoking [nicotine] and opioids), Dr. Ezard is testing lisdexamfetamine (a prodrug for dexamphetamine with a long duration of action) for treating methamphetamine use disorder. Her studies have shown that doses of lisdexamfetamine larger than those used to treat ADHD are safe, tolerable, and showing promising effects for treating methamphetamine use disorder.

She also provided an update on other approaches and drugs for treating stimulant use disorders, including psilocybin, ketamine, and mirtazapine, among others. She concluded by acknowledging the need for greater communication internationally among researchers in order to increase the translational value of clinical research on stimulant use disorders.

“Frontline cases of addiction and solutions” -

Dr. Roneet Lev, director of operations at the Scripps Mercy Hospital Emergency Department in San Diego, discussed the current substance use epidemic from the perspective of an emergency room physician. She began her presentation with an overview of the magnitude and the challenges of substance use disorders in the US, noting that only 12% of individuals with a substance use disorder receive treatment. She then detailed front line cases, indicating emergency department physicians often treat a variety of overdose cases within a single shift, spanning opioid overdose (respiratory

depression requiring administration of naloxone) to methamphetamine-induced suicide to hyperemesis from chronic use of cannabis. In San Diego, the most common substance she encounters in the emergency department is alcohol; however, methamphetamine is a close second, and there is no approved treatment for methamphetamine use disorder. While opioid prescribing practices have improved significantly over the past several years, the opioid crisis continues, in part, because many different drugs, including stimulant drugs, are adulterated with fentanyl. She likened individuals she sees in her daily practice, who continue using drugs despite adverse consequences, to the shock-resistant rats described by Dr. Cadet. Dr. Lev closed by reiterating the chronic, relapsing nature of substance use disorders and the need for more and better medications to address the ongoing substance use epidemic.

All three presentations generated many excellent questions and lively discussion.

ASPET - JPS Lecture

Submitted by Wayne Backes, PhD, and Margaret Gnegy, PhD

Dr. Yoshikatsu Kanai from the Osaka University Graduate School of Medicine presented a highly interesting keynote address at the joint American Society for Pharmacology and Experimental Therapeutics and Japanese Pharmacological Society. The lecture, entitled “Nutrient Transporters in Molecular Target Drug Discovery,” examined how a nutrient transporter, the Large Amino Acid Transporter 1 (LAT1), is regulated to meet cellular metabolic demands under different physiological and pathological conditions. The gene SLC7A5 encodes the 12-transmembrane protein that carries eight of the nine neutral amino acids into tissues. It is primarily located in the placenta and the blood brain barrier. Although not important for absorption of amino acids from the diet, LAT1 plays an important role in cell development and growth. LAT1 was only expressed in brain in normal tissues; however, it is highly induced in all cancer cells. Dr. Kanai’s approach focused on inhibition of the LAT1 transporter to affect cancer growth.

Dr. Kanai’s group synthesized a radiolabel 3-[(18)F] fluoro- α -methyl-L-tyrosine (L-[(18)F]FAMT) that selectively labeled LAT1 in solid tumors. Any solid

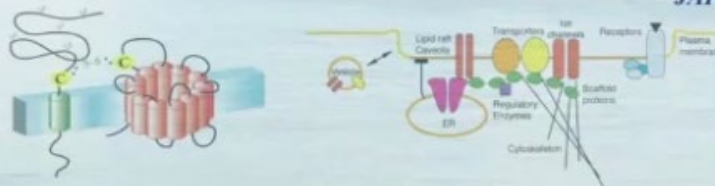
tumor, even gliomas, displayed increased levels of LAT1 over non-tumor tissues and the higher the expression of LAT1 in a patient’s tumor the greater likelihood of death.

Based on the structures of phenylalanine and triiodothyronine, which exhibit high affinity binding to LAT1, his group developed a small molecule inhibitor, KYT0353. Using leucine uptake as a marker of transport they proved that KYT0353 was highly specific for inhibiting LAT1 and not the more abundant transporter, LAT2. Both knockdown of LAT1 and inhibition of LAT1 activity were effective at suppressing tumor growth and prolonging survival. KYT0353 is now in Phase 2 clinical trials for biliary cancer.

In probing the structure of LAT1 they recognized an association between the K_i for amino acid transport of leucine and the log P of the amino acid, suggesting that the LAT1 binding site was hydrophobic in nature. Using Cryo-EM, they found that LAT1 had a Leu-T fold. The inward-open state had an unusual loop structure on transmembrane helix 6 with an extended hydrophobic pocket that could accommodate bulky drugs. Interestingly, a single Gly to Ala modification in the LAT1

Nutrient Transporters in Molecular Target Drug Discovery

Yoshikatsu Kanai
Department of Bio-system Pharmacology
Osaka University Graduate School of
Medicine
JAPAN



active site changed its substrate selectivity, which is likely due to disruption of the hydrophobic pocket.

Not only was LAT1 responsible for amino acid transport in cancer cells, but it also affected cell signaling; in particular, signaling involving mTOR. Inhibition of LAT1 blocked mTORC1 signaling and, interestingly, protein translation, possibly by suppression of CDK kinase activities. This was shown to be mediated by decreased CDK phosphorylation.

LAT1 was also expressed in blood vessel endothelial cells of cancer tissues and was induced by VEGF and FGF. The LAT1 inhibitor KYT0353 effectively suppressed endothelial sprouting in aortic rings and

its IV injection decreased tumor growth, possibly by inhibition of angiogenesis.

Their group is now looking to develop 2nd generation LAT1 non-competitive inhibitors that are not affected by elevated amino acid concentrations.

Overall, LAT1 was shown to be an effective potential target not only for cancer diagnosis, but also a target for cancer treatment. Inhibitors of this transporter reduce amino acid accumulation into cancer cells, and by causing alterations in cell signaling, leading to increases in EIF2 phosphorylation and decreases in phosphorylation of proteins involved in the mTOR signaling pathway.

ASPET Webinars On-Demand

Log Into ASPETConnect to Explore the Webinar Library at <https://bit.ly/38AnRAp>

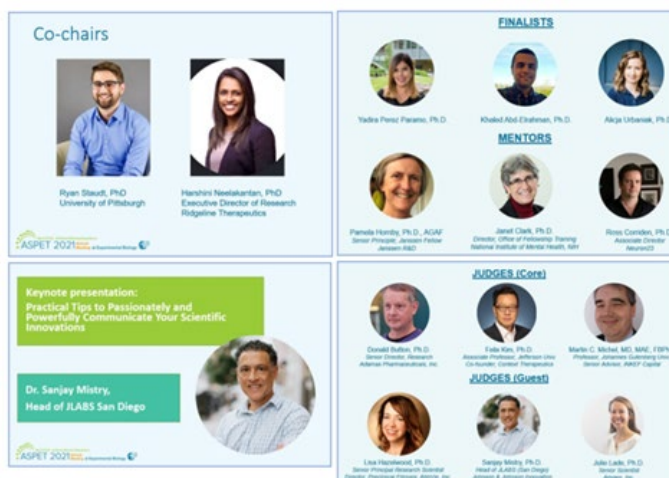
Guppy Tank Translational Science Pitch Showcase

Submitted by Harshini Neelakantan, PhD, and Ryan Staudt, PhD

The Guppy Tank Translational Science Pitch Showcase, a unique, first-of-its-kind symposium marked its debut at the Experimental Biology virtual meeting this year. This event was fully developed and organized by the ASPET's Young Scientists Committee (YSC) members, with the prime objective to provide ASPET trainees an opportunity to hone their communication skills, deliver a captivating pitch highlighting the translational applications of their scientific research, and compete in front of a live EB audience to win the "Best Pitch" and "People's Choice" awards.

This event had several novel attributes, including a formal application process, one-on-one mentoring sessions with scientific industry leaders of the ASPET community, and a Q&A session with an elite panel of industry-expert judges during the live showcase. From 20+ originally received applications, three contestants (postdoctoral-level ASPET trainees) were selected as finalists for the science pitch showcase at EB. The finalists' pitches were preceded by a keynote presentation by Sanjay Mistry of the Johnson and Johnson Innovation JLABS at San Diego who shared his career journey traversing translational pharmacology to drug development, innovation, and startup biotech venture financing. His talk covered the hallmark components of a translational science pitch and practical tips to develop tailored presentations highlighting scientific discoveries and translational vision to a broader audience (e.g., Pharma and Venture Capitalist Investors).

Yadira Perez Paramo of Genentech was awarded both the "Best Pitch" and "People's Choice" awards for her pitch that described a technology addressing personalized treatment strategy for smoking cessation on the basis of patient-centric pharmacogenomic data. The transformative "FitQuit App" technology incorporates genotyping of biological samples, data interpretation via machine learning algorithms to comprehensively evaluate nicotine addiction, metabolism, and pharmacological response metrics, and digital results presentation to clinicians for rapid and easy clinical adoption. A defined timeline and development plan for completing analytical and clinical



Winner of the Guppy Tank Showcase,
Yadira Perez Paramo.

validity testing, followed by ethical and legal launch of the technology as a mobile medical app was presented.

Overall, we thank all our finalists for wholly embracing the novel symposium structure and delivering phenomenal pitches. The YSC team is fortunate and truly grateful to the mentors and judges who graciously guided and supported the symposium, making it not only possible, but a great success too. We hope that this successful showcase sets a benchmark for continued programming of future YSC-organized science pitch showcases.



Diversity, Equity, and Inclusion

ASPET Launches Diversity, Equity, and Inclusion Task Force

Diversity, equity, inclusion (DEI) are at the core of ASPET's guiding principles. As a scientific organization dedicated to advancing pharmacology, we believe our diverse community strengthens our ability to make a difference in the world around us. We are committed to creating a community of scientists who value each other and the important work we do, regardless of race, ethnicity, religion, national origin, mental or physical ability, age, gender identity or expressions, or sexual orientation. Discrimination and inequity have no place in ASPET, the scientific community, or society at large.

To further the Society's work in this sphere, ASPET Council engaged Vernetta Walker, JD, President & CEO of Walker and Associates Consulting, to facilitate a discussion on April 7, 2021. Ms. Walker has extensive expertise in non-profit association governance, particularly with regard to creating a culture of inclusion. During this discussion, Council considered ways ASPET can cultivate a welcoming environment, ensure appropriate procedures and processes are in place to promote DEI in speaker selection, leadership, and awards, promote transparency, and promote participation that reflects the diversity of the Society. ASPET Council also discussed potential challenges such as ensuring we have a common understanding of DEI terminology, understanding the needs of diverse society members, and addressing missing data (e.g., member demographics).

As a result of these conversations, ASPET has created a Diversity, Equity, and Inclusion (DEI) Task Force which will lead our efforts to identify and dismantle barriers to full participation and develop strategies to embrace and leverage diversity and create a more equitable and inclusive society. Areas of focus will include:



- Increasing diversity of the membership and engaging next generation and diverse members
- Cultivating a diverse pipeline for leadership positions
- Integrating DEI into our strategic plan, and ensuring our programs, committees, and speakers reflect the diversity of the society
- Reviewing policies, practices, and procedures with an equity lens
- Providing resources and programming on DEI for our members

The above statements will serve to guide and inform the work of the DEI Task Force, not limit it, so that ASPET can lead authentically and build a stronger society. We recognize that this will be a continuing journey, and some changes will happen over time. The Task Force will develop a specific charge and action plan over the coming months. You can see more about the DEI Task Force, including the members, at this link: <https://www.aspet.org/aspet/about-us/aspet-committees/dei-task-force>.

ASPET is also developing a web page that will serve as a home for our DEI journey. We will post resources, perspectives, updates, and other highlights. We look forward to a real dialogue around how best to advance DEI within ASPET and the pharmacology community. If you would like to share your thoughts with us, please write to info@aspnet.org.



2021 ASPET Bylaws Revisions

As part of an ongoing governance review process initiated by ASPET Council, a comprehensive legal review of the ASPET Bylaws was recently conducted. This review was necessary to ensure the Society is compliant with applicable city, state, and federal laws which may have changed over time, as well as current guidelines for governance practices of non-profit organization bylaws.

Two provisions were identified by ASPET legal counsel for immediate revision. Revised language approved by ASPET Council and ASPET legal counsel was presented to ASPET members attending the 2021 ASPET Business Meeting. The Business Meeting members approved forwarding both proposed revisions to the full membership for the final vote. Voting on proposed revisions by the full membership was held via online voting from May 3, 2021 to June 4th, 2021. Members have voted to approve the following bylaws:

Bylaws Revision #1 – Amendment Clause

Rationale for revision:

The goal of the proposed revision to the bylaws is to:

- Ensure the amendment clause language is clear, concise, and allows flexibility for the Society.
- Simplify the amendment process with a single membership vote.
- Allow members to submit suggested revisions. Council felt strongly about giving members a greater voice in the Society and put forward this proposal to the membership to amend the Bylaws accordingly.

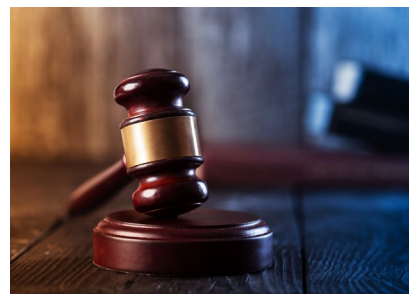
Original Text:

ARTICLE IX.

Amendment of Bylaws

Adoption, alternation, or repeal of bylaws may be moved at any business session of the

Society. Upon a favorable vote of two-thirds of the members present, the motion shall be submitted to the membership at large by ballot. Final passage shall require a three fifths majority vote of the members responding within 30 days after submission.



Approved Text:

ARTICLE IX. Amendment of Bylaws

Amendments to the Bylaws may be initiated by a member of Council or by no less than five percent (5%) of the voting membership. The Council must act upon amendments within six months of initiation.

Following approval by Council, proposed amendments will be publicized for thirty (30) days during which active voting members may submit their ballot. The amendment is adopted by a simple majority of votes cast by the voting members.

Bylaws Revision #2 – Publications Clauses

Rationale for revision:

In a non-profit organization such as ASPET, the Council, as the elected governing body, is ultimately responsible for all actions of the organization. While Council can delegate some authority to a committee, such delegation should not be done in an unqualified and permanent manner, which is the case under our current bylaws. The current phrasing creates a serious risk for the Society and ASPET's legal counsel and independent auditors have recommended immediate action to revise these clauses.

The proposed change will bring the Society in line with current best practices for governance of a non-profit organization but does not modify the mission and responsibility of the now Publications Committee to manage the journals and nonserial publications.

The ASPET Council is committed to supporting the ASPET journals and fully expects the Publications Committee to continue to do what it has done so well for so long, manage the Society's journals and nonserial publications. However, this revision will appropriately adjust the relationship between the Publications Committee and Council to be consistent with best practices whereby the elected leadership of ASPET

retains the ultimate decision-making authority on all matters related to the Society. This is currently the case for all other ASPET committees and allows Council to ensure fiduciary responsibility for the Society.

The change from Board of Publications Trustees to Publications Committee retains the spirit of the working relationship between the BPT and Council and reflects standard nomenclature for similar scientific societies.

Original Text:

SECTION 1: Board of Publications Trustees

ITEM 1. Functions. There shall be a Board of Publications Trustees with authority and responsibility delegated by the Council to control and manage, both editorially and financially, the Society's journals and nonserial publications.

SECTION 3: Journal Fund

All publication funds shall be separately accounted for subject to the control of the Board of Publications Trustees. Publication funds may be diverted for other than publication purposes upon affirmative vote of two-thirds of a combined meeting of the Board and Council with a quorum of each present.

Approved Text:

SECTION 1: Publications Committee

ITEM 1. Functions. There shall be a Publications Committee with such authority as delegated to it by the Council to manage the Society's journals and nonserial publications.

SECTION 3: Journal Fund: **DELETED**

All references for the Board of Publications were revised to Publications Committee throughout the Bylaws.

To review the full ASPET Bylaws, visit <https://www.aspet.org/aspet/about-us/constitution-and-bylaws>.



Meet the 2021-2022 ASPET Council

On July 1, 2021, ASPET's newly elected Council members will take office. ASPET is governed by an elected council consisting of the President, the President-Elect and the immediate Past President (each serving for a one-year term in that elected office), the Secretary/Treasurer, the Secretary/Treasurer-Elect and the immediate Past Secretary/Treasurer (each serving for a one-year term in that elected office), and three Councilors (each serving a three-year term in that elected office, with one Councilor retiring each year). In addition to the elected members of Council, the Executive Officer, the chair of the Publications Committee, the chair of the Program Committee, and the FASEB Board representative are non-voting ex officio members of Council during their terms in the respective offices.



MARGARET E. GNEGY,
PhD
President



MICHAEL F. JARVIS, PhD,
FBPHS
President-Elect



CHARLES P. FRANCE,
PhD
Past President



CAROL L. BECK,
PHARMD, PhD
Secretary/Treasurer



KATHRYN A.
CUNNINGHAM, PhD
Secretary/Treasurer-Elect



MARY-ANN BJORNSTI,
PhD
Past Secretary/Treasurer



NAMANDJÉ N. BUMPUS, PhD
Councilor



RANDY A. HALL, PhD
Councilor



JOHN R. TRAYNOR, PhD
Councilor



CATHERINE M. DAVIS, PhD
Ex Officio
FASEB Board Representative



MICHAEL W. WOOD, PhD
Ex Officio
Chair, Program Committee



EMILY E. SCOTT, PhD
Ex Officio
Chair, Publications Committee



JUDITH SIUCIAK, PhD, CAE
Ex Officio
Executive Officer

Get to Know ASPET's Leadership

Add ASPET's Council members to
your network on ASPETConnect.

<https://connect.aspet.org>



Call for 2022 Award Nominations

ASPET is dedicated to recognizing the best research in, contributions to, and accomplishments in all areas of pharmacology. We encourage members to nominate deserving scientists to raise awareness of the outstanding work being done in our field.

ASPET is strongly committed to diversity. Nominations for members of underrepresented groups, women, and persons with disabilities are particularly encouraged.

■ Who can submit a nomination?

You must be an ASPET member to submit nominations.

■ Who is eligible to receive awards?

Scientists from all over the world and at all career stages are eligible for ASPET's various awards. Learn more about the specific eligibility details for each award at <http://www.aspet.org/awards>.

■ How do I submit a nomination?

To nominate someone, visit: <http://www.aspet.org/awards>. Review the award criteria and nomination requirements. Nomination forms can be accessed via the Awards Portal.

■ When are nominations due?

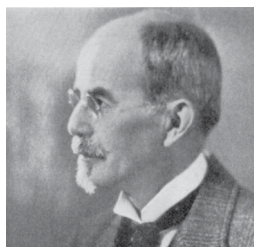
The deadline for nominations is Wednesday, September 15, 2021 at 5:00 PM EDT.

■ What happens after a nomination is submitted?

Each nomination is reviewed by the members of a designated committee. Scores and rankings are given, and compiled results are discussed by the committee, leading to the final selection of the 2022 awardee.

ASPET SCIENTIFIC ACHIEVEMENT AWARDS

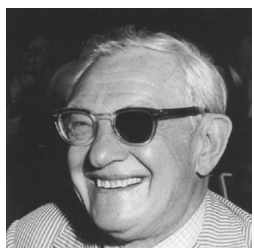
JOHN J. ABEL AWARD IN PHARMACOLOGY



This award is presented for original, outstanding research in the field of pharmacology and/or experimental therapeutics by a candidate who is younger than 45. This award, named after the founder of ASPET, was established in 1946 to stimulate fundamental research

in pharmacology and experimental therapeutics by young investigators.

JULIUS AXELROD AWARD IN PHARMACOLOGY



This award is presented for significant contributions to understanding the biochemical mechanisms underlying the pharmacological actions of drugs and for contributions to mentoring other pharmacologists. This award was established in 1991 to honor the memory

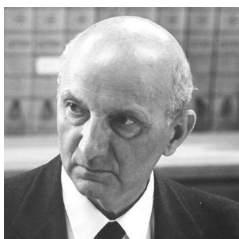
of the eminent American pharmacologist who shaped the fields of neuroscience, drug metabolism, and biochemistry and who served as a mentor for numerous eminent pharmacologists around the world.

LOUIS S. GOODMAN AND ALFRED GILMAN AWARD IN RECEPTOR PHARMACOLOGY



This award was established in 1980 to recognize and stimulate outstanding research in the pharmacology of biological receptors. Such research might provide a better understanding of the mechanisms of biological processes and potentially provide the basis for the discovery of drugs useful in the treatment of diseases.

OTTO KRAYER AWARD IN PHARMACOLOGY



This award is presented to commemorate the enduring legacy of Otto Krayer's personal qualities: his ethical

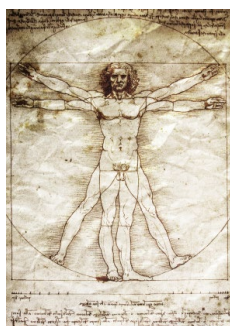
behavior, his commitment to teaching, his high standards of scientific scholarship, publication and editorship, his promotion of interdisciplinary research to reveal the actions of drugs or other chemicals, and his guidance and support of younger scientists. The award recognizes an individual whose character and career contributions to pharmacology are in accord with those exemplified by Dr. Krayer.

ROBERT R. RUFFOLO CAREER ACHIEVEMENT AWARD IN PHARMACOLOGY



This award honors the scientific achievements of scientists who are at the height of their careers (typically mid-to late-career) and who have made significant contributions to any area of pharmacology. This award recognizes the contributions made to drug discovery and development by Dr. Ruffolo.

PHARMACIA-ASPET AWARD IN EXPERIMENTAL THERAPEUTICS



This award recognizes and stimulates outstanding research in pharmacology and experimental therapeutics, basic laboratory, or clinical research that has had, or potentially will have, a major impact on the pharmacological treatment of disease.

Are you an ASPET Emeritus member in need of travel funding to attend the ASPET Annual Meeting at EB 2022?

E. LEONG WAY EMERITUS TRAVEL AWARD



The E. Leong Way award provides financial support to defray the expenses for an ASPET emeritus member to attend the ASPET Annual Meeting at EB. The award honors Edward Leong Way (1916-2017). Dr. Way, a former president of ASPET, is remembered for his contributions to drug metabolism research, opioid pharmacology, and a western understanding of Chinese traditional medicine, as well as the numerous scientists he mentored over 75 years of his professional life. Self-nominations are permitted.

ASPET DIVISION-SPONSORED AWARDS

EARLY CAREER AWARDS

Division-sponsored early career awards are intended for ASPET members who are past the postdoc or trainee career stage but still early in their careers (no more than 15 years after receiving their doctorate). Applications and nominations are welcome from members in academia, industry, government, or other organizational affiliations.

Sponsored by the ASPET Division for Behavioral Pharmacology



The **JH Woods Early Career Award in Behavioral Pharmacology** recognizes outstanding original research by early career investigators in the area of behavioral pharmacology.

Sponsored by the ASPET Division for Cardiovascular Pharmacology



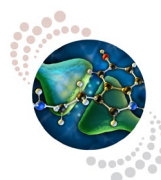
The **Division for Cardiovascular Pharmacology Early Career Award** recognizes outstanding original research in any area of cardiovascular science by members early in their careers.

Sponsored by the ASPET Division for Molecular Pharmacology



The **Division for Molecular Pharmacology Early Career Award** recognizes scholarly achievements of junior investigators early in their independent careers in the area of molecular pharmacology.

Sponsored by the ASPET Division for Neuropharmacology



The **Division for Neuropharmacology Early Career Award** recognizes and honors a young independent investigator who is working in any area of neuropharmacology.

Preference is given to candidates who hold an independent position. An independent position is considered to be one that is responsible for securing and administering their own budgets for research (traditionally a faculty position, or a team leader in a non-university setting).

Sponsored by the ASPET Division for Pharmacology Education

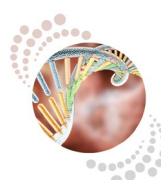


Pharmacology Educators Awards (formerly Travel Awards)

defray costs to participate in the ASPET Annual Meeting at EB 2022. They are available for pharmacology educators who have relatively less experience

as a pharmacology educator and/or junior faculty members (e.g., assistant professor). In addition to promoting participation in the ASPET meeting by pharmacology educators, this award is intended to foster career development in pharmacology education. Applicants must have significant teaching responsibilities in pharmacology, either graduate, undergraduate college classes, or professional schools.

Sponsored by the ASPET Division for Toxicology



The **Division for Toxicology Early Career Award** recognizes excellent original research by early career investigators in the area of toxicology.

Sponsored by the ASPET Division for Translational and Clinical Pharmacology



The **Division for Translational and Clinical Pharmacology Early Career Awards** recognize excellence in translational and clinical pharmacology research that comes from early career scientists. The

purpose is to provide travel support to defray costs for two members to participate at the ASPET Annual Meeting. The awardees will be invited to share with the division their research and ideas pertinent to the division's mission.

OTHER DIVISION-SPONSORED AWARDS

ASPET is strongly committed to diversity. Nominations for members of underrepresented groups, women, and persons with disabilities are particularly encouraged.

Sponsored by the ASPET Division for Cancer Pharmacology



The **Susan B. Horwitz Award Lecture in Cancer Pharmacology** is a new award established to recognize excellent original research by established investigators in the area of cancer pharmacology. The

award honors Dr. Horwitz who has been a pioneer in understanding the mechanism of action of cancer chemotherapy drugs many of which have been and remain mainstays of cancer therapy.

Sponsored by the ASPET Division for Cardiovascular Pharmacology



The **Division for Cardiovascular Pharmacology Mid-Career Award** is a new award that recognizes and honors those who are working in any area of cardiovascular science. The award is open to mid-career

stage, independent investigators from all types of organizations including academia, industry, private or government institutes who are primary members of the division.

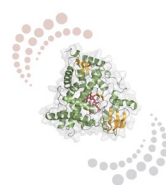
Sponsored by the ASPET Division for Drug Discovery and Development



The **Scientific Achievement Award in Drug Discovery and Development** recognizes outstanding investigators who have made significant contributions in drug discovery,

translational and/or drug development science. This can include investigators who have developed technologies, methods or processes that have enhanced the process of drug discovery or enabled accelerated drug development. Contributions to any therapeutic area or therapeutic modality (small molecule, oligonucleotide, gene therapy, biologic or drug-device combination) will be considered.

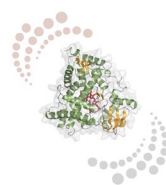
Sponsored by the ASPET Division for Drug Metabolism and Disposition



The **Bernard B. Brodie Award in Drug Metabolism and Disposition** recognizes outstanding original research contributions in drug metabolism and disposition, particularly those

having a major impact on future research in the field. This award was established to honor the fundamental contributions of Dr. Brodie in the field of drug metabolism and disposition.

Sponsored by the ASPET Division for Drug Metabolism and Disposition



The **James R. Gillette Awards** are presented each year to two outstanding papers published in *Drug Metabolism and Disposition*, one each in the broad categories of a) drug metabolism and b)

disposition and pharmacokinetics. All articles published in *DMD* 2021 issues will be considered.

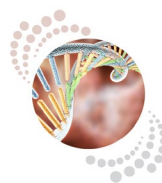
Sponsored by the ASPET Division for Pharmacology Education



Pharmacology Educators Awards (formerly Travel Awards) defray costs to participate in the ASPET Annual Meeting, are available for pharmacology educators at all career levels who are faculty

members. Applicants must have significant teaching responsibilities in pharmacology: either graduate, undergraduate college classes, or professional schools.

Sponsored by the ASPET Division for Toxicology



The **Division for Toxicology Career Award** recognizes outstanding original research contributions to toxicology by an established investigator.

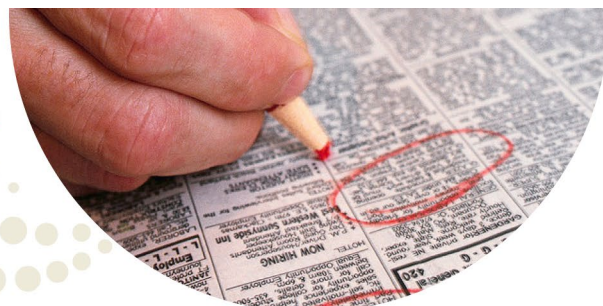
Note: The 2022 Paul M. Vanhoutte Distinguished Lectureship in Vascular Pharmacology and the 2022 P.B. Dews Lifetime Achievement Award will be given by the 2020 awardees whose lectures were postponed due to the cancellation of EB 2020 during the pandemic

Submit Your Nomination There is no better way to recognize someone who has made an impression on you and your career - submit your nomination by September 15, 2021. <http://www.aspet.org/awards>

Visit the ASPET Career Center

www.aspet.org/careercenter

The ASPET Career Center is the best resource for matching job seekers and employers in the 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.





Death by Poison

Rebecca J. Anderson, PhD

On Thursday, September 7, 1978, while waiting for a bus in London, Georgi Markov felt a sharp pain on the back of his right thigh, like a bee sting. He turned to see a man bending to pick up his umbrella. The man apologized, quickly crossed the road, and caught a taxi (1, 2).

Markov, a distinguished 49-year-old Bulgarian novelist and playwright, held strong anti-communist views and sharply criticized the Bulgarian president (1, 2). That afternoon in his BBC office, he mentioned the incident to a colleague, recorded his usual critical broadcast, and went home. He felt weak, developed a fever, and started vomiting (1, 2).

On Friday evening, he was admitted to St. James's Hospital with a rapid pulse and swollen, tender lymph glands in his right groin. The circular 6 cm inflamed area on his thigh had a 2 mm puncture wound at its

center, but no foreign material appeared on the X-ray (1).

At 6:30 pm on Saturday, Markov's blood pressure plummeted, his pulse rose, and his temperature dropped. This suggested septicemia, but repeated blood cultures were all negative, and his white cell count was only slightly elevated. To counteract septic shock, he was given plasma expanders (1).



Replica of the Bulgarian umbrella

This item can be viewed at the International Spy Museum in Washington, DC as part of the largest collection of international espionage artifacts ever placed on public display.

Erik Starar for the International Spy Museum

In the Intensive Care Unit on Sunday morning, Markov's white cell count more than doubled—the first indication of toxin exposure. His kidneys failed, he began vomiting blood, and his lungs filled with fluid (1, 2). His white cell count rose to a “dizzy height” of more than three times normal (1). Despite vigorous attempts at resuscitation, Markov died later that morning.

Markov always anticipated Bulgarian reprisal for his outspoken views, and Britain's anti-terrorist team mounted a full investigation. The postmortem revealed toxemia, hemorrhagic necrosis of the small intestines, and hemorrhagic lymph glands in the right groin. There were also diffuse hemorrhages throughout other organs including the pancreas, testicles, and inguinal lymph glands (1, 2).

A specimen from the lesion on Markov's right thigh and a comparable specimen from his left thigh were sent to David Gall, the Research Medical Officer at Porton Down. The British military research facility at Porton Down had extensively studied poisons. While examining the tissue lesion, Gall discovered a 1.53-mm metal pellet. Under microscopic examination, the solid ball had two holes drilled at right angles, each 0.34 mm in diameter (1).

Given the size of the holes, Gall's team estimated that the pellet could contain about 0.5 mg of material (1). That quantity was too small for a lethal dose of common poisons, such as arsenic or cyanide.

The pellet was sent to the Metropolitan Police Forensic Science Laboratory for further investigation.

Unfortunately, no poison remained in the pellet's holes. But it was clear that the substance (whatever it was) had caused a lot of local damage, the unusual clinical symptoms, and Markov's death (1, 2).

The possibilities narrowed to a few plant poisons, of which ricin was the leading candidate (1, 2). Ricin, a constituent of the castor oil plant, causes a clinical syndrome similar to that experienced by Markov: a fever, high white cell count, shock, local lesion at the site of injection, damage to lymph nodes,

and hemorrhages all over. The lethal dose is 1-10 µg/kg, which would fit into the pellet (1).

To confirm their suspicion, the Porton Down scientists injected a pig with ricin. The toxic effects mirrored the syndrome experienced by Markov, both clinically and histopathologically (1). This provided compelling evidence, but it was all circumstantial.

Around the same time, Vladimir Kostov, another Bulgarian dissident, was wounded in the small of his back while standing on an escalator of the Paris Metro. He developed a fever but survived (1, 2). After Markov's death, Kostov had his wound carefully examined, and doctors recovered a pellet identical to Markov's. Fortunately, some of the pellet's coating remained intact, trapping most of the ricin and limiting its toxicity (1, 2).

This led the Porton Down investigators to conclude that ricin was responsible for Markov's death, too. Regrettably, Markov and Kostov's poisoners were never identified.

Focus on Poisons

Forensic scientists analyze a wide variety of crime scene evidence. For DNA, fingerprints, bullets, etc., they use scientifically validated methods (3, 4). But when the evidence is of poor quality, the methods are unreliable, or the test results are uncertain, scientific analysis may fall short, and analysts must rely more heavily on observation, experience, and reasoning (3).

Some of the most challenging cases involve poisons.

Poisoning can result from accidental overdose, recreational use, environmental exposure, suicide, or criminal intent (5). Biological specimens commonly include blood, semen, and saliva, but

sometimes also the victim's stomach contents, hair, bones, etc. (3). Poison detection in

these specimens may be difficult, and all too often, investigators jump to a conclusion, mistakenly, that death was due to natural causes rather than poisoning.

For conviction, prosecutors must establish that an accused suspect had the means, opportunity, and



Castor Beans

motive to commit the crime—conditions that are often difficult to prove in cases of intentional poisoning. And frequently, as in the Markov case, the poisoner disappears long before investigators determine that the victim was poisoned.

Establishing Means — Arsenic

Heavy metals were the first poisons to be extracted from human tissue. In 1832, James Marsh, an ordinance chemist at the British Royal Arsenal, was asked to investigate the suspicious death of 80-year-old George Bodle. Marsh performed a standard colorimetric test, treating a cup of coffee and a sample of Bodle's intestine with acid. The chemical reaction produced a yellow substance, indicating arsenic (2).



In the public domain

James Marsh

Unfortunately, Marsh's samples deteriorated by the time he testified at the trial. The jury found the test results unconvincing and his technical descriptions incomprehensible. They acquitted John Bodle, the victim's grandson (2). John later confessed, but he could not be tried a second time for the crime.

Marsh, upset by the jury's verdict, went back to the lab, determined to develop a test that any juror could understand (2). That method, subsequently called the Marsh test, deposited silvery-black (metallic) arsenic on a glass surface (6). Marsh published his method in *The Edinburgh Philosophical Journal* in 1836.

Mathieu Orfila was the first to successfully use the Marsh test in a criminal trial (2). In 1840, Orfila was asked to investigate the suspicious death of Charles Pouch-Lafarge in Paris. Charles had died after eating a Christmas cake given to him by his wife, Marie. At trial, Orfila confirmed that arsenic was the poison (using the Marsh test), and the jury found Marie guilty of murder (2).

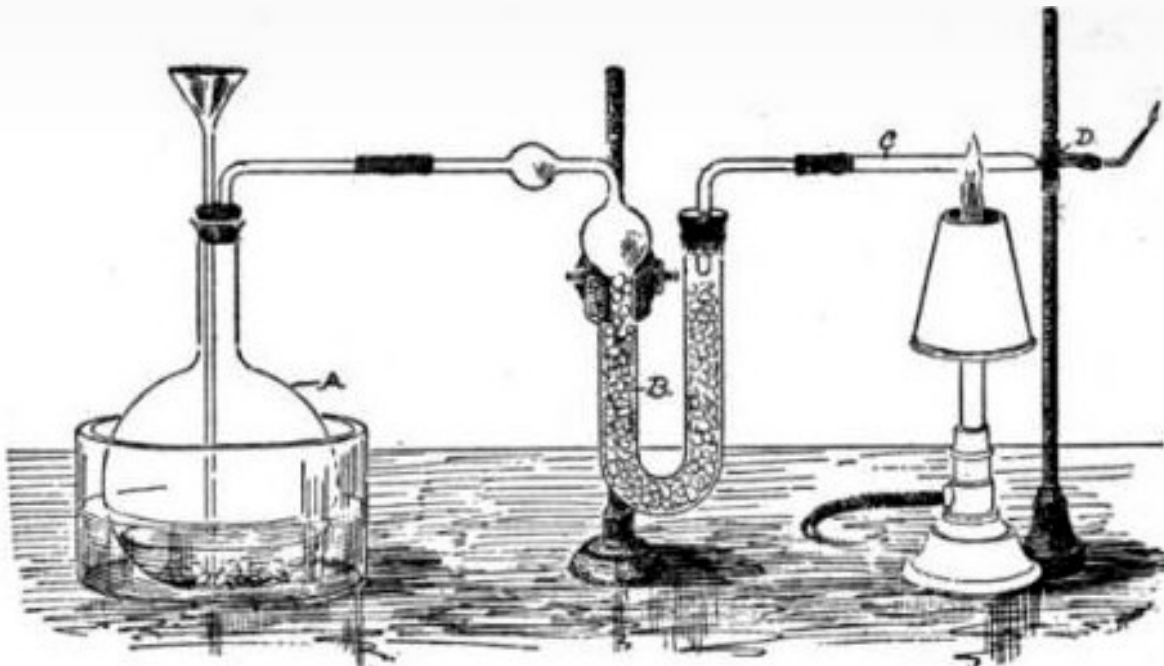
Orfila's Influence

European scientists led the way in establishing modern forensic toxicology, and much of the credit goes to Mathieu Orfila. After receiving his medical degree from the Faculty of Medicine in Paris in 1811, he taught courses in chemistry, legal medicine, anatomy, and botany (7). In 1819, he



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Marie Lafarge



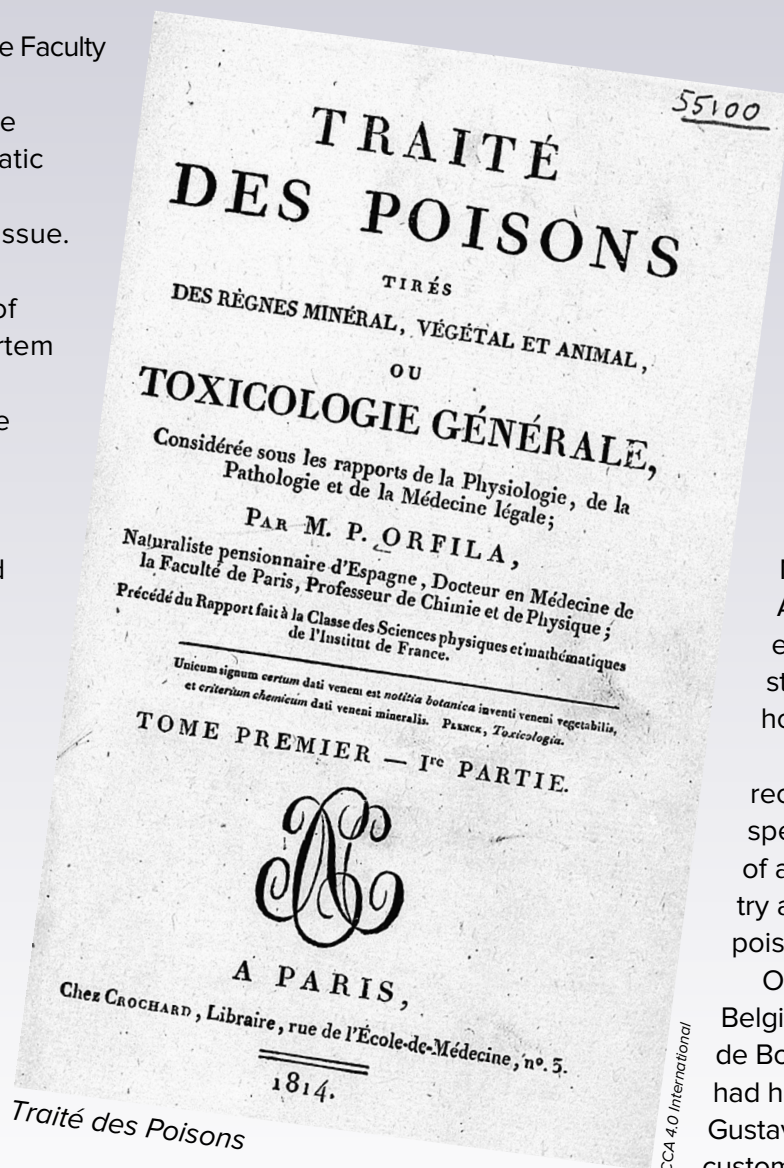
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The Marsh test

became a professor at the Faculty of Medicine.

Orfila was among the first to conduct systematic experiments to extract poisons from organic tissue. Using dogs, he noted the clinical symptoms of poisoning and postmortem pathological damage. He also determined the lethal dose of poisons by different routes of administration and explored antidotes and treatments (7).

Orfila published a compilation of those animal experiments and his meticulous chemical analyses in *Traité des Poisons* (1814). The two-volume text was translated into English, German, Italian, and Spanish. For the next 40 years, this was the principal reference work on toxicology and helped define toxicology as a profession (7).



Establishing Opportunity — Nicotine

Establishing heavy metals as the means of poisoning became routine after development of the Marsh test. But that method destroyed the tissue (by acid or combustion), which also destroyed organic plant-derived poisons, such as strychnine, ricin, and belladonna. By 1847, scientists could identify purified plant alkaloids in lab tests, but no one had ever managed to extract them from human tissues. In fact, Orfila declared that it might never be possible to extract and identify alkaloid poisons from cadavers (8).

In addition to identifying the organic substance, forensic scientists also needed to establish that the poisoner had the opportunity to use it as a poison. Plant alkaloids are present in the environment and in many consumer products, making it difficult to distinguish

between incidental exposure and intentional poisoning.

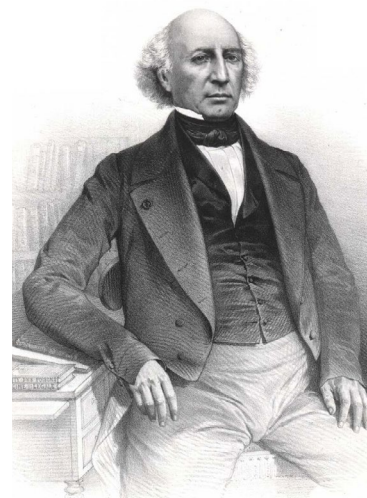
In the 1830s, Jean Servais Stas served as one of Orfila's toxicology assistants in Paris. Stas possessed a medical degree and was an accomplished chemist. In 1841, he returned to his Belgian homeland and was appointed professor of chemistry at the Royal Military Academy. The Academy was poorly equipped, so he set up a state-of-the-art lab in his home at his own expense (8).

In December 1850, Stas received some autopsy specimens preserved in jars of alcohol and was asked to try and identify the suspected poison (2).

On November 21, 1850, Belgian Count Hippolyte Visart de Bocarmé and his wife, Lydie, had hosted Lydie's young brother, Gustave, for dinner (8). Contrary to custom, the Count and Countess served the dinner themselves.

Their children and all of the château's servants were restricted to the kitchen (2).

Gustave was somewhat disabled (recovering from a leg amputation) but reasonably healthy. Unaccountably, he fell ill during dinner and died. Even more surprisingly, the Count and Countess spent the rest of the evening cleaning the scene. They laundered Gustave's clothes and used vinegar to flush



Mathieu Orfila

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Jean Servais Stas

his mouth and wash him. They also cleaned the clothes they were wearing and scrubbed the dining room floor (2).

The servants were told that Gustave had suffered a stroke, but they suspected foul play and alerted the local magistrate. The three physicians who accompanied the magistrate noted that

Gustave's mouth and tongue had chemical burns, and his face was bruised and scratched—signs inconsistent with a stroke (2, 8).

The postmortem revealed inflammation of Gustave's throat and stomach, indicating that he had been forced to drink a corrosive substance, perhaps sulfuric acid (2). Gustave's organs were sent to Jean Stas for analysis.

Stas worked day and night to extract the suspected poison. He detected vinegar, but that would not have killed Gustave. He also quickly discounted sulfuric acid (2, 8).

With limited ways to identify alkaloids, chemists routinely relied on taste and smell tests. One afternoon, after a number of experiments, Stas added potassium hydroxide to the specimens and extracted the tissue with diethyl ether. The next morning, he whiffed the distillate and detected the faint scent of tobacco and mouse urine—characteristic of nicotine (8).

Between December 1850 and February 1851, Stas refined his extraction and purification methods to prove that the extracted substance was nicotine (2, 8). He validated his method by performing nicotine-extraction experiments on animals from the local slaughterhouse and veterinary school. He also obtained tissue specimens from patients who died of lung cancer and those who died from other diseases, both smokers and non-smokers (8).

In his final quantitative analysis, Stas found enough nicotine in Gustave's liver "to kill several persons" (2). Stas reported his findings to the magistrate, who redirected the investigation (2, 8).

The gardener said the Count had bought large quantities of tobacco leaves, and he had assisted the Count in experiments to make a new type of perfume in the château's outbuildings (2, 8). The police found

chemical glassware hidden behind some wooden paneling at the château (2). They also discovered that the Count (using a pseudonym) had visited a chemistry professor in Ghent throughout 1850 (8).

In the château's garden, they exhumed the bodies of cats and dogs. The animal remains, wood samples from the floorboards, and the gardener's trousers were sent to Stas. He found traces of nicotine in all of them (2, 8).

The Count and Countess were arrested. They had apparently sought to maintain their extravagant lifestyle by acquiring the fortune that Gustave had inherited from his father (2, 8).

At the trial in May 1851, Stas' data clearly established that the Count had both the means and opportunity to kill Gustave. It was no accident. The Count was found guilty and was guillotined on July 19, 1851 (2, 8). The Countess was acquitted.

Stas published his method in 1852. It was the first reliable method for extracting plant alkaloids from human tissue (8). With some modifications, this method is still used to extract plant alkaloids such as strychnine, quinine, atropine, morphine, and caffeine. But modern chromatography methods are now used to identify and quantify them (2).

Forensic Science in America

By the end of the 19th century, forensic science had become a respected profession in Europe and was performed by skilled investigators like Orfila and Stas. But in the US, forensics lagged far behind. Most American coroners still had no technical or practical forensic expertise (6).

In February 1918, after a series of scandals and unsolved murders in New York City, Charles Norris was named the city's chief medical examiner (6). Norris had received his medical degree from Columbia and then studied pathology and bacteriology in Germany and Vienna. The charismatic pathologist was already chief of laboratories at Bellevue and Allied Hospitals, where the city had recently constructed a building for forensic services. The new facilities included the city morgue, autopsy rooms, the medical examiner's offices, and a forensic chemistry lab (6).

The imposing Norris, a former college football player, had a buoyant laugh and quick wit (6). He rapidly assembled a capable staff: technicians to handle lab work for all of the boroughs, a couple of physicians, and some pathologists. But the city's precarious financial situation forced Norris to battle the mayor's office every year for adequate funding.



Charles Norris (l) and Alexander Gettler (r) in the New York medical examiner's lab.

Fortunately, both of Norris' parents came from prestigious banking families, and he was independently wealthy. Throughout his tenure, he paid for much of the medical examiner office's expenses out of his own pocket (6).

Norris set standards for rapidly acquiring corpses from crime scenes and conducting autopsies. In cases of suspicious poisoning, he insisted that key organs be removed for chemical analysis—especially the stomach. Each organ, in a separate jar, was sent directly to the chemistry lab for analysis (6).

Establishing Motive — Accidental Poisoning

Unlike means and opportunity, forensic scientists cannot determine a poisoner's motive. But they can help investigators by providing evidence that distinguishes between accidental and intentional poisoning.

In April 1922, Fremont Jackson and his wife, Annie, were found dead in the bathroom of their ritzy hotel apartment in Brooklyn. Both were dressed in street clothes, and their clenched teeth, bloody froth on their lips, and red spots on their skin suggested cyanide poisoning (6).

The bodies were sent to Norris's office in Manhattan. But no cyanide was found in the stomachs and no damage that typically results from ingesting cyanide was seen in other organs. Also, the tests of every bottle, box, and container in the couple's apartment were all negative for cyanide (6). Fremont

and Annie were buried.

A tenacious Brooklyn detective went back to the Jacksons' hotel and interviewed all of the staff. One frightened maid told him that on the day of the Jacksons' death, the basement rooms under the Jackson apartment had been sealed—a standard fumigation practice. At that time, hydrogen cyanide (gas) was commonly used to kill pests. The hotel management had concealed from investigators the fact that the basement had been fumigated just before the couple died (6).

Freemont Jackson's body was exhumed, his lungs removed, and Norris saw lung damage consistent with cyanide poisoning (6). To test their suspicions, the medical examiner's office placed a dozen white rats in the Jacksons' apartment, released cyanide gas in the basement below, and in less than 3 hours, all of the rats were dead.

The Jacksons' deaths were ruled accidental. Because of their negligence, the hotel manager and fumigator were charged with manslaughter (6).

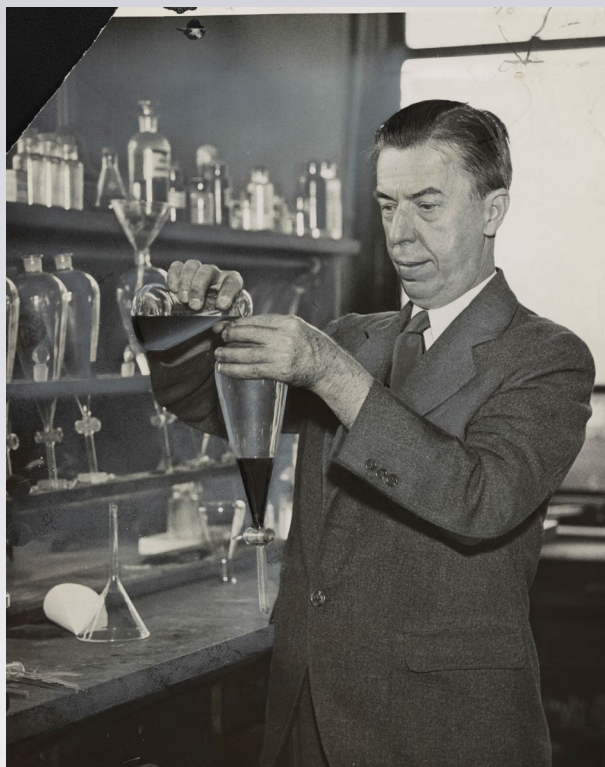
American Forensic Toxicology

Among the top-notch personnel that Norris recruited was Alexander Gettler. Unlike Norris, Gettler came from a humble family and paid for his college tuition by working as a ticket agent on the Brooklyn-to-Battery ferry (6).

He earned his bachelor's degree from City College of New York and his master's degree from Columbia by attending day classes and doing his homework during the ferry's quiet night hours (6). Gettler received a PhD in biochemistry from Columbia while serving as a chemist at Bellevue Hospital. He also taught biochemistry at New York University (9).

When Norris offered Gettler the job as forensic chemist, Bellevue refused to release him, and, also, he genuinely enjoyed teaching. So, they worked out a joint appointment (6). Gettler agreed to do chemical tests for Norris' pathologists on an as-needed basis (9).

Alongside his other responsibilities, Gettler managed to set up New York City's first forensic toxicology lab. Unlike in Europe, no American scientist had established forensic toxicology methods or procedures (6). There were no forensic toxicology training programs, and the few existing forensic books were based mostly on European research (6, 9). In addition, the instrumentation available to Gettler at that time was limited to little more than an analytical balance, a pH meter, a colorimeter, and a photometer (9).



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Alexander Gettler

A driven and exceptionally talented chemist, Gettler loved challenges and positively loathed the idea that he could be outwitted (6). If a test didn't exist, he invented one. He regularly bought liver from the local butcher shop, and in the lab, injected segments with a test compound. Then, he would systematically try various methods to extract and identify it. Those methods would be optimized until he could detect extremely small amounts of each poison (6, 9).

One of Gettler's assistants said, "Everyone marveled at how well he identified the offending agents" (6). He could stand, shirtsleeves rolled up and cigar tucked in a corner of his mouth, survey a tray of beakers containing treated liver extracts, and identify the poison.

Gettler hated to give up. He once sat up all night building a tiny apparatus to collect drops of chemical solution from an infant's brain. His results showed that the baby had been accidentally poisoned after overzealous treatment for head lice (6).

The opposite of Norris, Gettler was a slight man, shy with strangers, and impatient with the constant

media interest in his work. He gave dry, terse answers to journalists' questions. Privately, he liked competitive bowling, loved the Yankees, was addicted to horse racing, and regularly played card games with coworkers from the office (6).

In the summer of 1923, Gettler was still juggling three jobs: chemical pathologist for Bellevue and Allied Hospitals, city toxicologist, and associate professor of chemistry at NYU (6). He was also gaining a national reputation.

Establishing Lack of Motive — Mercury

Besides providing evidence that supports a poisoner's motive, forensic scientists can also help investigators vindicate innocent suspects.

In August 1923, while vacationing at the Westchester Country Club in Rye, NY, Gertrude Webb complained of abdominal pain and shortness of breath. Dr. William Meyer, a highly regarded local doctor, diagnosed mild pneumonia. But Meyer was also an amateur sleuth and regularly lectured to high school students on the science of crime. From the start, he suspected that Gertie might have been poisoned. Her skin was waxy yellow, her condition worsened despite treatment, and she died (6).

Gertie had recently updated her will, leaving her considerable wealth to her new husband, Charles, and Dr. Meyer and Gertie's relatives blamed him for her death. Charles insisted he was innocent. To settle the matter, the district attorney asked Gettler to handle

both the toxicology assessment and the autopsy (6).

Gettler detected calomel, a mercury salt (Hg_2Cl_2), in Gertie's stomach, kidneys, liver, and intestines. Mercury poisoning causes damage to the mouth and throat, ulcers in the stomach wall, and bloody inflammation of the intestines—none of which were present in Gertie's autopsy. The only abnormal findings were lung congestion from pneumonia and severe kidney disease (6).

Gettler thought the barely detectable levels of calomel in Gertie were far below a lethal dose (6). At that time, calomel was commonly used as a laxative, and it is much less toxic than other mercury salts.

"He could stand, shirtsleeves rolled up and cigar tucked in a corner of his mouth, survey a tray of beakers containing treated liver extracts, and identify the poison."

To confirm his suspicion, Gettler dosed several cats with a standard dose of calomel tonic. He found organ concentrations similar to those in Gertie's organs. With that information, the district attorney re-interviewed Gertie's physicians. Meyer had not prescribed calomel, but her personal physician had advised her to take regular doses of it. The official coroner's conclusion was that Gertie Webb died from natural causes: kidney disease, a bad heart, and pleural pneumonia.

The charges against Charles Webb were dropped. Norris and Gettler were gratified that scientific evidence could exonerate an innocent man (6).

Gaining Respect

In the Jackson case, the fumigator and hotel manager admitted that they had deceived investigators about the cyanide fumigation. But at the trial, their lawyer successfully challenged the medical examiner's testimony (6). Both defendants were acquitted because of reasonable doubt. Norris was furious.

Forensic toxicology was a new science in the US, and defense lawyers skillfully attacked forensic testimony. The assistant district attorney explained to Norris that it was very difficult for prosecutors to educate and convince a jury (6).

Norris was determined to "improve the medico-legal situation," not just in New York but across the country. In September 1922, he convened a meeting in Washington, DC, with the Chicago coroner's physician, a Johns Hopkins pathologist, a Cornell Medical College chemistry expert, and George Magrath, the highly respected Boston medical examiner who had created one of the first professional programs in the US (6). They pooled their resources and with a small grant from the Rockefeller Foundation, hired an investigator to survey the state of forensic medicine in the US. Then, they began setting national standards (6).

In New York, the successful clearing of Charles Webb allowed Norris to show that the medical examiner's office was a beneficial partner in criminal investigations. In the fall of 1923, he initiated a regular training program for city detectives. The detectives visited the morgue, observed autopsies, and toured Gettler's toxicology lab, where detection of poisons (mercury salts, arsenic, and cyanide) was routine (6).

In June 1933, Bellevue Hospital and New York University announced the formation of a forensic medicine department (6). It was the first of its kind in the country, bringing the US closer to the level of European forensic medicine as a credible profession. Harvard was

also starting a forensic medicine department, but the NYU program was entirely pragmatic: training talented scientists to work in criminal justice.

Charles Norris headed the new department. Alexander Gettler headed the toxicology section, and most of the city's other assistant medical examiners taught pathology (6). The training included how to properly sign a death certificate and how to testify in court. Fourth-year students could assist with autopsies in the medical examiner's office. The department also offered graduates a three-year residency in forensic medicine, including a practicum

"They had spent long nights in the lab and insisted on excellence—solving many cases that perplexed police and stopping a great many poisoners"

in the medical examiner's office and additional training in toxicology (6).

By 1935, defense attorneys were complaining that the medical examiner's office wielded too much influence. Norris and Gettler were so respected in the courtroom that jurors tended to accept whatever they said (6).

This dramatic shift, from skepticism to absolute acceptance of forensic evidence, was entirely due to Norris and Gettler's unfaltering dedication. They had spent long nights in the lab and insisted on excellence—solving many cases that perplexed police and stopping a great many poisoners (6).

Norris was remembered for his friendship, his many personal acts of assistance, his extremely generous and unstinting words of encouragement, and his cheery smile, especially when the ongoing financial difficulties made everything seem bleak (6).

Gettler trained the next generation of forensic toxicologists. And "Gettler's Boys" would, in turn, head forensic labs from Long Island to Puerto Rico. They all praised Gettler's expertise, professional intuition, inventiveness, and absolute understanding of chemical reactions (6).

During their long careers, Norris performed 4,000 autopsies and Gettler analyzed specimens from an estimated 100,000 bodies (6). They set forensic standards for the rest of the country, and their published papers on forensics have become classics. Like Orfila

and Stas in Europe, Norris and Gettler are considered the founders of modern forensic science in the US (6, 9).

From Fiction to Fact

More than any of her contemporaries, Agatha Christie used poisons in the plots of her mystery novels, plays, and short stories. Her knowledge came not only from a lifelong interest in poisons but also from direct experience (2).

During World War I, Christie passed her exams as a pharmacy assistant and worked in a local hospital dispensary. At that time, most prescriptions were prepared manually, and she became skilled at compounding dangerous drugs and potential poisons. During World War II, she again volunteered, serving in the dispensary at University College Hospital, London (2).

Christie's descriptions were so detailed and accurate that her books were sometimes cited as the source and inspiration for real-life cases of intentional poisoning. None of these accusations was ever proven (2).

In 1977, a 19-month-old child became ill in Qatar. After an initial seizure and high fever, she grew increasingly clumsy, lethargic, and had slurred speech—symptoms that stumped all of the doctors. By day 10, she was unable to sit, stand, or walk, and had difficulty swallowing. So, her parents flew with her to London (10).

She was admitted to Hammersmith Hospital, where the British doctors ran a series of tests. They saw no evidence of viral infection, and a routine toxicology screen was negative. Over the next four days, her

"the frequency of accidents, suicides, and a few murders led to banning thallium pesticides in the US in 1972"

condition grew worse, and the doctors remained baffled (2, 10).

Then, during routine hospital rounds, nurse Marsha Maitland suggested that the child might have thallium poisoning. Maitland had been reading Agatha Christie's *A Pale Horse* (1952), which described a series of cases of thallium poisoning. The girl's bizarre symptoms were remarkably similar (10).

Thallium salts are among the most toxic heavy metals. Beginning in the 1920s, thallium was used as a rodenticide. But the frequency of accidents, suicides, and a few murders led to banning thallium pesticides in the US in 1972 (2, 6).

Thallium competes with potassium in the body, which disrupts cellular metabolism and many physiological functions. The resulting symptoms are often mistaken for one natural disease or another (2, 6). The most distinctive characteristic is hair loss after about 2 weeks of thallium exposure.

In Christie's book, hair loss was consistently observed in all of the victims, and the Qatar child seemed to be developing the same condition. That morning, the doctors noted clusters of her hair coming out "with minimal tension" (10).

Thallium was not part of the routine toxicology screen. Urine samples were sent to Scotland Yard's forensic lab for special analysis. The lab reported that the girl's urine contained 3.7 µg/liter of thallium—more than ten times the permitted maximum (10).

In discussions with the child's parents, the most likely source seemed to be a pesticide used to eliminate cockroaches and rodents in the drains and septic tank in their home. Thallium pesticides were still commonly used in the Middle East (10).

The child was treated to detoxify the thallium, and at a four-month follow up, she showed remarkable improvement (10).

The British physicians published this case study, acknowledging their indebtedness to "Agatha Christie for her excellent and perceptive clinical descriptions, and to Nurse Maitland for keeping us up to date on the literature" (10).

They also suggested, "It would be reassuring if a simple test...was introduced by toxicology laboratories, just in case Agatha Christie's book goes out of print" (10).

Unintended Consequences

On March 4, 2018, Sergei Skripal and his daughter, Yulia, were found slumped on a park bench in Salisbury, England. Yulia was leaning against Sergei. Sergei was gazing up at the sky and making strange, jerky movements with his hands (11).

Sergei had been a Soviet intelligence officer, who was later recruited as a British spy. The Russians caught him passing secrets to his British handler, and he was imprisoned. Later, he was released as part of a prisoner exchange and settled in Salisbury (11).

Sergei remained fearful of Russian reprisal, and British officials immediately suspected that the Skripals had been intentionally poisoned. On April 3, 2018, the British Defense Science and Technology Laboratory announced that it was “completely confident” that the poison was Novichok (12).

Novichok refers to a group of oily liquid organophosphate nerve agents that were developed in Russia from 1970 to 1993 as fourth-generation chemical weapons. They have a half-life of up to 50 years and are ten times more potent than the nerve agents (e.g., VX, soman, sarin) that were developed in World War II.

Investigators determined that Novichok had been smeared on the door handle of the Skripals’ home (11). From there, the poison was unwittingly spread around Salisbury by the Skripals and, subsequently, by crime scene investigators. Up to 38 people were affected by the poison and four were hospitalized, including a police officer.

Detailed records (cell phone transmissions, passport control, traffic cameras, etc.) pointed to two Russian Intelligence colonels as the poisoners. They had traveled to England under false passports, posing as tourists. Novichok was concealed inside a specially engineered bottle of Nina Ricci’s Premier Jour perfume (11).

A few months later, a British couple found the discarded bottle in a trash dumpster and sprayed themselves with it. Both fell ill. Charlie Rowley recovered, but his partner, Dawn Sturgess, died (11).

On August 20, 2020, Russian opposition leader Alexei Navalny fell ill during a flight from Tomsk to Moscow. The plane made an emergency landing, Navalny was hospitalized, and he was later transferred to a hospital in Berlin. Testing in Western labs confirmed that Navalny had also been poisoned with a Novichok agent similar to the one that poisoned the Skripals. A water bottle in Navalny’s hotel room in Tomsk was the likely source.

The Skripals, Navalny, Rowley, and the police officer spent months recovering. And it took nearly a year for dozens of military personnel to clean and restore the contaminated locations in and around Salisbury.

Modern Forensic Science

Historically, forensic scientists (like Stas, Norris, and Gettler) did everything: blood typing, fingerprinting, and chemical analysis. In the past 20 years, forensic

toxicology has become a specialty, and it is relatively easy to identify poisons in body fluids, tissues, and organs. Standard chromatography and mass spectrometry, along with various immunoassays, can detect even minute concentrations of poisons like ricin and Novichok (4).

Forensic scientists typically have a bachelor’s degree in biology or chemistry. They must also pass a battery of tests and a panel interview. If hired, they undergo extensive specialized training before being certified to work on cases (4). In the US, certification of forensic toxicologists, as well as certification of forensic labs, can be obtained through the American Board of Forensic Toxicology (5).

Forensic toxicologists work in crime labs, medical examiners’ offices, government health labs, and

***"Novichok was
concealed inside
a specially
engineered bottle
of Nina Ricci's
Premier Jour
perfume"***

independent contract labs (5). Every day, they receive boxes loaded with blood and urine samples for testing (4).

Because forensic evidence links suspects to crimes, accuracy and expertise are paramount. The chain of custody must be preserved from the morgue to lab testing, reporting, and storage (5). This work is both more mundane and more demanding than that portrayed in television and movie plots.

Quantitative analytical tests must be validated and documented, according to Standard Operating Procedures. The tests are always repeated to confirm the results and then peer reviewed by a second toxicologist before the report is released (5).

The report not only is accurate and complete in scientific details but also interprets the results in language that non-scientists (attorneys, judges, and jurors) can easily understand (4). The stakes

are high: forensic results help to establish the guilt or innocence of accused suspects.

Toward the end of his career, Alexander Gettler admitted to a *Harper's* interviewer that for all his obsession with detail, the carefully repeated experiments, and the wealth of chemical information he had accumulated over the years, the results still weighed heavily on him (4). His findings had helped to acquit some defendants. But his data had also helped convict others and send them to the electric chair. "I keep asking myself, have I done everything right?" (4).

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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 aspirin.

Don't miss the September 2021 issue.



Science Policy News

Washington Fellows Recap

In March, ASPET hosted its Hill Day for its 2021 Washington Fellows class. This year's program was conducted virtually due to travel restrictions and closures related to COVID-19. Despite these unusual circumstances, the Washington Fellows were still able to meet with legislators and staff to advocate for increased funding for biomedical research and the importance of the use of animal models. This year's class of nine were accompanied by five former fellows

who served as guides. Working in groups of three (two fellows + one guide), the Washington Fellows met with 15 House offices and 20 Senate offices over the course of the day. One of the guides was Dr. Sophia Kaska.

Dr. Kaska is currently the Manager of Science Initiatives and Outreach at Research!America and is a member of ASPET's Science Policy Committee. She wrote about her experience for Research!America which we've reprinted here with permission.



Sophia Kaska, PhD

How are research advocates making their case on Capitol Hill during COVID-19? I had the opportunity to find out recently when the Washington Fellows visited congressional offices – virtually! This March, I served as a mentor to a group of early career scientists participating in the ASPET Hill Day for the first time. Our goals were two-fold: to champion NIH and NSF funding by asking congressional offices to sign Dear Colleague Letters, and to discuss the essential use of animals in biomedical research to develop therapies for improving human and veterinary health.

Normally, Fellows would be in Washington, DC, for a two-day experience. The first day would consist of an advocacy training conference in which Fellows would attend lectures on topics such as how to conduct successful Hill meetings, how to talk to legislators about animal research, and how to develop their meeting strategies. A group dinner would follow with previous Washington Fellows who would be serving as Hill guides. On the second day, Fellows would spend time on the Hill dashing between congressional office buildings and stopping for photo opportunities in front of the Capitol building.

Due to the ongoing COVID-19 pandemic, training and meetings were conducted virtually this year. Tyler Lamb, ASPET's Senior Manager of Government Affairs and Science Policy, hosted a series of science policy lectures leading up to the virtual advocacy training conference. At this

conference, guest speakers from the Federation of American Societies for Experimental Biology (FASEB) and the Chief of Staff of a South Carolina representative joined Tyler in providing information and advice to help the Washington Fellows develop their meeting strategies.

As a previous Washington Fellow, my role for Hill Day was to serve as a Hill guide. My responsibilities were to serve as a resource for the 2021 class, to help develop pitches to explain their research to non-scientists, and to supplement their congressional office conversations with additional information as needed.

Instead of navigating busy security lines and walking down long hallways, my Fellows and I calmly sat at our desks and attended meetings by clicking through calendar invites. The ability to have a prepared script and additional information displayed side by side with Zoom windows reduced some of the nervousness from the first few meetings of the day, allowing us to keep our messages and asks consistent and concise.

From meeting to meeting, the Fellows gained confidence in their ability to effectively communicate their research and to respond to questions and comments from staffers.

The responses from each congressional office were positive and even surprised one of my Fellows. The strong bipartisan support for biomedical research was refreshing to hear throughout the day. I was pleasantly surprised and delighted to hear that several offices have been engaged in conversations on the use of animals in biomedical research. Previous Hill visits required more discussion with legislative offices on this topic, but some of the staffers we spoke to showed incredible understanding of the valuable role that animals play in research.

I began Hill Day with an open mind, not knowing how virtual meetings would compare to in-person ones. The outcomes exceeded my expectations. I was proud of how my Fellows had rapidly developed their advocacy skills in one day. While some aspects of Hill Day can't be captured virtually, we accomplished our goal, which was to engage with congressional offices on the value of supporting biomedical research.



If you're interested in becoming a Washington Fellow or would like to learn more about the program, please visit the website at aspet.org/aspet/advocacy/aspet-washington-fellows-program.



Education News

ASPET Names 2021 Individual Summer Undergraduate Research Fellows

The ASPET Summer Undergraduate Research Fellowship (SURF) program is designed to introduce undergraduate students to pharmacology research through a 10-week summer laboratory research experience. The goal of the program is to use authentic, mentored research experiences in pharmacology to heighten student interest in careers in research and related health care disciplines. ASPET offers both institutional and individual SURF awards. Institutions with funded fellowship programs are listed at www.aspet.org/SURF-Funded. The individual fellowships are designed to support students whose home campus lacks an institutional program, or who seek more specialized training opportunities at a different university. ASPET congratulates the 4 students selected for 2021 individual fellowships:



Ethan Dintzner will work in the Araç Laboratory at the University of Chicago to investigate the structural basis for dimerization of the CELSR G protein-coupled receptor, an understudied oncogene found mutated across several cancers and birth defects. The

goal of his research this summer will be to screen expression constructs of different extracellular domain fragments and use biophysical methods to understand how CELSR's cadherin repeats interact with each other.



Insha Maknojia will work in the laboratory of Dr. Matthias Riess at Vanderbilt University. Her research will examine the location of where copolymer-based cell membrane stabilizers work to confer cellular protection against oxidative injury in vitro. Insha will use

transendothelial electrical resistance to assess EC monolayer barrier integrity.



Bryson Rorie will work in the laboratory of Dr. Erin Calipari at Vanderbilt University. Bryson's research will focus on characterizing pentameric nicotinic acetylcholine receptor (nAChR) modulation of the neural circuits underlying reward-learning in both males

and females to better understand the extent of sex-based differences in associative learning.



Aman Singla will work in the laboratory of Dr. Michele La Merrill at the University of California-Davis, where he will be investigating hepatic signaling that leads to EGFR-mediated fatty liver caused by the flame retardant triphenyl phosphate (TPhP). Utilizing molecular assays in

experimental models of fatty liver, he will assess how TPhP affects key proteins enzymes both within the liver and those involved in tissue crosstalk, in order to understand the mechanisms responsible for such a response.

We wish the 2021 individual fellows as well as the fellows participating in the SURF institutional programs a productive and fun summer of research!

Institutional Summer Undergraduate Research Fellowship (SURF) Program



Applications Due October 1, 2021 for 2022 Awards

ASPET's Summer Undergraduate Research Fellowship (SURF) program introduces undergraduate students to pharmacology research through a 10-week laboratory research experience. The goal of the program is to use authentic, mentored research experiences in pharmacology to heighten student interest in careers in research and related health care disciplines.

Who Should Apply

Groups of faculty from the same campus who conduct pharmacology-related research including, but not limited to, scientists representing departments of pharmacology, toxicology, pharmaceutical sciences, and/or biological chemistry are encouraged to apply for funding to establish a SURF program on their campus. If awarded, institutional programs will be responsible for recruiting and selecting students to participate.

Program Overview

A group of at least five ASPET regular or affiliate members in good standing from one institution may apply, with one ASPET member serving as the program director. Students are expected to receive at least a \$2,800 stipend for a minimum of ten weeks participation in the program. ASPET support for an undergraduate fellowship program is \$1800/student for at least 5 students per year of funding (\$9000 total/year). The application should include an institutional commitment for matching funds of at least \$1000/student from local resources.

Student participants are expected to be current members of ASPET or to join no later than the start of their summer research experience.

Institutional awards are normally made for three years. For award terms and application instructions, please visit <https://www.aspet.org/awards/SURF>. For questions, please contact Catherine L. Fry, PhD at cfry@aspnet.org.



Journals News

Axelrod Symposium – *Molecular Pharmacology* Special Section

Separate from the EB Axelrod Symposium, the Special Section on Phosphoproteomic Analysis of G Protein-Coupled Pathways – Axelrod Symposium is a collection of five articles that are available in the May issue of *Molecular Pharmacology*.

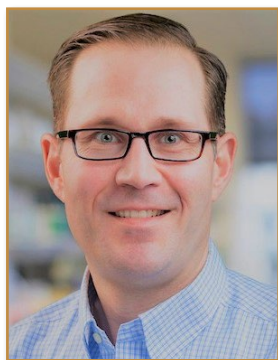
All of the articles in the special section are freely accessible through July 31, 2021, at <https://bit.ly/3sJwAr8>.

New Editorial Board Members

Gregory T. Collins, Emily M. Jutkiewicz, Michael Nader, and Daniel J. Morgan recently joined the *JPET* Editorial Advisory Board. Dr. Collins is an assistant professor in the Department of Pharmacology at the University of Texas Health Science Center at San Antonio. Dr. Jutkiewicz is an associate professor in the Department of Pharmacology at the University of Michigan Medical School. Dr. Nader is a professor

of physiology and pharmacology at the Wake Forest School of Medicine. Dr. Morgan is an associate professor in pharmacology at the Joan C. Edwards School of Medicine, Marshall University, Huntington, West Virginia.

The Publications Committee thanks them and all of ASPET's editorial board members for their service and dedication to the Society's journals.



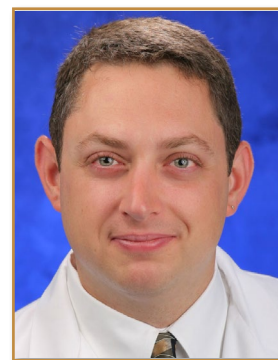
Gregory T. Collins



Emily M. Jutkiewicz



Michael Nader



Daniel J. Morgan

Highlighted Trainee Authors

Congratulations to the latest Highlighted Trainee Authors selected for *Drug Metabolism and Disposition*, *The Journal of Pharmacology and Experimental Therapeutics*, and *Molecular Pharmacology*:

Drug Metabolism and Disposition

- Guo Zhong (Univ. of Washington) – March
- Sisi Feng (Shanghai Hexaell Biotech Co., Ltd.) – April
- Lingxin Zhang (Mayo Clinic) – May



Guo Zhong



Sisi Feng



Lingxin Zhang

JPET

- Mathieu Panel (Mondor Inst. for Biomed. Res.) – March
- Victor M. Jimenez Jr. (UT Health Sci. Ctr., San Antonio) – April
- Clare Diester (Virginia Commonwealth Univ.) – May



Mathieu Panel



Victor M. Jimenez Jr.



Clare Diester

Molecular Pharmacology

- Yunhui Xu (Marshall Univ.) – March
- Riley E. Perszyk (Emory Univ.) – May



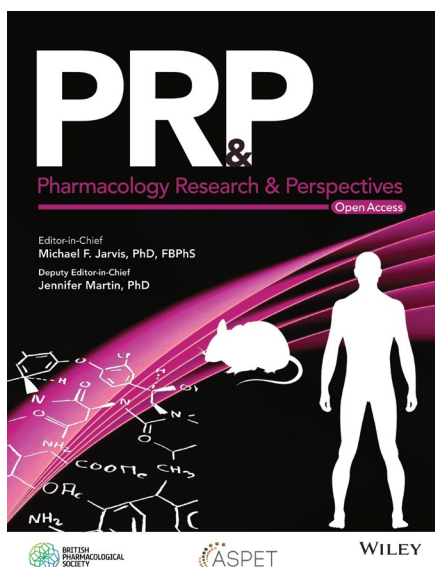
Yunhui Xu



Riley E. Perszyk

A brief description of their areas of research, current projects, the anticipated impact of their work, and what they enjoy when not in the lab is online at <https://bit.ly/2yX1YeH>. We congratulate all of them for being selected.

Pharmacology Research & Perspectives Introduces: Pharmacology Education and Innovation Series



PR&P has recently launched a new series with the title “Pharmacology Education and Innovation.”

Articles published so far as part of this series can be found here: [https://bpspubs.onlinelibrary.wiley.com/doi/toc/10.1002/\(ISSN\)2052-1707.pharm-ed](https://bpspubs.onlinelibrary.wiley.com/doi/toc/10.1002/(ISSN)2052-1707.pharm-ed)

Pharmacology education is an essential element of biomedical science and practice. Knowledge of drug action on biological systems, patient outcomes, and how the body responds to pharmacological interventions are key curricular competencies in schools of medicine, nursing, pharmacy, dentistry, physiotherapy, and veterinary medicine, particularly in the context of disease and variable physiological and clinical parameters.

In addition, emerging biomedical scientific developments require the continual evolution of pharmacology educational methodology and practices. Assessing the downstream utility and practice of such training in the research and clinical settings, by way of clinical efficacy, toxicity, and adverse prescribing behaviors provides valuable opportunities to evaluate the quality of educational outcomes in pharmacology.

Call for Papers – Now Open

Educational research-related papers have been a key component of the content published in PR&P in recent years. To build on this important feature of the journal and to further the advancement of pharmacology education, PR&P has opened a call for papers on all aspects of current and future pharmacology education including:

- curriculum development,
- learning strategies,
- new pedagogical models, and
- approaches to the delivery of pharmacology content.

More information about this call for papers can be found on the call for papers page (found at https://bpspubs.onlinelibrary.wiley.com/hub/journal/20521707/cfp_pharmacology_education) and in the Editorial (found at <https://bpspubs.onlinelibrary.wiley.com/doi/full/10.1002/prp2.772>) by the Editor-in-Chief, Dr. Mike Jarvis, and Deputy Editor, Dr. Jennifer Martin.

Submission Requirements

As part of this series, we encourage submissions of all article types (e.g., Original Articles, Reviews, Commentaries). The PR&P Author Guidelines provide further information about submission requirements for manuscripts submitted as part of the series, and can be reviewed here: <https://bpspubs.onlinelibrary.wiley.com/hub/journal/20521707/author-guidelines.html>

APC Discount

Articles accepted as part of the Pharmacology Education and Innovation Series are also eligible for a **20% discount** on the Article Publication Charge, the details of which can be reviewed at: <https://bpspubs.onlinelibrary.wiley.com/hub/journal/20521707/article-publication-charges.html>.



Meeting News

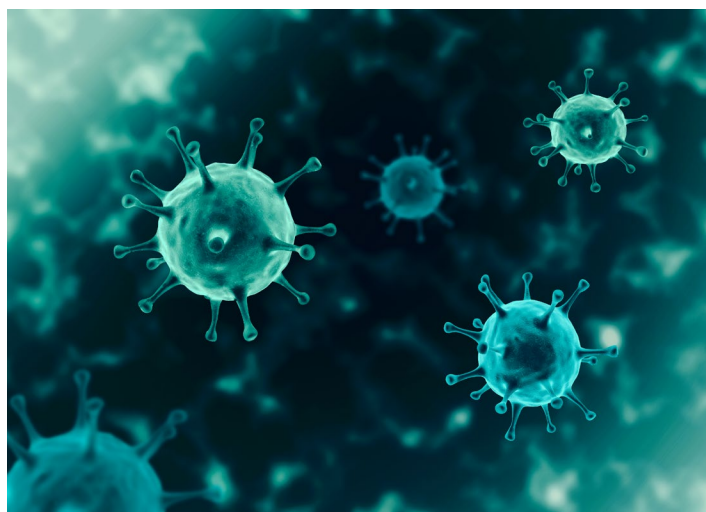


ASPET's Focus on Pharmacology Virtual Series was launched in July 2020 as a venue for communicating innovative science in pharmacology and experimental therapeutics. The webinars are broadcast live, and many have interactive components before, during, and after each session. The Focus on Pharmacology Virtual Series is free for ASPET members. Below are two summary articles on recent sessions. Did you miss the chance to attend? **Recordings of all the sessions are available on the ASPETConnect Focus on Pharmacology community.**

Coronavirus Series – Part 4: COVID-19 Vaccine: *Between Myth and Reality*

Submitted by Khalid Garman, PhD, and Mohamed Ghonim, PhD

Since early 2020, the spread of the novel coronavirus has been rapid and devastating, leaving more than 3 million dead worldwide and almost 600,000 in the US alone. The pandemic has put entire nations on lockdown, overwhelmed healthcare systems, and plunged the global economy into an unprecedented recession. The FDA Emergency Use Authorization and the public availability of COVID-19 vaccines finally promise an end to social isolation and a path toward economic recovery. However, despite this offer of hope and safety, many individuals remain reluctant to receive the vaccine, inadvertently putting critical scientific and public health efforts at stake. Much of this trepidation stems from a lack of clear, accessible information – as well as an abundance of unsubstantiated and sensationalist claims – about vaccines, in general, and the COVID-19 vaccines, in



particular. To address the uncertainty, members of the ASPET Young Scientists Committee (YSC) organized a public outreach event titled, “COVID-19 Vaccines:

Between Myth and Reality” as part of the ASPET Focus on Pharmacology virtual series.

The event was a webinar held on March 25th, 2021 and addressed frequently asked questions about COVID-19. The speaker was Dr. Paul Thomas, a faculty member of the Department of Immunology at St. Jude Children’s Research Hospital and a well-published scientist who studies the immunopathology of inflammatory airway diseases mediated by viral infections. He is currently the principal investigator of a clinical trial aiming to decipher the underlying mechanisms and consequences of SARS-CoV-2 infection before and after vaccination.

In addition to event promotion by ASPET, YSC members distributed the event invite through their personal networks, reaching a diverse audience spanning multiple countries from North America to Southeast Asia. Nearly 190 attendees registered for the webinar, making it the highest attended ASPET virtual event since the start of the pandemic. Attendee excitement was palpable from the moment

attendees logged in to the meeting, with many audience members asking questions even before the event started. During the one-hour webinar, Dr. Thomas covered information on COVID-19 vaccines highlighting their safety and efficacy, and his presentation was followed by a twenty-minute Q&A session. There were more questions than it was possible to answer during the session, but more have been addressed in supplemental recordings available to the public through the ASPET website under “COVID-19 Resources.”

After the event, session organizers spoke with attendees, who provided an overwhelmingly positive response to the session. Many expressed a sense of relief knowing that they could make informed decisions for themselves and their families. In a cultural climate saturated with misinformation and fear-mongering about COVID-19 vaccines, effective evidence-based science communication is our best and only remedy.

Becoming a Resilient Scientist

Submitted by Sharon Milgram, PhD & Anna Han, PhD

Scientists in biomedical sciences experience significant stress, anxiety, and harassment. For example, a survey of 4,300 academic scientists worldwide reported that at least half of participants struggle with depression and anxiety, and 67% reported witnessing bullying or harassment, with 43% experiencing it.¹ This effect is exacerbated amongst trainees who are experiencing more stressors and are at six times greater risk for depression and anxiety than the general population.² These trainees face a myriad of issues prevalent in academic cultures, such as long lab hours, constant looming deadlines, pressures to publish, and isolation. Yet, they are expected to keep up the relentless pace and focus while facing setbacks and rejections. Perhaps one of the greatest ironies in biomedicine is that while our trainees are being trained for the next innovation in healthcare and public health, their own well-being languishes.

It is clear that practical and effective interventions are vitally needed to help manage stress and increase resilience amongst biomedical trainee populations. In

her talk, Dr. Sharon Milgram, the Director of the Office of Intramural Training and Education at the National Institutes of Health, gave voice to those issues – 1) the importance of an integrated approach to wellness and stress management amongst biomedical trainees, 2) emphasizing the need for a scientific culture that normalizes mental health and wellness, and 3) the need to promote and cultivate resilience, the ability to adapt and grow through adversity. Specifically, Dr. Milgram argued that wellness is a foundation of resilience, and resilience is a key to scientific and career success.

In the first part of her talk, Dr. Milgram discussed the importance of integrative wellness, not just at an individual level but also at the institutional policy level with all stakeholders. She argued that the first step in building a culture of wellness starts with treating time for wellness as a right rather than something that distracts from one’s worth as a scientist. She said, “To do well, we have to be well,” and reasoned that people function at their best and are most creative when they are in the “window of tolerance.”³ She then discussed

a self-care model that incorporates and assesses all aspects of the self - mental, physical, emotional, and spiritual. (The assessment can be found in her talk: https://www.youtube.com/watch?v=iDh36f4s4_k)

Having addressed the foundation of wellness, Dr. Milgram focused the second half of the talk on building resilience. Specifically, she discussed how distorted negative self-talk (cognitive distortions) and imposter fears can hinder resilience and how to challenge the distortions and fears. For example, she provided the **HATS** model to aid in reframing or retelling self-stories [**HATS** - **H**ear your negative self-talk, **A**ppreciate that you have a choice and fact check it, **T**alk back to your negative self-talk, **S**eeK support and guidance when needed]. She emphasized that fighting negative self-talk is a learned skill that requires intention and consistent practice.

In the last portion of her talk, Dr. Milgram emphasized the need to improve shame resilience (there is no such thing as an alternative career!) and the need for those in mentoring and training, especially principal investigators, to explicitly support diverse career outcomes. Furthermore, she also encouraged mentors to 1) embrace the concept of multiple mentors, where trainees can cultivate

a positive network of personal and professional mentors, 2) have a more thoughtful and holistic approach to hiring trainees and staff, and 3) develop an open communication and a willingness to use resources to resolve any conflicts before they become insurmountable.

Dr. Milgram urged everyone to address the wellness and resilience barriers head-on as a community and become wellness ambassadors and support each other. For science to flourish, biomedical fields must retain and nurture the next generation of scientists and capitalize on the talent in the workforce. To do that, we need to normalize and prioritize wellness and resilience, resulting in more robust and more innovative scientists and a more collaborative community.

1. Abbott, A. (2020). Huge Survey Reveals Pressures of Scientist's Lives. *Nature*, 577(7791), 460-461
2. Evans, T.M., Bira, L., Gastelum, J.B., Weiss, L.T., & Vanderford, N.L. (2018). Evidence for a Mental Health Crisis in Graduate Education. *Nature Biotechnology*, 36(3), 282-284
3. Siegel, D.J. (1999). *The developing mind: How relationships and the brain interact to shape who we are*. New York; Guilford Press



Do You Have An Idea for a Future Focus on Pharmacology Webinar?

To propose a Focus on Pharmacology session, reach out through *ASPETConnect* to your division's Program Committee representative or the chair of the ASPET committee most related to your topic. Proposals are accepted on a rolling basis through ASPET divisions and committees. Contact meetings@aspet.org with questions.



Membership News

Member-Get-A-Member: EB 2021 Edition

We would like to thank the participants who took part in the special EB 2021 edition of Member-Get-A-Member.

Congratulations

Judith A. Cole is the winner of the \$100 American Express gift card raffle. Thank you for supporting ASPET membership through your recruitment efforts.

New Members

Regular Members

Noelle C. Anastasio, Univ of Texas Med Branch
 Munawar A. Ansari, Liaquat Univ of Med & Hlth Sci, Pakistan
 Charles Betlach, II, Betlach Consulting, CA
 Gregory Carr, Lieber Inst for Brain Development, MD
 Ming F. Chan, Accugent Labs, Inc., CA
 Traci A. Czyzyk, Merck Res Labs, CA
 Yu Gao, Univ of Illinois, Chicago
 Aaron L. Hilliard, I, Florida A&M Univ
 Beatrice E. Imananagh-Amene, Univ of Port Harcourt, Nigeria
 Priyank Kumar, Coll of Pharmacy - Marshall B Ketchum Univ, CA
 Michele A. La Merrill, Univ of California, Davis
 Chuang Lu, Accent Therapeutics, MA
 Hiroko Masamune, Lassogen, Inc., CA
 Michael Mingueneau, Biogen Inc, MA
 Yuu Miyauchi, Sojo Univ, Japan
 Shekher Mohan, Liberty Univ - Coll of Osteopathic Medicine, VA
 Rosalyn Reid, Johnson C. Smith Univ, NC

David Riese, II, Auburn Univ Harrison - Sch of Pharmacy, AL
 Kristie Ruddick, The Univ of Memphis, TN
 Sibghatullah M. Sangi, Northern Border Univ, Saudi Arabia
 Sanjay K. Srivastava, Texas Tech Univ HSC
 Pedro Torres-Ayuso, National Cancer Inst, MD
 Frederick A. Villamena, The Ohio State Univ
 Jennifer Xie, New York Inst of Tech, Coll of Osteop Med at Arkansas State Univ
 Yunhui Xu, Marshall Univ, WV
 Smita Yadav, Univ of Washington
 Cheng Zhang, Univ of Pittsburgh, PA
 Daniel P. Zimmer, Vedere Bio II, MA
 Jill A. Zitzewitz, Univ of Massachusetts Med Sch

Postdoctoral Members

Jorge Gomez, Univ of Texas Health, San Antonio
 Samantha L. Hodges, Univ of Michigan
 Sadie Johnson, Moffitt Cancer Center, FL
 Cody W. Kowalski, The Scripps Res Inst, FL

Immaculate Langmia, Rheinisch-Westfälische
Technische Hochschule Aache, Germany
Vijay Mettu, Washington State Univ
Tapas K. Nayak, Temple Univ, PA
Swati Sharma, Michigan State Univ
Daniel Stroik, Duke Univsity, NC
Takefumi Kimura Tak, NIDDK, MD
Michael J. Wedemeyer, Univ of Texas Health,
San Antonio

Affiliate Members

Ibraheem M. Attafi, Ministry of Health, Saudi Arabia
Deepthy Nair, Univ of Detroit Mercy, MI

Graduate Student Members

Amal Aburahma, Bowling Green State Univ, OH
Yousef M. Aliohani, Georgetown Univ, DC
Ekua K. Amelemah, Cedarville Univ, TX
Ankit Balhara, NIPER, SAS Nagar, India
Arryn T. Blaine, Purdue Univ, IN
Yixin Chen, Sun Yat-sen Univ, China
Tinslee Dilday, Indiana Univ

Robert Goldsmith, Univ of Michigan
Julia K. Huey, Oregon Health & Science Univ
Joseph F. Loomis, Univ of Michigan
Chandler J. McElrath, Med Coll of Wisconsin
Ama D. Okyere, Temple Univ Lewis Katz Sch of
Med, PA
Alexander Pilski, Univ of Minnesota
Abby M. Pondelick, Virginia Commonwealth Univ
Nicole Ramos Solis, IUPUI Sch of Med, IN
Leah M. Salinsky, Univ of Texas Med Branch
Mary A. Schleiff, Univ of Arkansas for Med Sci
Ethan Shelkey, Wake Forest Inst for Regenerative
Medicine, NC
Amal Shoeib, Univ of Arkansas for Med Sciences
(UAMS)
Hunter Snoderly, West Virginia Univ
Cecilia E. Villanueva, Univ of Kansas Med Center
Donnell White, III, LSU HSC - New Orleans, LA

Undergraduate Students

Jazmine Grant, Howard Univ-Bison STEM Scholars, MD
Divya Parmar, Univ of Georgia
Nicholas Sterge, Stony Brook Univ, NY

ASPET 25 Year Members

Thank you to the following members who have devoted 25 years to ASPET and the growth of our discipline!

Suresh K. Alahari, PhD
Frank C. Barone, PhD
John K. Bentley, PhD
Randy D. Blakely, PhD
Charles S. Bockman, PhD
Jerold J. Chun, MD, PhD
Vicki L. Coffin, PhD
James M. Culhane, PhD
Lee E. Eiden, PhD
Haian Fu, PhD
Patricia E. Ganey, PhD
Michael M. Gottesman, MD
Kathleen A. Grant, PhD
Lee M. Graves, PhD

Chih-Peng Hsieh, PhD
Francis Johnson, PhD
M. Firoze Khan, PhD
Diana N. Krause, PhD
Pin-Lan Li, MD, PhD
James A. McCammon, PhD
David Morilak, PhD
Marilyn E. Morris, PhD
Michael A. Nader, PhD
Charles A. O'Neill, PhD
Mabayoje A. Oriowo, PhD
Yoichi Osawa, PhD
Yingxian Pan, MD, PhD
Roger J. Porter, MD



Steven R. Post, PhD
Arnold E. Ruoho, PhD
Daniela Salvemini, PhD
Charles N. Serhan, PhD
Mark A. Simmons, PhD
Shogo Tokuyama, PhD
David R. Wallace, PhD
Hoau-yan Wang, PhD
Daniel Martin Watterson, PhD

ASPET 50 Year Members

Thank you to the following members who have devoted 50 years to ASPET and the growth of our discipline!



Donald O. Allen, PhD
 Carl E. Aronson, PhD
 Cheston M. Berlin, MD
 David A. Blake, PhD
 Henry E. Brezenoff, PhD
 Gary Brooker, PhD
 Allan M. Burkman, PhD
 Sungman Cha, MD, PhD
 George C. Chiou, PhD
 Wesley G. Clark, PhD
 A. A. Hagen, PhD
 John C. Hancock, PhD
 Eugene H. Herman, PhD
 Barry J. Hoffer, MD, PhD
 Louis J. Ignarro, PhD

Anthony R. Imondi, PhD
 Charles E. Inturrisi, PhD
 Lawrence Isaac, PhD
 Frederick C. Kauffman, PhD
 Yutaka Kobayashi, PhD
 Jyh-Fa Kuo, PhD
 Walter M. Lovenberg, PhD
 Anthony Y. Lu, PhD
 Kafait U. Malik, DPhil
 Daniel W. Nebert, MD
 Philip J. Privitera, PhD
 Donald J. Reed, PhD
 Wendell H. Rooks, MS
 Ben F. Rusy, MD
 Elaine Sanders-Bush, PhD

M. K. Shellenberger, PhD
 Sheldon B. Sparber, PhD
 Herman H. Stein, PhD
 Bitten Stripp, PhD
 Palmer W. Taylor, PhD
 Frank F. Vincenzi, PhD
 Shreepad R. Wagle, PhD
 David P. Westfall, PhD
 Sherwin Wilk, PhD
 Shu Y. Yeh, PhD
 Robert F. Zelis, MD

In Sympathy

ASPET notes with sympathy the passing of the following members:

Dennis M. Ackerman
 Gouri Shankar Bhattacharyya
 Elise Ann Brown
 Charles R. Craig
 Joseph Kaiser
 Mary J. Kreek
 Mary J. Mycek
 Arleen B. Rifkind



Division News

2021 Division Town Halls

In place of the in-person division annual business meetings that take place at EB each year, ASPET's 10 divisions held virtual town halls from March 22 – April 9. The town halls provided members with a chance to learn about their division's latest activities and how to get involved. Each town hall also featured breakout rooms to network and meet with other division members. Below are summaries from a few of the town halls.

If you missed your division's town hall meeting, you can view the recording on your ASPETConnect division community on <https://connect.aspet.org>.



Submitted by Helmut Gottlieb, PhD

Dr. Katharina Brandl, the Division for Pharmacology Education's chair, welcomed members to the division town hall meeting on April 9th, 2021. The meeting began with executive committee introductions, travel award winner introductions, and new inductees of the Academy of Pharmacology Educators. Dr. Brandl provided a quick update on division activities and Experimental Biology 2021 meeting before splitting into break rooms to discuss more specific topics.

Symposia & Focus on Pharmacology Webinars, with Drs. Jayne Reuben, Nicole Kwiek and Peggy Bush as facilitators, was one of the topics. This breakout room was targeted at DPE members' interest in symposia

topics about pharmacology teaching strategies for other audiences beyond the medical or pharmacy programs and interest in addressing learning objectives for different disciplines. The importance of incorporating DEI into future content was emphasized. Members spoke highly of prior virtual webinars, and there was interest in offering different forms of DPE sessions to increase opportunities for member engagement and increase accessibility.

During the *Future of Research in Pharmacology Education* session members expressed interest in developing a "home" for pharmacology education research. *Pharmacology Research & Perspectives (PR&P)* has also expressed interest in promoting pharmacology education and the group discussed

the types of articles that could be submitted and willingness to contribute as reviewers.

When the focus shifted to serving DPE members topics included mentorship initiatives within DPE, international members, increasing international outreach, promoting and reaching minority serving institutions and considering renaming the travel awards as an educators award. Positive feedback was received during a discussion on ASPETConnect, and members also discussed students as partners in education and how to bring them into the division

There was also a session on *The Patient-Oriented Problem-Solving System (POPS) in Pharmacology*. A brief overview and history of the POPS was provided, as well as detailed available exercises, structure, and file organization. None of the attendees had previously used the POPS for teaching, and questions regarding the logistics of using the POPS were discussed. Comparisons to other team-based learning approaches were discussed.



Submitted by Alicja Urbaniak, PhD

On April 5th, 2021, the Division for Drug Discovery and Development (DDD) held a virtual town hall meeting. The meeting started with opening remarks from the division's chair, Dr. Tom Parry, who welcomed over 30 participants.

Dr. Parry introduced newly selected chair and secretary-elects for 2023 - Dr. Benita Sjögren and Dr. Alicja Urbaniak, respectively. In addition, the division is looking for a communications officer starting July 2022, and members are encouraged to volunteer in this role.

Dr. Parry introduced the winner of the 2021 DDD Scientific Achievement Award, Dr. Francis Willard from Eli Lilly Co. Dr. Willard gave a talk during the 2021 Experimental Biology meeting. In addition, members are encouraged to submit nominations for the 2022 DDD Award by September 2021.

Program Committee Representative Dr. Donald Button shared highlights about DDD activities during the 2021 Experimental Biology meeting.

Dr. Alicja Urbaniak (communications officer) provided an update on division communications

and encouraged members to register and actively participate in ASPETConnect. Dr. Urbaniak discussed the divisions participation in ASPET's division social media takeover week, during which the division will share division dedicated posts on ASPET's Facebook and Twitter accounts. DDD members are encouraged to use #ASPETDDD on the relevant posts and tag @ASPET to allow ASPET to re-tweet the content. Lastly, Dr. Urbaniak shared DDD web page statistics from the last year.

Lastly, Dr. Parry presented future plans and directions for the division, which is increasing the emphasis on drug development and increasing collaboration with sister divisions: the Divisions for Translational and Clinical Pharmacology, Drug Metabolism and Disposition, and Toxicology.

The following updates from the division's leadership, attendees participated in three breakout sessions on career building, led by Dr. Sjögren, DDD leadership for 2023 and beyond, facilitated by Drs. Parry and Urbaniak, and interactions with other divisions beyond meeting programming, hosted by Dr. Button.



Submitted by D. Fernando Estrada, PhD,
and Lindsay Czuba, PhD

On April 5th, 2021, the ASPET Division for Drug Metabolism and Disposition (DMDD) held its first virtual town hall meeting. The division chair, Dr. Rob Foti, introduced the following newly elected members of the DMDD Executive Committee: Dr. Joanne Wang, University of Washington, as incoming chair-elect; Dr. Haojie Zhu, University of Michigan, as incoming secretary/treasurer-elect; Dr. Andrew Rowland, Flinders University, as incoming senior communications officer; and Dr. Jed Lampe, University of Colorado, as incoming councilor. Dr. Foti also briefed attendees on recent DMDD activities. These included division participation in the annual ASPET social media takeover and the launching of ASPETConnect. The division's secretary/treasurer, Dr. Aarti Sawant-Basak, then presented a summary of the division finances, with a notable change being a recent increase in funding allocated toward the Gillette Award. The meeting also included an update from the division communications officers, Dr. Fernando Estrada and Dr. Lindsay Czuba, in which recent DMDD member spotlight articles in *The Pharmacologist* were reviewed.

Dr. Foti announced the winners of the Division awards. Dr. Bridget Morse from Eli Lilly, and Dr. Eva

Hansmann from the University of California, are the winners of the 2020 James R. Gillette Awards for outstanding papers published in the journal, *Drug Metabolism and Disposition*. Dr. Huichang Bi, Sun Yat-sen University, is the winner of the 2021 Richard Okita Early Career Award.

Last, Dr. Foti briefed attendees on upcoming division activities, including symposia at the annual ASPET meeting, planning for EB 2022 Symposia, planned virtual 'Meet and Greet' activities with the Division Executive Committee, and plans to launch fundraising initiatives to increase the financial reserves for Division awards.

Following the presentation, a call soliciting new business for the division was answered by attendees who suggested organizing a future symposium focused on drug metabolism and disposition issues that may have arisen in relation to the current pandemic. Other town hall meeting attendees supported the motion. Lastly, attendees inquired whether the division was planning to conduct member outreach outside of the annual meeting schedule. Dr. Foti assured the attendees that there are currently several virtual events planned that will occur throughout the year.



Submitted by Cheryl Rockwell, PhD

The ASPET Division for Toxicology held its town hall meeting on March 26th, 2021. At this meeting, the current officers of the division were introduced, including Qin Chen as the chair, Brian Cummings as the past chair and program chair, Brendan Stamper as the secretary/treasurer and chair-elect, Cheryl Rockwell as the secretary/treasurer-elect and communications chair, Namandjé Bumpus as the Council liaison and Elaine Leslie and Qing Ma as

Councilors. Dr. Chen discussed a plan to expand the Executive Committee. She also announced the members of the Executive Committee for the 2021 – 2022 term, which include Brendan Stamper as the chair, Qin Chen as the past chair and program chair, Cheryl Rockwell as the secretary/treasurer and chair-elect, Elaine Leslie as the secretary/treasurer-elect, Merrie Mosedale as councilor and communications chair, Qing Ma as Councilor, Namandje Bumpus as council liaison, Yining Jin as the postdoctoral

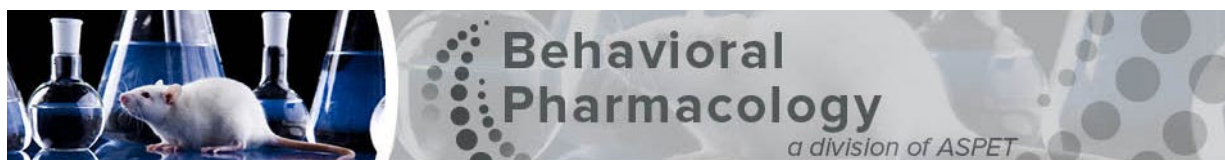
representative, Lillie Marie Barnett as the graduate student representative and Brian Friedhof as the undergraduate student representative.

Dr. Chen announced the winners of the division awards for the past two years. These included Dr. Bryan Yamamoto for the 2020 Career Award and Dr. Merrie Mosedale for the 2020 Early Career Award, and Dr. Debra Laskin for the 2021 Career Award and Dr. Julia Yue Cui for the 2021 Early Career Award.

Dr. Chen reviewed the responsibilities of the Executive Committee positions and discussed plans to increase membership. Dr. Cummings provided a brief summary of programming for the EB 2021 virtual meeting, including division-sponsored programs and highlights. Dr. Stamper discussed the June 2021 issue of *The Pharmacologist*, which will highlight our award

winners. Dr. Rockwell talked about the rollout of the new ASPETConnect platform, including features relevant to the Toxicology division's community and encouraged division members to send news items to either herself or Dr. Mosedale to be highlighted on ASPETConnect and on the ASPET social media accounts.

The session ended with an open discussion among all the participants concerning potential future programming that could be sponsored by the division. There was considerable positive feedback to the very productive discussion which identified future sessions of interest. Overall, there was considerable enthusiasm for the virtual format of the town hall meeting. There was some discussion about whether such a virtual format should be retained even after the pandemic has ended.



Submitted by Vanessa Minervini, PhD

The Division for Behavioral Pharmacology (BEH) held their virtual town hall meeting on March 29, 2021. Attendees participated in breakout rooms, covering topics in membership, seminars/webinars, divisional awards, divisional leadership, and the future of behavioral pharmacology research.

During the membership discussion, executive committee members and ASPET staff members brainstormed ideas for recruitment and retention of members in the division. To help division members feel more engaged, the division will begin sending personalized welcome messages to new division members. They will also send out "reminder" emails to current members providing regular division updates and invitations to participate in upcoming events.

Other discussions included ideas for session proposals, how to better develop the proposals, and how to increase submissions from the BEH membership. Another breakout room discussed the importance of increasing diversity and representation among the division and ASPET leadership. The most popular discussion topic was on the future of research in behavioral pharmacology.

The group agreed that behavioral pharmacology should continue playing a major role in the analysis of behavior and in studying the effects of drugs on behavior because of its relatively sophisticated approach to something that is anything but simple. Some participants felt that behavioral pharmacologists need not be threatened by the recent molecular and technical advances that seem so pervasive in today's research landscape, because their ultimate relevance will still be based on how they change behavior. Division members need to continue to educate the NIH on the importance of behavior not only as it applies to drug addiction, but as it applies to so many other areas of research (e.g., schizophrenia, bipolar depression, Alzheimer's Disease, and anxiety disorders). This type of cross-disciplinary approach will also help us achieve the funding we all need to advance our science. It is also a reason why division members need to continue to serve on study sections and as reviewers for ASPET's journals to make sure that we are reinforcing the principles that are the foundation of our science with the rest of the scientific community.

2021 Division Award Winners

Oral Competition Winners

Division for Behavioral Pharmacology

Postdoctoral

1st Nikki Clauss

Division for Cardiovascular Pharmacology

Postdoctoral

1st Owais Bhat

2nd Xuan Yu

Graduate

1st Kishore Chittimalli

2nd Santo Kalathingai Anto

3rd Soyoung Cheon

Division for Molecular Pharmacology

Postdoctoral

1st Qiuyan Chen

Division for Neuropharmacology

Postdoctoral

1st Lillian Brady

2nd Dino Luethi

3rd Neil Varshneya

Division for Translational and Clinical Pharmacology

Postdoctoral

1st Jia Nong



Poster Award Winners

Division for Behavioral Pharmacology

Undergraduate

1st Sarah Mott

2nd Kerry Chou

Graduate and Post-baccalaureate

1st Bryan Sears

2nd Shawn Flynn

3rd Clare Diester

Division for Cancer Pharmacology

Graduate and Post-baccalaureate

1st Sarah Copeland

Postdoctoral

1st Andrew Robles

Division for Cardiovascular Pharmacology

Undergraduate

1st Kristina Sin

Graduate and Post-baccalaureate

1st Dawn Kuszynski

2nd Dina Salem Maaliki

Postdoctoral

1st Van Ninh

Division for Drug Discovery and Development

Undergraduate

1st Christopher Honeycutt

Graduate and Post-baccalaureate

1st Jacqueline Silva

2nd Yuma Ortiz

3rd Julia Rocereta

Postdoctoral

1st Daniela Dengler

Division for Drug Metabolism and Disposition

Graduate and Post-baccalaureate

1st Nayiar Shahid

2nd Deepak Ahire

3rd Hannah Work

Postdoctoral

1st Sumit Bansal

2nd Simone Brixius-Anderko

3rd Md Masud Parvez

Division for Molecular Pharmacology

Graduate and Post-baccalaureate

1st Khairunnisa Semesta

2nd Vanessa Gutzeit

3rd Tyler Lefevre

Postdoctoral

1st Yu-Chen Yen

2nd Karina Pena

3rd Yonghoon Kwon

Division for Neuropharmacology

Undergraduate

1st Alexander Major

2nd Lee Augenblick

Graduate and Post-baccalaureate

1st Diana Zebadua Unzaga

2nd Christopher O'Brien

3rd Karim Ibrahim

Postdoctoral

1st Jianping Chen

2nd Deborah Rudin

3rd Deborah Luessen

Division for Pharmacology Education

Graduate and Post-baccalaureate

1st Bianca Nguyen

2nd Nicholas Conway

3rd Tori Ehrhardt

Division for Toxicology

Undergraduate

1st Tanvi Banota

Graduate and Post-baccalaureate

1st Janet Zhou

2nd Alyssa Bellomo

3rd Jaclynn Andres

Postdoctoral

1st Ley Smith

2nd Satyendra Singh

3rd Eric Rodriguez

Division for Translational and Clinical Pharmacology

Graduate and Post-baccalaureate

1st Nicholas Ether

2nd Sana Khajehpour

3rd Javiera Cortés

Division for Drug Metabolism and Disposition



James R. Gillette Best Paper Award

Submitted by Lindsay Czuba, PhD, and D. Fernando Estrada, PhD

Each year the Division for Drug Metabolism and Disposition (DMDD) honors the late NIH pharmacologist **James R. Gillette, PhD** by presenting two awards for outstanding papers in the categories of drug metabolism and pharmacokinetics/drug transporters for papers published in the previous year's *Drug Metabolism and Disposition*. Dr. Gillette was a renowned pharmacologist known for his major contributions to drug metabolism and pharmacokinetics. Over the course of his career, he published 300+ scientific papers and book chapters and co-edited seven books and mentored numerous postdoctoral fellows.



The winner of the 2021 James R. Gillette Award in the category of Pharmacokinetics/Drug Transporters is **Bridget L. Morse**, PharmD, PhD from Eli Lilly and Company. Dr. Morse's paper titled "Pharmacokinetics of Organic Cation Transporter 1 (OCT1) Substrates in Oct1/2 Knockout

Mice and Species Difference in Hepatic OCT1-Mediated Uptake." The work was published in the February 2020 issue of *Drug Metabolism and Disposition* (<https://dmd.aspetjournals.org/content/48/2/93>) along with co-authors, Anil Kolur, Loyd R. Hudson, Andrew T. Hogan, Lisa Hong Chen, Ryan M. Brackman, Geri A. Sawada, John K. Fallon, Philip C. Smith, and Kathleen M. Hillgren. The researchers used Oct1/2 knockout mice to evaluate the pharmacokinetics of four OCT1 substrates with documented pharmacogenetic effects to demonstrate the role of OCT1 on in vivo hepatic clearance. Oct1/2 knockout had significant effects on the hepatic clearance and liver partitioning of fenoterol and sumatriptan, demonstrating their potential utility as

clinical probes for assessing OCT1-mediated drug-drug interactions. Notably, the authors highlight a species difference in OCT1-mediated uptake using mouse and human hepatocytes and the potential substrate-dependent impact of lysosomal trapping on OCT1 transport studies.



In the category of Drug Metabolism, the winner of the 2021 James R. Gillette Award is **Eva Hansmann** for work performed at the Laboratory of Environmental Toxicology, Department of Pharmacology at the University of California, San Diego. Eva's paper titled "Differential Role of Liver X

Receptor (LXR) α and LXR β in the Regulation of UDP-Glucuronosyltransferase 1A1 in Humanized *UGT1* Mice" was published in the April 2020 issue of *Drug Metabolism and Disposition* (<https://dmd.aspetjournals.org/content/48/4/255/tab-article-info>). This work was published along with Elvira Mennillo, Emiko Yoda, Mélanie Verreault, Olivier Barbier, Shujuan Chen, and Robert H. Tukey. **Shujuan Chen** presented the work on behalf of the researchers at the 2021 ASPET Annual Meeting. Using humanized *UGT1* mice, the authors evaluated the isoform specific role of LXR on *UGT1A1* gene induction through knockout of LXR α and LXR β alone or in combination. In neonates treated with two different LXR agonists, LXR α was found to be a critical regulator of *UGT1A1* induction via a response element within the *UGT1A1* promotor. Treatment with the non-specific LXR agonist, T0901317, demonstrated that other nuclear receptors including CAR and PXR may contribute to *UGT1A1* induction, although LXR α expression was vital for constitutive *UGT1A1* expression in adult livers.

Congratulations to the recipients who were honored at the 2021 ASPET Annual Meeting and had the opportunity to present their work! In addition to

these awards, the **Richard Okita Early Career Award in Drug Metabolism and Disposition** was awarded to **Huichang Bi**, PhD at the ASPET Annual Meeting.

Division for Pharmacology Education



Division for Pharmacology Education Inducts Three New Fellows into the Academy of Pharmacology Educators

The Academy of Pharmacology Educators was established in 2010 to recognize individuals who have made exemplary contributions to pharmacology education in one or more of the following areas: student-teacher interaction, innovative contributions, scholarly endeavors, professional development, and service. Three new fellows were inducted into the Academy this year by the Division for Pharmacology Education. Additional information about the Academy, including application instructions and a roster of inductees, can be found here: <http://www.aspet.org/Education/Academy/>.



Dr. Willmann Liang obtained his BSc and PhD degrees in pharmacology from the University of British Columbia, Canada, and postgraduate diploma in higher education from the National Institute of Education, Singapore. As a pharmacology

teacher, Dr. Liang designed and delivered a new pharmacology course for undergraduates at Nanyang Technological University, Singapore. He also carried the title of Academic Associate Director, with which he led students to develop pharmacology e-learning coursewares and advocated the use of similar self-directed learning aids in other disciplines at the university. Since moving to the Chinese University of Hong Kong, where he currently serves as Lecturer, he has been devoting more time to pharmacology education, including the delivery of lectures and

tutorials, as well as design of a new drug design course. He and his collaborators have obtained university support to produce interactive coursewares on the cardiovascular and gastro-intestinal systems for use by both medical and biomedical sciences students. Selected highlights of teaching tools include PictoPharm, which uses customized images and font styles to express drug names and their targets, PharmaClips and Pharma's Pie, which are both animated clips that summarize, respectively, the mechanistic basis of individual drug pharmacology and overall classification of drugs. Students at both the Chinese University of Hong Kong and at Tunghai University, Taiwan, at which Dr. Liang teaches part-time in the summer, have praised the dozens of mnemonics he developed which made the learning of drug names more fun and less stressful. Dr. Liang has also published articles and abstracts showcasing his teaching outputs while being recognized for his continuous contribution in pharmacology teaching and mentorship.



Dr. S. Niru Nirthanan, MBBS PhD FRCP (Edin), is the Deputy Head for Education in the School of Pharmacy and Medical Sciences, and Discipline Lead for Pharmacology in the School of Medicine and Dentistry in the Griffith Health Group at Griffith University, Queensland, Australia. After graduating MBBS from Sri Lanka, he completed a pre-doctoral fellowship in pharmaceutical sciences at Kumamoto University,

Japan (1998), a PhD in pharmacology and biochemistry at the School of Medicine at the National University of Singapore (2002), and a postdoctoral fellowship as the Alice and Joseph Brooks Fellow in Neurobiology at Harvard Medical School, Boston (2002-2006). After a short tenure as Principal Scientist at the National Neuroscience Institute of Singapore (2007-2008), he moved to Australia, where, in senior leadership positions in learning and teaching for the past decade, his interests focus on future-ready program design, technology-enabled education, capstone experiences, student transitions to medical school, students-as-partners in curriculum design, and service learning and humanities in health profession education. He is the recipient of an Australian National Award for Outstanding Contributions to Student Learning (2011) and the Prime Minister's Endeavour Australia Asia Award (2012); and his contributions to medical education have been recognized by Fellowships of the Royal College of Physicians of Edinburgh and Academy of Medical Educators (UK) as well as Senior Fellowships of the Higher Education Academy (UK) and the Griffith Academy for Learning and Teaching (Australia). Dr. Nirthanan has been a member of ASPET and the Division for Pharmacology Education for 16 years; and the British Pharmacological Society for 19 years, in which he serves as the Academic Ambassador (Australia) and Lead for the International Pharmacology Network.

Dr. Jayne S. Reuben is an Instructional Associate Professor in the Department of Biomedical Sciences and Director of Instructional Effectiveness at the Texas A&M University (TAMU) College of Dentistry. She was a founding faculty member and clinical associate professor (Biomedical Sciences) at the University of South Carolina School of Medicine (USCSOMG) where she helped develop an integrated curriculum.



She currently serves as the director for all undergraduate and resident pharmacology courses in the college. Dr. Reuben earned her doctorate in pharmaceutical sciences with a specialization in pharmacology/toxicology from Florida A&M University College of Pharmacy

and Pharmaceutical Sciences before completing a postdoctoral fellowship at the University of Michigan in the Department of Pathology. She is a past chair of the Division for Pharmacology Education and serves on Partnerships and Career Development committees. She currently chairs the American Dental Education Association Section on Physiology, Pharmacology and Therapeutics. A New Leadership Academy Fellow of the National Center for Institutional Diversity, Dr. Reuben is a 2021 recipient of the TAMU Provost Teaching Excellence Award. She was a member of the FASEB MARC Advisory Board member and the Converse College Board of Trustees. Dr. Reuben has worked as a MCAT/DAT instructor/curriculum adviser for Stanley Kaplan, Inc. and as a biologist at the NINDS. Her research in inflammation has been published in dental and medical journals. A long-time advocate for diversity, equity, and inclusion, Dr. Reuben has authored articles on the recruitment of underrepresented groups into health sciences careers and presented continuing education and career development workshops for faculty and students.

The Division for Pharmacology Education considers it a privilege to add these educator-scholars to the roster of the Academy of Pharmacology Educators and appreciates their many contributions to the discipline.



Chapter News

Canadian Society of Pharmacology and Therapeutics (CSPT)

2021 Virtual Annual Meeting

Submitted by Randee Holmes

Not unlike other ASPET chapters, the Canadian Society of Pharmacology and Therapeutics (CSPT) has been busy adapting our in-person programming to online platforms. We have been cognizant that the standards and expectations of participants for quality online offerings have exponentially increased compared to the start of the current COVID-19 pandemic. The CSPT Board of Directors and our many committee members have worked hard to meet, and even exceed, these expectations.



Our webinar series, spearheaded by the CSPT Education Committee, has been highly successful – evidenced by the overwhelmingly positive feedback we have received through participant surveys. Webinar topics to date have addressed the use of technology to teach

pharmacology in professional programs, the role of medical cannabis in women's and children's health, and an update on COVID-19 including basic and clinical perspectives. Our most recent webinar, focused on rare diseases in children, was in partnership with the European Society for Developmental Perinatal and Paediatric Pharmacology. The recordings and slides of previous sessions are all available on our website and can be accessed by CSPT members.

The CSPT Scientific Program Committee held our second virtual annual meeting — **Not on Mute: Let's Talk Contemporary Pharmacology** — from June 8-11, 2021.



One highlight of our meeting was the *High Cost Drugs in Paediatrics Summit* on June 8. Features of the remaining days included a cutting-edge session on *Membrane Protein Pharmacology and Druggability: Basic Mechanisms and Clinical Relevance* (June 9), the *COVID-19 Symposium*, the highly popular *Top Ten Trainee Oral Presentations* session (June 10) and *Cancer Pharmacology – Developing Next-Generation Therapeutics* (June 11). Traditional favorites such as the *Practical Pharmacology* and *Pharmacology Education* sessions were also included. Added extras included *Pharmacology Jeopardy!* and a *Career Networking Event*.

The program was entirely virtual making it accessible to participants across the globe. ASPET members were eligible for reduced registration fees. To learn more about the annual meeting, visit pharmacologycanada.org

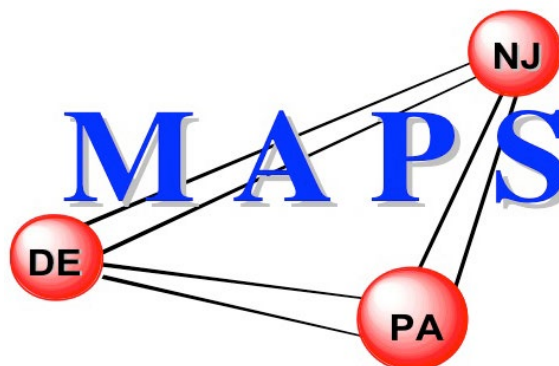
Mid-Atlantic Pharmacology Society (MAPS)

Upcoming Annual Meeting: October 29, 2021

Submitted by Thomas M. Keck, PhD

The Mid-Atlantic Pharmacology Society (<https://www.aspet.org/MAPS/>) is excited to announce that it will hold its annual meeting on Friday, October 29, 2021. The event will be held entirely virtually and thus we welcome attendance and participation from colleagues around the world as well as in our Mid-Atlantic region. The theme of this year's meeting will be "Ion Channel Pharmacology."

We're pleased to announce that Dr. Lori L. Isom, PhD of the University of Michigan will be our keynote speaker. The virtual meeting will also include video poster presentations, including poster awards for outstanding presentations; some trainees will be selected to give brief presentations during the meeting. Online registration (\$10 for undergraduate students, \$15 for graduate students, \$20 for postdoctoral fellows and research associates, and \$30 for faculty and other attendees) will open in the fall. The abstract submission deadline will be October 7, 2021.



MAPS Annual Biotech Roundtable

MAPS will also hold its Annual Biotech Roundtable as a nationally available free online event, hosted by ASPET, in spring 2022. Join us for a career-focused exploration of biotechnology companies and insights into how to prepare for and pursue a career in start-ups and other biotechnology companies. Stay tuned for more details.

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ASPET's *Explore Pharmacology* booklet provides students with a broad overview of the discipline of pharmacology. It describes the many employment opportunities that await students who pursue pharmacology and outlines the academic path that they are advised to follow. **The 2021 edition is due out this Fall and will be distributed to undergraduate students directly interested in graduate pharmacology programs.** Take advantage of this unique opportunity today!

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Visit www.aspet.org/explorepharmacologyads for print specifications and pricing information or contact Suzie Thompson, ASPET Marketing Director at sthompson@aspet.org.

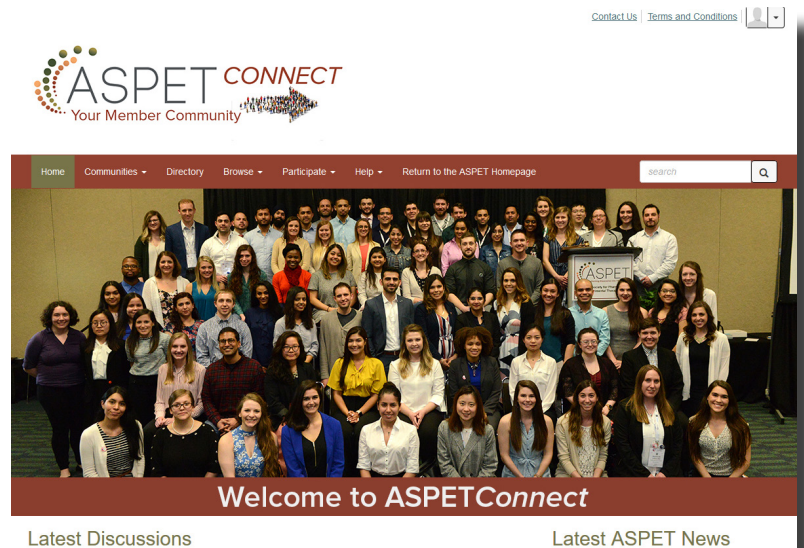
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Network, communicate, and collaborate with your fellow ASPET colleagues through ASPET's online community.

ASPETConnect's online communities allow you to network, communicate, and collaborate with your fellow ASPET colleagues anytime from anywhere. As a member, you get access to discussion forums where you can connect with subject matter experts, get or give advice on career matters, or work with your committee or division members. Have a question or discussion topic? Post it on the community and allow members to provide their input. Want to see what other members are discussing? Visit your division community and scroll through the discussions.



- Online Communities
- Discussions
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- Online Library
- Communicate with Leaders

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