THE Physiologist MAGAZINE

NOVEMBER 2019

LIVING IN THE AURA

What life is like after winning the Nobel Prize

american physiological society

New Look
New Content
New Value
Same Tradition

This season of giving, we're asking you to be a champion for our organization, physiology's future and research pioneers. Whether you donate to your section or a program-specific fund, your contribution is crucial as we strive to launch innovative programs and grow our premier scientific community.

"I owe the APS everything when it comes to my career because the foundation that I learned, beyond what I got from my mentor and committee, came from APS. The most important aspect of an opportunity...is that it can always be paid forward and continue."

Adrienne Bratcher, PhD
Member Since 2013

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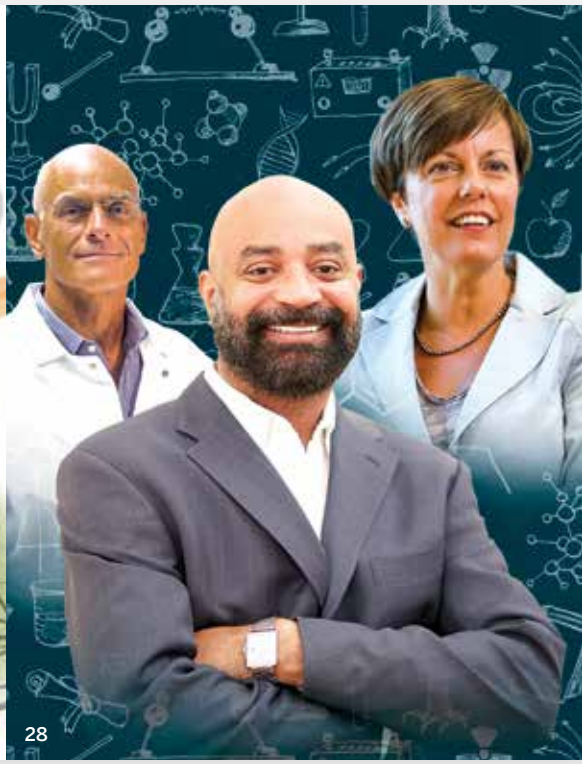

On the cover: Nobel laureate Randy W. Schekman, PhD; photograph by Brittany Hosea-Small

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american physiological society

CALL FOR NOMINATIONS
EDITOR-IN-CHIEF

American Journal of Physiology—Heart and Circulatory Physiology®

Nominations are invited for the position of editor-in-chief of the *American Journal of Physiology—Heart and Circulatory Physiology* (**ajpheart.org**) to succeed Irving H. Zucker, PhD, who will complete his term as editor on December 31, 2020. The American Physiological Society (APS) Publications Committee plans to interview candidates in the spring of 2020.

Applications due: January 10, 2020

How to Nominate

Nominations, accompanied by a curriculum vitae, should be sent to the chair of the APS Publications Committee via email, care of APS Publications Department Administrative Assistant Charmon Kight (**ckight@the-aps.org**).

Meet the Team

physiology.org/ajpheart/edboard

Submit Your Best Work

ajpheart.msubmit.com

You're Shaping the Future of APS

BY SCOTT STEEN, CAE, FASAE

Over the past year, the APS Council and staff have begun a process to reimagine the Society to ensure a better future for our members, the discipline of physiology and the organization. While you will be seeing a lot of change in the coming years, we are equally committed to engaging our members in the process every step of the way.

Toward this end, we have been asking our members a lot of questions in recent months. Through surveys, interviews and focus groups, thousands of you have shared your thoughts about your professional landscape, your career wants and needs and your relationship with APS.

Earlier this year, we commissioned McKinley Advisors—a strategic consulting firm specializing in membership research and insight—to conduct a survey and tell us more about our members: how you engage with the Society, what you think we're doing right and the high-priority areas where you think we can improve or expand our services to meet your needs. We also asked McKinley to provide general intelligence about overall trends in membership across the association landscape to help us ensure that we're moving in line with the needs of today's science professionals.

"We are committed to providing you with more opportunities to contribute to the conversation so that we are building this future together."

Among the findings, we learned that we're doing some important things right. APS has been rated highly in measures of member service, engagement opportunities and opportunities to attain awards and honors (especially for early-career physiologists). Not surprisingly, expectations of how members are able to engage with the Society vary widely by career level. While members at all career stages said that the ability to publish and present their work was important, significantly more early careerists indicated that professional and career development resources, as well as access to awards, are important benefits. Supporting and advancing the field of physiology was rated significantly more important by those with 16 or more years of experience than by those with 15 years or less.

Other key insights from the research include:

Today's association members have different expectations than those of even a decade ago. Members expect that 21st century associations will be diverse and inclusive, central to member needs, explicitly valuable, frictionless, mobile-friendly, dynamic and experimental, responsive, focused, resonant, measureable and impactful.

Our members want APS to be more proactive. Members indicated that they want the Society to take an active role in raising awareness and appreciation for the field of physiology, identifying career pathways for physiologists; enhancing the APS annual meeting; recruiting and retaining younger members; expanding APS' reach to new markets, including undergraduate faculty and industry; promoting diversity in APS leadership; and creating a meaningful space for top leaders in the field.

APS membership has been slowly declining, but we have several opportunities to grow our community. These include expanding value and engagement for non-university career researchers, international physiologists, undergraduate educators and others.

These insights—garnered directly from our members—help establish a road map toward a better and more robust Society. As we move forward, I believe it is critical for us to share with you what we're learning along the way and what's coming next. As important, we are committed to providing you with more opportunities to contribute to the conversation so that we are building this future together.

If you haven't yet participated in our member engagement research, you will have more opportunities to do so. In the meantime, please share your thoughts and suggestions with me at **executivedirector@the-aps.org**. I look forward to hearing from you!

Scott Steen, CAE, FASAE, is executive director of the American Physiological Society.

Read the comparative physiology blog

Life Lines

by

Dr. Dolittle

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Interested in contributing?
Email communications@the-aps.org.

lifelinesblog.com

UNIVERSITY OF CALIFORNIA
MERCED

Assistant Professor in Physiology

The Department of Molecular and Cell Biology in the School of Natural Sciences at the University of California, Merced is seeking one new faculty member at the rank of Assistant Professor (tenure-track) in Physiology. While all candidates in all areas of Physiology are encouraged to apply, candidates that incorporate integrative and system approaches to the study of metabolism and/or metabolic disorders at a basic biological, clinical, and/or translational level will be particularly attractive. Candidates with expertise in cardiovascular and/or cardiometabolic, renal, and/or general or altered (ie, caloric restriction or dietary manipulation) metabolism areas using either traditional or non-traditional models of study are especially encouraged to apply. We expect outstanding scholars to establish and maintain a creative and productive research program, to contribute to the existing research programs within MCB and other departments at UC Merced, to participate actively in the development of innovative interdisciplinary programs and research, to teach effectively at both the undergraduate and graduate levels, and to eagerly contribute to our department's, school's, and university's mission of enhancing diversity and inclusion. The faculty within the Department of Molecular & Cell Biology has been very successful at attracting funding from primarily NIH, but also NSF, HHMI, and USDA among others, and many state-funding agencies with programs unique for UC faculty.

Qualifications: In order to be considered, candidates must have a PhD in biology, physiology, or a closely related field by the position start date.

Applications must be submitted via the link below, and must include: (1) a cover letter stating area of interest, (2) a curriculum vitae, (3) a 2 page statement of research, (4) a 2 page statement of teaching philosophy and practice, and (5) a 1 page statement of contributions to diversity, equity and inclusion*. Please see below for additional information.

Applicants for the Assistant Professor level should arrange to have three letters of reference submitted online. After an application is submitted, the letters of reference should be electronically uploaded by the letter writers (instructions will be provided by the application system). Letters of reference should be received no later than December 1, 2019.

*The contributions to diversity, equity and inclusion statement should describe your past experience, activities and future plans to advance diversity, equity and inclusion, in alignment with UC Merced's mission to reflect the diversity of California and to meet the educational needs and interests of its diverse population. Some faculty candidates may not have substantial past activities. If that is the case, we recommend focusing on future plans in your statement. For an example of a Diversity, Equity and Inclusion Statement, please visit
http://facultyexcellence.ucsd.edu/c2d/index.html#Are-there-any-guidelines-for-wr
and/or
https://ofew.berkeley.edu/sites/default/files/example_statements_contributions_to_diversity.pdf.

Deadline: With a final closing date of November 22, 2019, review of applications will begin on November 25, 2019.

The University of California, Merced, is the newest of the University of California system's 10 campuses. With 8,500 undergraduate and graduate students (https://www.ucmerced.edu/fast-facts), UC Merced provides outstanding educational opportunities to highly qualified students from the heart of California, the nation, and abroad. The campus has special connections to nearby Yosemite National Park; is on the cutting edge of sustainability in construction and design; and supports the economic development of Central California. The Merced 2020 Project doubled the physical capacity of the campus, and enhanced academic distinction, student success, and research excellence (https://merced2020.ucmerced.edu/).

The University of California is an Equal Employment Opportunity/Affirmative Action employer and invites applications from all qualified applicants, including women, minorities, veterans, and individual with disabilities, who will enrich the teaching, research and public service missions of the university. All qualified applicants will be considered for employment without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, disability, age or protected veteran status. For the complete University of California nondiscrimination and affirmative action policy, see: UC Nondiscrimination & Affirmative Action Policy (https://policy.ucop.edu/doc/4000376/DiscHarassAffirmAction).

Salary is commensurate with education, experience, and UC academic salary scales.

For additional information or to apply, please visit: **https://apptrkr.com/1654199**.

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american physiological society

"I have been very impressed with [APS] because of their commitment to education. I've met some incredible scientists and just as many incredible educators through my involvement with APS."

—Ed Merritt, PhD, APS Member, Southwestern University, Texas

WITH MEMBERSHIP COMES

TEACHING RESOURCES

The American Physiological Society (APS) champions physiology education and educators to support bigger discoveries and better clinical outcomes. Our community of educators provides resources, opportunities and mentoring for trainees, early-career faculty and established faculty. Take advantage of your benefits at the-aps.org/educator-resources, and access awards for educators at the-aps.org/educatorawards.

the-aps.org

Physiologists and mathematicians met to explore how mathematical models and imaging tools can sharpen the focus on physiological problems related to the body's smallest blood vessels at the Interface of Mathematical Models and Experimental Biology: Role of the Microvasculature conference. Read research news and conference proceedings at www.the-aps.org/mathmodelsnews.

In September, the APS Career Opportunities in Physiology Committee met at APS headquarters to discuss strategies and initiatives designed to promote interest in physiology careers and support APS members in a wide variety of potential career sectors.

LAB NOTES

STATS & FACTS

79

Number of Nobel laureates who've published in APS journals

APS counts more than 20 of these laureates as our members. Read research by these esteemed researchers at www.physiology.org/nobel-laureates.

American Physiological Society

RESEARCH FIZZ

Resistance-exercise training ameliorates LPS-induced cognitive impairment concurrent with molecular signaling changes in the rat dentate gyrus

This study suggests that three weekly resistance exercise sessions can improve cognitive dysfunction caused by inflammation-promoting toxins by increasing signalling of insulin growth-like factor 1.

***Journal of Applied Physiology*, July 2019**

https://doi.org/10.1152/japplphysiol.00249.2019

MENTORING Q&A | LIFE-WORK BALANCE AND SELF-CARE

Take Care

Learn how to balance your personal life with work and go easier on yourself

Each issue, we'll ask a trainee member to pose their career questions to an established investigator and mentor. Here, **Macarena Ramos Gonzalez, MS**, a third-year PhD student in the applied physiology doctoral program at the University of Delaware, asks for tips on balancing personal matters with productivity at work and strategies for self-care when things don't go as planned in the lab. **John Chatham, DPhil, FAPS**, a professor in the division of molecular and cellular pathology at the University of Alabama at Birmingham, shares advice on how to keep the lines of communication open with your mentor, fight "imposter syndrome" and take it easier on yourself.

Above: Illustration by Kagan McLeod; Left: iStockphoto

Q: What are some tips to enjoy free time without feeling guilty or that I should be working, not enjoying myself?
A: Working and enjoying yourself shouldn't be mutually exclusive. Taking time away from the lab is important and will make you more productive. Do something you really enjoy and that needs all your attention. Spend time with your friends.

"It is impossible to prevent difficult events in your personal life from affecting your work. Trying to do so will only make you more stressed."

Q: How can I not take research-related mistakes personally, and how can I differentiate my life as an individual from my life as a researcher?
A: Recognize that it is OK to feel bad when things don't go as planned. Make sure you have non-work things you enjoy doing. Take time to celebrate successes—even the small ones.

It is very easy to be overly critical of our "failures" and ignore those things that do go well. Instead of using the word "mistakes," perhaps it's better to think about it as "things not working out as planned or expected."

Q: How do you prevent negative or difficult events in your personal life from interfering with your work? And how do you communicate this to your mentor properly?
A: It is impossible to prevent difficult events in your personal life from affecting your work. Trying to do so will only make you more stressed. It is important to talk to your mentor as early as possible so they know why you are less focused or productive. If you wait too long they will more likely be frustrated by your lack of productivity. Hopefully, your mentor will understand and will work with you in getting a plan together. If that doesn't happen, find someone else to confide in—a member of your thesis committee, perhaps, or someone from the graduate school or postdoc office—and ask them for help. They can act as an intermediary between you and your mentor.

Q: Even when your mentor supports you, sometimes you may feel you are not doing enough, that you are not good enough. How can you stop that train of thought?
A: You will be surprised how many people experience the feeling of not being "good enough." It is likely that these thoughts will reappear throughout your career, so it is OK to feel that way once in a while, but not all the time! Acknowledge the feeling and try to see if there was a trigger, such as a manuscript being rejected or an experiment that went wrong after you spent a lot of time working on it. It is OK to feel lousy when something like that happens. Take the day off or just an hour. Do something that is not work related, go for a walk or do something else for fun.

Q: What should you do if a mentor or colleague is the source of anxiety?
A: Talk to someone, perhaps a program director at the graduate school. They will have experience with this issue and can help you with coping strategies. If a mentor is causing anxiety because of inappropriate behavior or has unrealistic expectations, they can also address the issue with the mentor.

Q: Do you have suggestions for how we can support our colleagues if we suspect someone in the lab is experiencing mental health problems or a crisis?
A: Try to engage them. Suggest going for coffee or lunch. Give them the chance to talk to you and see if they will confide in you. If they do, encourage them to talk to their mentor or see a mental health professional. If they don't or won't talk to you, tell your mentor about your concerns for the individual.

Got a career question you'd like to submit? Email it to education@the-aps.org and we'll consider it for an upcoming Mentoring Q&A.

Top right: iStockphoto

RESEARCH FIZZ

Chemotherapy acutely impairs neurovascular and hemodynamic responses in women with breast cancer

Researchers found that a single cycle of chemotherapy with doxorubicin and cyclophosphamide significantly increases sympathetic nerve activity, raises blood pressure and leads to neurovascular damage in women with breast cancer.

***American Journal of Physiology—Heart and Circulatory Physiology*, July 2019**

https://doi.org/10.1152/ajpheart.00756.2018

STATS & FACTS

32 and 87

Age of the youngest and oldest Nobel laureates, respectively, awarded the prize for Physiology or Medicine

Frederick Banting was the youngest person to receive the Nobel Prize in Physiology or Medicine. He received it at age 32 "for the discovery of insulin." Peyton Rous, who was honored "for his discovery of tumour-inducing viruses," was the oldest to receive the Physiology or Medicine prize at 87.

Nobel Prize Facts

RESEARCH FIZZ

Habitual cigarette smoking raises pressor responses to spontaneous bursts of muscle sympathetic nerve activity

This study suggests that long-term smokers are more likely than nonsmokers to experience an increase in blood pressure following spontaneous sympathetic nerve activity.

***American Journal of Physiology–Regulatory, Integrative and Complementary Physiology*, August 2019**

https://doi.org/10.1152/ajpregu.00293.2018

STATS & FACTS

1 in 5

Number of U.S. adults who experienced a mental illness in 2018

19.1% of U.S. adults experienced mental illness in 2018 (47.6 million people). This represents 1 in 5 adults.

National Alliance on Mental Illness

POLICY IQ | APS EARLY CAREER ADVOCACY FELLOWSHIP

Make a Difference at Home and on the Hill

The APS Early Career Advocacy Fellowship is a two-year program that seeks to engage early-career investigators in advocacy activities and provide them with skills to become long-term advocates for scientific research. The program—which has an application deadline of November 29, 2019—also pairs Fellows with an experienced APS Science Policy Committee member as a mentor to help develop their advocacy skills.

We asked some of our recent Fellows to share what made the experience so worthwhile:

"I gained a lot of insight into how to serve as an advocate for the research community throughout my career as new challenges arise."

"The Early Career Advocacy Fellowship was an excellent introduction to science policy issues and how to advocate for the scientific community. Our trips to Capitol Hill were an invaluable opportunity to learn from APS staff and the Science Policy Committee. Since finishing my fellowship, I have built on the experience through subsequent Capitol Hill visits and have organized science policy events at my home institution. I am grateful to all who made the fellowship possible." *–Giovanna Collu, PhD, postdoctoral fellow, Icahn School of Medicine at Mount Sinai, New York, N.Y.*

"The Early Career Advocacy Fellowship gave me a great exposure to the issues currently facing the biomedical research community. Even more, I gained a lot of insight into how to serve as an advocate for the research community throughout my career as new challenges arise. The opportunity to work with experienced advocates while interacting with my legislators was truly invaluable." *–Eric George, PhD, associate professor, University of Mississippi Medical Center*

"I became interested in serving as an Advocacy Fellow to broaden my knowledge about science policy and to better understand ways to create equity in access to science education. As part of my fellowship, I was trained in how to represent biomedical research to those in government, who make decisions regarding allocation of funds for science training

Top left: iStockphoto; all other photos on this page are contributed by the researchers.

and research. I never imagined how much I would enjoy this aspect of science. I consider it 'teaching,' where I am educating others about the importance of biomedical research. In this case, my 'students' happen to be politicians." *–TanYa M. Gwathmey, PhD, assistant professor, Wake Forest School of Medicine, Winston-Salem, N.C.*

"Participating in the Early Career Advocacy program

was a highlight of my scientific training. It's becoming more and more important for scientists to share our experiences and expertise and to be more accessible to the public. This fellowship provided practical and proactive experience engaging the public and policymakers on the role of science in society. It's a chance to make a difference." *–Allyson Hindle, PhD, assistant professor, University of Nevada, Las Vegas*

"The APS Advocacy Fellowship is a terrific opportunity. This experience solidified

my training to be an effective and influential advocate of biomedical research and allowed me to participate in the public dialogue and learn to speak on behalf of the scientific community. I feel like the skills I am obtaining in this program provide me with the means to make an actual difference, as I am now incorporating scientific advocacy into my career, locally and nationally." *–Daria Ilatovskaya, PhD, assistant professor, Medical University of South Carolina*

"As an Early Career Advocacy Fellow, I have had the opportunity to develop and share science communication skills I wouldn't have otherwise. Working with the APS Science Policy Committee members has been a

great way to get direct mentorship in advocacy activities. As scientists, we all have the responsibility to advocate for government support of research, and participation in this fellowship has given me the tools and confidence to do that." *–Anna Stanhewicz, PhD, assistant professor, University of Iowa*

Find more information on how to apply at www.the-aps.org/advocacyfellowship.

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Still have questions? More scenarios can be found in the APS Instructions for Authors at www.physiology.org/author-info.permissions.

APS' experienced publishing staff share their tips and know-how to help you improve the polish of your scientific manuscripts. Got a scientific publishing or style question that you want us to weigh in on? Email it to tphysmag@the-aps.org.

RESEARCH FIZZ

Accurate and affordable assessment of physiological and pathological tremor in rodents with the accelerometer of a smartphone

This article describes an affordable method—using a smartphone—for measuring tremors in people with chronic neurological conditions.

***Journal of Neurophysiolgy (JNP)*, July 2019**

https://doi.org/10.1152/jn.00281.2019

STATS & FACTS

More than half of graduate students with anxiety and depression do not feel valued by their mentor.

The majority of graduate students experiencing anxiety and/or depression did not agree with the statement that their principal investigator or adviser is an asset to their career (53% and 54% versus 37% and 35% who agreed) or that they feel valued by their mentor (55% and 56% versus 34% and 30% who agreed).

"Evidence for a mental health crisis in graduate education," Nature Biotechnology

POLICY IQ | RESEARCH FUNDING

Research Funding Top Priority for Science Policy Community

On September 12, APS Science Policy Committee members and Early Career Advocacy Fellows went to Capitol Hill to urge Congress to increase federal support for research. They met with 20 congressional offices from nine states, requesting substantial fiscal year 2020 research funding increases for the National Institutes of Health, National Science Foundation, VA Medical and Prosthetic Research Program and NASA.

Eileen Chang, PhD; Steven Brooks, PhD; and Jeff Henegar, PhD, at the U.S. Capitol.

Top left: Ben Krinsky, PhD (FASEB); James Hicks, PhD, FAPS; Michelle Gumz, PhD; and Laura McCabe, PhD, at Florida Sen. Rick Scott's office. Bottom left: Alicia Pate, PhD, and TanYa Gwathmey-Williams, PhD, chat in the office of North Carolina Sen. Richard Burr. Top right: Early Career Advocacy Fellows gather for a quick huddle before their meetings. Bottom right: Alicia Pate, PhD; TanYa Gwathmey-Williams, PhD; and J.R. Haywood, PhD, FAPS, at the office of North Carolina Sen. Richard Burr.

Robey and his sons, Murphy (left) and Jack (center), at the Matterhorn in Switzerland in August 2019.

UNDER THE MICROSCOPE

Rapid Fire Q&A

R. Brooks Robey, MD, FAPS, talks curiosity—of both humans and rats—the joys of coffee and rugby, and a liquid nitrogen incident.

Q: Ever had a "eureka" moment? Tell us about it.
A: pH-dependent green fluorescent protein tags permit non-destructive intracellular pH monitoring.

Q: How would you describe your job to a child? A : I solve puzzles for a living.

Q: What inspired you to become a scientist?
A: Autosomal dominant intellectual curiosity. I come from a family of educators who rewarded inquisitiveness and collectively instilled an appreciation for critical thought in me. They constantly encouraged me to think outside the box and to question assumptions, and I was fortunate to have teachers and role models along the way who reinforced these traits and behaviors. Although clearly applicable to other career paths, I think that it was inevitable that I would be drawn to science and education.

Q: Favorite time of the day/week to work in the lab and why?
A: Early, late or on weekends when there are fewer distractions.

Q: "Old school" technique you're most proud of mastering?
A: DNA footprinting analysis.

Q: Most challenging laboratory technique you've learned to use?
A: *In ovo* expression cloning using *Xenopus laevis* oocytes.

Q: Items on your lab bench that you are most possessive of?
A: I'm not particularly territorial in the laboratory. I'm generally OK with sharing.

Q: Favorite lab mishap story that you can share without incriminating the innocent?
A: An adjacent laboratory once left a large Dewar flask unattended while filling it with liquid nitrogen. Liquid overflowing the Dewar created a massive pool on the adjacent floor, preventing access. It took an assortment of wooden blocks and old textbooks to create a "flagstone path" to reach the shut-off valve.

Q: If you could meet any scientist (living or dead) who would it be and why?
A: Eric Newsholme (1935–2011), renowned biochemist at Oxford University. In addition to his unrivaled grasp of the metabolic gestalt, he had a rare gift for making complex scientific concepts accessible to general audiences through his writings.

Q: If you could do a sabbatical with any scientist (living or dead) who would it be and why?
A: John Wilson—professor and chair emeritus in the Department of Biochemistry and Molecular Biology at Michigan State University—has made seminal contributions to our understanding of the evolution, structure, function and regulation of hexokinase isoforms and has always served as an exemplar of scientific rigor, investigative thoroughness and professional generosity in my limited interactions with him.

Q: If you were a model organism, which model organism would you be?
A: Probably a rodent. In addition to serving as versatile models for studying mammalian physiology,

Robey and musician Johnny Clegg at Dartmouth College in April 2014.

Valley Rugby Football Club Old Boys in Hong Kong in June 2013.

rodents are highly adaptable creatures that are inherently curious about the world they inhabit.

Q: Favorite book about science (fiction or non-fiction)?
A: "From Fish to Philosopher" (1953) by Homer Smith. Based on comparative physiological studies, this classic physiology treatise charts the evolution of the homeostatic functions of the kidney that helped facilitate the aquatic to terrestrial environmental transition of vertebrate animals. Honorable mention would go to "The Eighth Day of Creation: The Makers of the Revolution in Biology" (1979) by Horace Freeland Judson, which chronicles the advent of molecular biology and the personalities associated with it.

Q: No. 1 guilty pleasure?
A: Coffee. I have a coffee cup in hand almost 24/7.

Q: Favorite science-related TV show (fictional or factual)?
A: Factual: "Nova" on PBS. Fictional: "Star Trek"

Q: The scientific discovery or invention (made by someone else) that you wish you had made?
A: Kary Mullis' polymerase chain reaction. Ingenious.

Q: Favorite way to spend a free hour?
A: I love competitive sports, both as a participant and as a spectator.

Q: Most valuable quality in a colleague?
A: Intellectual rigor.

Q: Tell us a surprising fact about you.
A: I started playing rugby just before my 30th birthday and am still playing three decades later at 60 years of age.

Q: Favorite part of your job?
A: I enjoy the unpredictability and challenges of a life in science. I also prize the camaraderie and esprit de corps that this shared experience frequently engenders in the academic environment.

Q: Least favorite part of your job?
A: Administrative paperwork.

Q: Title you'd use on your autobiography?
A: "The Wayward Adventures of an Itinerant Seeker Circumnavigating the Sun"

Q: How would you describe your job to a child?
A: I solve puzzles for a living.

Q: One thing every researcher/scientist should try at least once in their life?
A: Every researcher/scientist should try to work or train at NIH at least once during their career if given the opportunity.

Q: Favorite TV show, movie series or podcast to binge-watch/listen?
A: "Jeopardy"

Q: Favorite musician/musical artist/band?
A: Johnny Clegg (1953–2019), South African musician, anthropologist and social activist extraordinaire.

Q: All-time favorite city in the world?
A: Washington, D.C.

Q: City, suburb, country?
A: In rank order: 1. city. 2. country (with accessibility to city amenities). 3. suburb (with accessibility to both country and city amenities).

R. Brooks Robey, MD, FAPS, is associate professor of medicine and medical education and co-director of the renal physiology curriculum at the Geisel School of Medicine at Dartmouth in New Hampshire. He is also associate chief of staff for research and the former founding chief of nephrology at the White River Junction VA Medical Center in Vermont. He has been an active member of APS since 2000.

Photos courtesy R. Brooks Robey, MD, FAPS

STATS & FACTS

41

Percentage of graduate students scored as having moderate-to-severe anxiety on the Generalized Anxiety Disorder 7-item (GAD-7) scale, compared to 6% of the general population.

"Evidence for a mental health crisis in graduate education," Nature Biotechnology

RESEARCH FIZZ

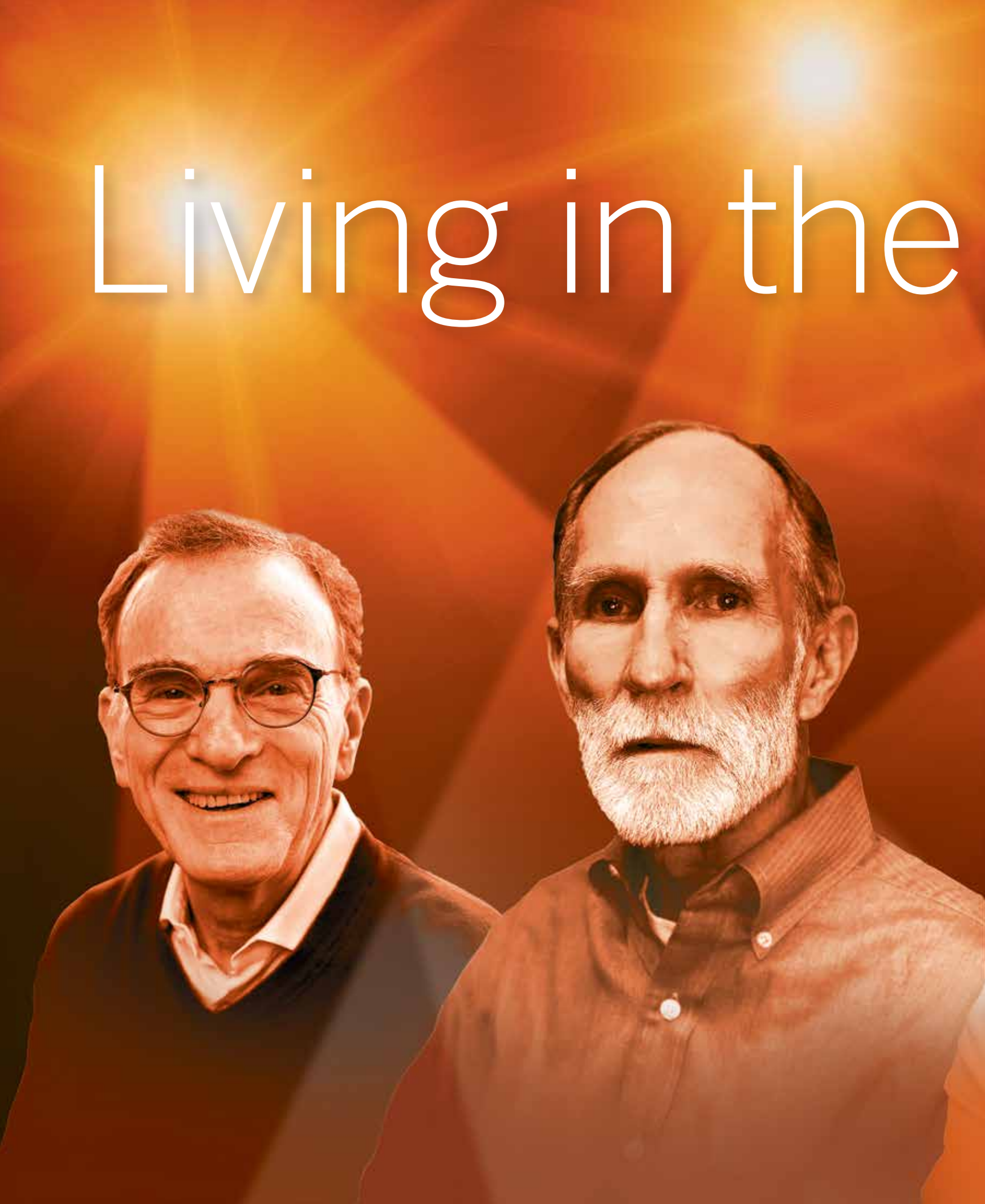
Pulmonary inflammation induced by low dose particulate matter exposure in mice

A study in mice suggests that exposure to low levels of roadside particulate matter (air pollution) can impair lung health.

***American Journal of Physiology—Lung Cellular and Molecular Physiology*, July 2019**

https://doi.org/10.1152/ajplung.00232.2019

Living in the



Aura

What life is like after winning the Nobel Prize

BY HEATHER BOERNER

Nobel laureates (from left) Randy W. Schekman, PhD; Peter C. Agre, MD; and Robert J. Lefkowitz, MD

In the decades that Robert Lefkowitz, MD, has been a researcher, he's known multiple Nobel Prize winners. No matter how familiar he was with them before they received that early-morning call from Sweden, once they were awarded that highest honor in science, it changed how he saw them. They all share a singular aura, a mystique, says Lefkowitz, the James B. Duke Professor of Medicine at the Duke University School of Medicine and professor of biochemistry and chemistry.

"There were people who were good friends who would then win the Nobel Prize, and from then on I looked at them differently," he says. "I can't put it into words, but it was like they were a different species."

But that, he says, is where the similarities between Nobel laureates end. The prize gives winners the opportunity to pursue anything they wish. For some, it's the ability to keep doing the research they love or the chance to pursue new fields they may not have been tapped for otherwise. For others, it's an opportunity to pursue their non-research passions. For all, it's an opportunity to advocate for a better scientific future.

THE STALWART

The two months between finding out he'd won the Nobel Prize in Chemistry in September 2012 and accepting it in December are still a blur to Lefkowitz.

"Between doing interviews and preparation videos [for the award] and preparing your lecture and preparing to go and making arrangements and who am I going to bring, and the family …" he says. "You can't see straight."

Lefkowitz still gets multiple invitations a week to speak, provide a keynote or receive an honorary degree. Today, the wall in his office is plastered not only with the Nobel in a case and the National Medal of Science that President George W. Bush gave him in 2007, but with a framed Duke University basketball jersey with his name and the number 1—a signifier of Lefkowitz as the university's first Nobel laureate.

Then there are the honorary degrees from Baylor College of Medicine, Mayo Clinic College of Medicine, University of Camerino in Italy—"They're from all over the place," he says.

But mostly, Lefkowitz stays closer to home, speaking to students from elementary through high school, faculty groups, adults, and, especially, undergraduates. "After I won the Nobel, undergrads kind of discovered me," he says. So he uses the Nobel aura to inspire the next generation.

"They're being inspired by somebody who's doing something socially constructive and by doing science," he says. "They have this kind of amorphous thing in their head. And then they see somebody in the flesh and blood standing in front of them doing it, being recognized for it. That's very, very inspirational."

Afterward, he says, he's mobbed for photos and autographs.

And then there's the Physician Scientist Support Foundation (PSSF), which Lefkowitz founded to encourage more physicians to do research. Physician-scientists have done work "that strongly impacts the way medicine is practiced today," he says. But now the number of physicians involved in active research lags at about 1.5 percent, according to PSSF. His foundation is Lefkowitz's attempt to "right that ship."

Seven years later, the broad outlines of Lefkowitz's life remain the same as they were before September 2012. He may arrive at work a little later, and he may not physically conduct experiments, but he still shows up to

"With other awards, the glow is relatively short lived. With the Nobel, it just never stops."
—Randy Schekman, PhD

And the Winner Is …

The 2019 Nobel Prize in Physiology or Medicine was awarded jointly to William G. Kaelin Jr. of the Dana-Farber Cancer Institute in Boston; Sir Peter J. Ratcliffe of the University of Oxford in England and the Francis Crick Institute in London; and Gregg L. Semenza of Johns Hopkins University School of Medicine in Baltimore.

The three were honored for their discoveries of how cells sense and adapt to oxygen availability. In the press release accompanying the announcement, the Nobel committee explained that the researchers "identified molecular machinery that regulates the activity of genes in response to varying levels of oxygen." It was described as "one of life's most essential adaptive processes."

Though the three researchers never collaborated formally, they would discuss their latest findings with one another at scientific conferences. In a press conference at the Dana-Farber Cancer Institute, Kaelin credited this "free exchange of information" with helping their research "hit escape velocity and go much faster."

Two of this year's Nobel winners—Ratcliffe and Semenza—have published frequently in APS journals. Curated lists of APS journal articles authored by Ratcliffe, Semenza and other Nobel laureates are available at www.physiology.org/nobel-laureates.

Bottom left: Photographer Brittany Hosea-Small

work every day—even through those first, blindingly busy two months. He spends his days reviewing data from the lab one-on-one or in small groups. He continues to publish. Now it's just easier to find collaborators.

The Nobel allowed him to do what he always wanted to do: follow his passions in the lab. "I've always felt that whatever I was doing at the moment was the most interesting thing I ever did. That is true right up until this moment," he says. "I'm not working on anything right now that I think is going to be my second Nobel Prize. But I love what we're doing, and I'm excited about it."

"I've always felt that whatever I was doing at the moment was the most interesting thing I ever did. That is true right up until this moment."

—Robert Lefkowitz, MD

THE PUBLIC EDUCATOR

By the time Randy Schekman, PhD, professor of molecular and cell biology at the University of California, Berkeley, got the call that he'd been awarded the Nobel Prize in Physiology or Medicine in 2013, he'd already received a number of prestigious awards, including the Lasker Award for Basic Medical Research. But nothing could have prepared him for the "shine" that accompanies the Nobel.

With other awards, "the glow is relatively short lived," he says. "With the Nobel, it just never stops."

From the moment he won the award, he was swept up in invitations, phone calls and "a blizzard of emails" so deep that, in the months following the announcement, he gave up responding to most of them.

Sometimes those invitations came with offers of piles and piles of cash. The week his win was announced, he was invited to a meeting of Nobel laureates in Azerbaijan. The letter said that if he agreed to come, the hosts would "deposit a large sum of money in your bank account." And if you showed up? Another large sum would show up.

"It was ridiculous," he says. "I thought, 'Oh my god, is this what I can expect?' And the answer is, more or less, yes." Schekman declined the offer.

But he did take advantage of the higher profile the prize afforded him. He started by donating the $400,000 Nobel prize money to UC Berkeley to establish the Esther and Wendy Schekman Chair in Basic Cancer Biology. His goal was to highlight the fact that few of America's Nobel laureates work at public universities but that those are the universities 70 percent of students attend.

Public education is important to him, so Schekman speaks often about the lack of state funding of public universities. He's also happy to speak to potential donors whenever UC Berkeley or his undergraduate alma mater, UC Los Angeles, ask him to.

"I grew up in the University of California," he says. "I'd always been passionate about it. But I didn't have a soapbox."

Another passion that he's been able to express on a larger stage since winning the Nobel is his critique of closed-access corporate journals. Schekman served as editor of the *Proceedings of the National Academy of Sciences* until 2011, after which he served as the founding editor for *eLife*, an open-access journal run and edited by active researchers.

For years, it had bothered him that major publishing companies had taken over scientific publishing, relying on what Schekman believes is a meaningless number: the journal impact factor. Those journals weren't edited by active research scientists. And they were keeping research behind a paywall.

So on the same day as his Nobel ceremony in Stockholm, he published an editorial in *The Guardian* stating he would not publish in *Nature*, *Cell* or *Science*, calling the way that journal impact factors work "toxic" and a "mismeasure of the value of research."

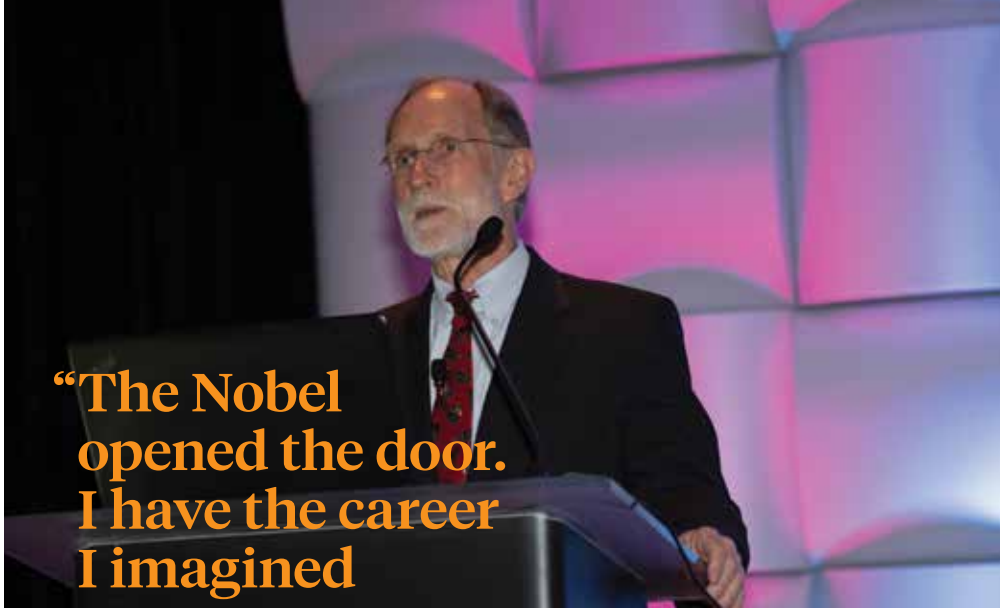
Still, research remains his focus. Before he won the Nobel, he had shifted his attention away from the way proteins are secreted by cells to how extracellular vesicles allow the cell to secrete RNA. It's possible that further research could lead to liquid biopsies for cancers that often go undetected until they metastasize.

Now Schekman is embarking on a new path. Three years after his wife passed away from Parkinson's disease, he has agreed to act as the scientific director of ASAP Parkinson's, a new

Top right: Duke University Photographer Tracey Koepke

scientific venture funded by the Sergey Brin Family Foundation to expand work in the basic science of Parkinson's.

He won't be conducting that research himself. But he will help decide which research to fund through the foundation. "This has become my new cause," he says. "How could I say no?"



"The Nobel opened the door. I have the career I imagined as a young person, just in a somewhat different form."

—Peter Agre, MD

THE DIPLOMAT

As a child, Peter Agre, MD, dreamed of being a physician, traveling the world to "serve humanity" by healing the sick.

Instead, Agre found himself, with the support of mentor Bill Guggino, PhD, tinkering in a lab with cells, trying to figure out how water passed in and out of them. Still, that desire to serve the bigger world lingered. He loved the science, he says, but he never had any illusion that he'd be in the lab his whole life.

"I had expected that some time in my mid-50s or sooner, I'd turn into a director—that is, not strictly a lab researcher," says Agre, director of Johns Hopkins Malaria Research Institute and Bloomberg Distinguished Professor in the School of Public Health. "I'm interested in science and politics, science and human rights, science diplomacy."

Those goals are worthy. But "how do you pay your rent?" he asked.

The answer came in 2003, when the Nobel committee recognized his work identifying the "plumbing system of the cells," the aquaporin water channels. Suddenly, Agre had the momentum to follow his extracurricular interests.

Like other Nobel winners, Agre says the immediate aftermath of the announcement was a whirlwind. By the time it settled down a year later, the pieces of his life settled in a very different arrangement.

First, he reduced the size of his lab and became the "director and cheerleader" for science instead of an active participant, as the director of Johns Hopkins Malaria Research Institute. The institute allows him to work with Johns Hopkins researchers in African countries.

"I loved the whole idea of going to Africa and visiting our personnel there and seeing the field," he says.

Then, he accepted membership in the Committee on Human Rights at the National Academy of Sciences, Engineering and Medicine, eventually serving as its chair. There, he petitions governments to protect or release scientists held in prison.

And he was elected president of the American Association for the Advancement of Science, where he had the chance to serve as a scientific diplomat. In that capacity, he visited countries that have been politically hostile to the U.S., such as North Korea, Iran, Myanmar and Cuba, to foster peaceful scientific collaborations. These have included projects on improving agriculture, developing medicine and improving public health.

He found friendship with "Fidelito," Fidel Castro's son, who was also a scientist. Through that work, Johns Hopkins began to sponsor an outstanding Cuban chemist to come to the institution to teach. Agre doesn't know if that program will continue, though, as Washington policies are changing visa access for scientists.

With every trip, Agre tries to serve a greater good. He often thinks back to his Minnesota childhood, where he dreamed of serving the sick of the world. Today, he says, he's simply grateful.

"The Nobel opened the door," Agre says. "I have the career I imagined as a young person, just in a somewhat different form."

Schekman to Speak at EB 2020

Randy Schekman, PhD, will present the Nobel Prize Award Lecture at the APS annual meeting at Experimental Biology (EB) in San Diego on Tuesday, April 7, 2020. Submit your abstract today at **www.apsebmeeting.org**.

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OUT STRESSED

Mental health problems in the biomedical research community are rampant—here are ways to address them.

BY DEBORAH ABRAMS KAPLAN

Burnout. Depression. Anxiety. Stress. These are common feelings among those working in the biomedical community, and they're often experienced at higher rates than in the general population. But recent research about the pervasiveness of mental health problems among researchers has led to increased awareness in the scientific community and more avenues for support at both institutional and grassroots levels.

The statistics are alarming for those in research and academia experiencing mental health issues. Thirty-two percent of PhD students have or are at risk of developing a psychiatric disorder, most commonly depression. Organizational policies such as job demands, supervisor leadership styles and work-family interference were highly associated with PhD students' mental health disorders, according to a 2017 study in *Research Policy*. Furthermore, graduate students (90 percent of survey respondents were PhD candidates) are more than six times as likely to experience depression and anxiety, compared to the general population, according to a 2018 study in *Nature Biotechnology*.

Illustration by Sandra Dionisi

Thirty-two percent of PhD students have or are at risk of developing a psychiatric disorder, most commonly depression. ... Furthermore, graduate students are more than six times as likely to experience depression and anxiety compared to the general population.

THANK YOU FOR ASKING

Teresa Evans, PhD, a coauthor of the *Nature Biotechnology* study, said she and her collaborators were overwhelmed by the impact that launching the survey had on the community. The survey included clinically validated scales for anxiety and depression and questions about work-life balance and mentor relationships. One week after sending out the survey via direct mail and social media, the researchers received a high volume of responses and "people were thanking us for asking the questions," says Evans, assistant professor in the Department of Pharmacology at the University of Texas Health Science Center at San Antonio and the school's former director of workforce and career development. She says the results did not surprise the scientific community but that people appreciated having data to point to. Publishing the study led to an outpouring of individuals sharing their stories with Evans and the team. And universities shared their own initiatives and invited the coauthors to speak on the subject.

These stories about mental health problems are not unique to academia. Clinicians and veterinarians also face stressors that put them at a higher risk for depression, suicide and other mental health challenges. Suicide among female veterinarians is 3.5 times as likely as the general population while suicide among male veterinarians is 2.1 times as likely, according to a 2019 study in the *Journal of the American Veterinary Medical Association*.

Understanding these industry-related stressors that academics and clinicians face helps inform solutions. For veterinarians, stressors include compassion fatigue, burnout, societal expectations to save every animal, student debt, practice expectations of high hours and low pay, and the threat of negative practice reviews on social media, says APS member Diane McClure, DVM, PhD, associate professor at Western University College of Veterinary Medicine in Pomona, Calif.

Physicians face pressures of patient care, compassion fatigue, increasing administrative burdens, decreased renumeration and student debt, says Darshan Mehta, MD, MPH, medical director of the Benson-Henry Institute for Mind Body Medicine at Massachusetts General Hospital in Boston. Biomedical researchers also experience pressure to apply for and procure grants in an age of budget cuts and decreased funding from the National Institutes of Health and other funding agencies.

INSTITUTIONS ARE ADDRESSING MENTAL HEALTH

Employer and student-led initiatives are introducing healthy lifestyle activities through formal and informal programs. As the younger generations climb up an organization's rungs, these adults bring new cultural norms. A student-run group might create a mindfulness practice or meet up for yoga, Evans says. "There's something really powerful about that collegiality, making changes from the bottom up, but supported by the top down," she says.

In any organization, especially large ones, cultural changes take a long time, she says. That said, there are many ways to foster an environment that prioritizes mental health and recognizes and supports the needs of employees and students. Here's how some institutions are addressing mental health issues.

Cultivating resiliency: The Benson-Henry Institute for Mind Body Medicine at Massachusetts General Hospital reworked a patient stress management and resiliency program for health care practitioners. The eight-session model—two hours each session—focuses on developing a mind-body practice, skills for stress awareness and lifestyle strategies. The experiential group model is led by a facilitator. Participants learn movement-based approaches such as yoga, as well as cognitive restructuring, such as how to stop or redirect negative thoughts that otherwise feed into a cycle of stress. A skill that surgeons gravitated toward was sharing one thing they're grateful for. "One surgeon gave a powerful example: He never

really appreciated his operating room folks," Mehta says. Acknowledging that in the group setting gave the physician and others in the group a different view when going back to surgical suite. Practices such as these allow space for reflection and appreciation, are simple and inexpensive and, yet, have a profound effect on well-being.

Stressing grit and a growth mindset: Western University of Health Sciences in Pomona, Calif., is starting a program for faculty and students about thriving in adversity with a grit and growth mindset. Learning opportunities include books on the subjects and creating a safe place and a culture where failure is acceptable.

Mental health first aid: McClure recommends mental health first aid training. The eight-hour course teaches how to recognize signs of distress in others, including how and when to ask if someone has thought about harming themselves. She keeps an app on her phone called Suicide Safe with a checklist of suicide-related interventions and contacts for mental resources throughout the country.

Mentoring: In her study, Evans found that half of respondents who reported anxiety or depression did not feel that their mentors, advisers or principal investigators provided real mentorship, were assets to their careers or that these mentors valued them. Understanding these relationships is important because of the correlation between mental health and the perception of a mentor relationship, she says.

Targeting the mentor-mentee relationship in higher education, where apprenticeship is core to training, is an intervention. More organizations are starting to acknowledge the value of faculty mentors by giving them more time to properly mentor trainees. Programs based on the book "Entering Mentoring: A Seminar to Train a New Generation of Scientists" provide structure to discuss expectations and train mentors, Evans says. Mentors need to be mindful of their impact on the mentee to ensure positive outcomes.

Promoting wellness: School-based wellness programs include bringing in a pianist or offering chair massages during exam week, McClure says. Schools can schedule weekly yoga classes. In the class setting, McClure periodically asks students to drop their shoulders and pay attention to their breathing. While focused on students, this can benefit faculty as well, though she said it can be challenging to get faculty to adopt these practices.

SELF-CARE TIPS FOR STRESSED RESEARCHERS

Formal programs are not needed to help a colleague or student practice wellness techniques to improve one's own mental health. Here are some ways to do that.

Recognizing life stressors: Stressors occur in all facets of life, not just work. As the number of stressors increase, Evans says, the potential for mental health struggles increases too. Certain times in academia cause higher stress levels, including exams, residency interviews and matching, grant cycle deadlines and tenure review. Add in a car accident, family death or other personal stressor, and peers or mentors should have a heightened concern for that individual, with additional support. "We know that stress is cumulative, and it can be exponential," Evans says.

Giving permission for self-care: McClure asks her students questions about self-care, such as how much they're sleeping, if they're connected to peers and whether they're eating. "I think my role sometimes as a professor is to give them permission," she says. She's even taught students how to boil eggs so they have healthful snacks to eat when they're on the run.

Just ask: Asking a person if they're thinking of harming themselves is important, and they will often tell the truth. However, you need a plan for where to direct them if they respond yes and to ensure they follow up. "You have to make sure they get the appropriate help," McClure says.

Changing an institution's culture isn't easy, but small steps can lead to larger changes. Some traditional faculty don't feel comfortable taking a moment during class to ask students to breathe deeply or relax their shoulders, for example, or appreciate that the chair massages during exams actually reduce student stress levels, McClure says. One clinician from a war-torn country couldn't understand why students were worried when they had access to food and were not getting bombed. "The anxiety of doing well is just as alarming to them as his frame of reference," she says. Wellness offerings are more than just a nice perk, she says. They're necessary.

Mental Health Resources

- Not One More Vet: a veterinarian peer support group on Facebook. www.nomv.org
- National Suicide Prevention Lifeline: 800.273.8255
- Suicide Safe: a free mobile app with suicide prevention strategies and tips to assist others who are contemplating suicide. It includes resources to search by location. https://store.samhsa.gov/apps
- Mental Health First Aid: an eight-hour course offered by the National Council for Behavioral Health. www.mentalhealthfirstaid.org

Entrepreneurial ENDEAVORS

These APS members know what it takes to launch a business of your own in physiology.

BY POORNIMA APTE

For 25 years, Sylvie Breton, PhD, has been researching the intercalated cells of the kidney, studying how they regulate the acidity of the blood, at Massachusetts General Hospital (MGH) in Boston. But in 2013, she made a monumental discovery that galvanized her move toward entrepreneurship.

She discovered that intercalated cells could also initiate local inflammation in the kidney. Equally important, the cells triggered this inflammation when the kidney or any secondary organ, such as the heart, was injured. (A kidney might be injured when it is starved of oxygen, a condition known as ischemia). Such an event has a cascading effect: It triggers production of a dangerous molecule, UDP-glucose (UDP-G), which activates a receptor in intercalated cells that causes inflammation. And much like a canary in a coal mine signals danger, UDP-G signals inflammation of the kidney, which can lead to acute kidney injury (AKI) or acute renal failure.

Breton immediately recognized the significance of this discovery. AKI is one of the most common and severe medical complications in hospitalized patients. It increases the chance of death seven-fold, Breton says. "The problem right now is there is no specific therapy for AKI. Also, patients are often diagnosed too late in the process," she says. But Breton had found a way to signal the onset of trouble. What if, Breton wondered, she could bring this diagnostic marker to the market and develop a related receptor inhibitor as a therapeutic? She

could help save millions of lives. That possibility gave her the courage to take a leap of faith and launch a startup.

Across the U.S., in all industries, professionals are jumping into entrepreneurship, but physiologists' ultimate goal is often to develop therapies to help patients. Along the way, they face challenges, such as protecting their intellectual property, avoiding potential conflicts of interests between lab and company, and navigating legal and logistical hurdles. But developing and following a careful blueprint can lead to successful entrepreneurial endeavors.

FROM LAB TO STARTUP

In Breton's case, avoiding intellectual pollution was the first challenge. Before she presented her discovery at a meeting of the American Society of Nephrology, she filed a provisional patent application through MGH, where she is a professor of medicine and the Richard Moerschner Endowed MGH Research Institute Chair in Men's Health.

Money was the next hurdle to clear. Breton needed to divorce funding for the AKI project from the rest of the work supported by the National Institutes of Health (NIH). Her NIH-funded work was aimed at supporting research on the pH regulatory role of intercalated cells, not the pro-inflammatory role she had discovered.

Sylvie Breton, PhD

Breton received a couple of internal grants from Partners Healthcare (the parent group of MGH) and pilot grants from the Boston Biomedical Innovation Center. The grants—$200,000 in total—were enough to develop preclinical models to study ischemia of the kidney and show that the receptor inhibitor was effective at protecting the kidney from ischemia.

Realizing that proof-of-concept alone was not enough to have companies test-drive her work, Breton formally launched what started out as Kantum Diagnostics in 2016. Her entrepreneur husband, Jean-François Carbonneau, helped her build the company and create a business plan and venture capital pitch. They raised $3 million in seed funding for the project, which they used to assemble a team of experts. The company now employs four experts and six advisers in drug development and hires occasional consultants.

"You have to protect your discovery and know that what you have is marketable," Breton advises. "It's not only about science; it's also about business. Be ready to listen." Kantum is now ready to solicit venture capital firms for the next round of capital investment, called series A funding, which is usually designed for early-stage companies.

Although Breton initially went to market with the name Kantum Diagnostics, she quickly realized funding for diagnostic tools was limited. The market needed therapeutics. The new name, Kantum Pharma, captures both. "Above all, you have to know when to pivot," Breton says.

FROM LAB TO PHARMA

Moving from the study of neurobiology to pharmaceutical marketing, Eric Floyd, PhD, certainly knows how to pivot.

While pursuing a master's degree in neurobiology at Tennessee State University, Floyd received an APS Porter Physiology Development Fellowship in 1989. It helped him attend the annual meeting of the Society for Neuroscience, where he met one of his many mentors, James Townsel, PhD, then chair of the Department of Physiology at Meharry Medical College in Nashville, Tenn. The Porter Fellowship then funded two years of Floyd's doctoral research. He earned a PhD in neurophysiology in 1995.

Eric Floyd, PhD

Since then, Floyd has had an illustrious career in pharma, starting at Merck as associate director of regulatory affairs in 1998. He has worked for Aventis, Novartis, Cephalon and others, expanding his knowledge of global pharma regulatory affairs from the U.S. to Europe and beyond.

Early on in his studies, Floyd realized he wanted to do translational research. "I wanted to move from a

"You have to protect your discovery and know that what you have is marketable. It's not only about science; it's also about business."

—Sylvie Breton, PhD

rat and a primate model into work that could have the greatest impact on patients' lives," he says. He found that path in regulatory affairs.

The neuroscience and physiology degrees help him understand the mechanics of the human body under discussion. It was at Merck that another mentor, Larry Bell, MD, gave Floyd more valuable advice: build business acumen. "The pharmaceutical industry is a business. It's not enough to have the science; you need to be able to translate the science into a product that you can market," Floyd says. The next step: an MBA in pharmaceutical marketing from Saint Joseph's University in Philadelphia.

After 18 years of working under the regulatory affairs umbrella, Floyd decided to launch his own regulatory consulting firm, Floyd Regulatory Strategic Consulting. He serves as the principal and has a suite of 15 associates he refers work to through the consultancy. The business consults with companies on all regulatory and clinical development interactions with government agencies such as the U.S. Food and Drug Administration and the European Medicines Agency.

Floyd is also the chief regulatory officer at Neurogene, a startup that focuses on developing life-changing genetic medicines for patients and their families affected by rare, devastating neurological diseases such as Batten disease and Charcot-Marie-Tooth disease. To avoid any potential conflict of interest, any client with a therapeutic area focus on the central nervous system—which overlaps with Neurogene's work—is supported and managed by other consultants within the group.

If you have a spark of entrepreneurship, it's important to "know yourself and know your subject matter," Floyd says. "Look at the landscape and see where you can create a value proposition."

"If you have a spark of entrepreneurship, it's important to know yourself and know your subject matter. Look at the landscape and see where you can create a value proposition."

—Eric Floyd, PhD

Floyd believes in asking for help and in mentorship. "Dr. Robert Silverman and Dr. Larry Bell taught me to understand the data and to effectively communicate that to government agencies," he says.

Since his Porter Fellowship days, Floyd has come full circle, donating to the program and speaking to Porter Fellows about career opportunities. "I try to serve as a mentor to others that are coming up. We are all trained as scientists, but those skill sets are transferable. They can be applied in many different venues outside the bench. People need to know that."

FROM INDUSTRY TO BUSINESS OWNER

Craig Plato, PhD, also understands what it takes to strike out on your own. Toward the end of the Great Recession, Plato noticed a trend toward outsourcing in pharma. "There was a perspective that in-house discovery physiology capabilities were no longer 'critical path' and those efforts could be done extramurally," says Plato, the CEO and founder of Plato Biopharma Inc. (PBI) in Westminster, Colo.

The industry shift came at an opportune time for Plato. Having worked for Abbott Labs, Myogen and then Gilead Sciences (which acquired Myogen), he already had years of experience in the *in vivo* component of pharma and biotechnology. He understood the underpinnings of compound evaluation and drug discovery. In 2009, Gilead consolidated the Colorado operation and moved it to California, offering Plato a move to the Golden State. After a discussion at a conference with friend and industry veteran David Pollock, PhD, past president of APS, Plato instead decided to strike out on his own.

Craig Plato, PhD

PBI is a research organization that focuses on performing preclinical discovery, physiology and pharmacology studies for large multinationals, biotechs and startups. Since its founding in 2010, PBI has grown from a staff of two to 28.

Just a year before, Plato had set up a new lab for Gilead complete with laboratory equipment. When he launched PBI, he was able to buy those lab assets at a low market

Craig Plato photo, right, by photographer Todd Horn; other photos submitted by sources

“Physiologists are uniquely positioned to understand the multi-organ system interaction. There is so much opportunity for us to add value, perspective and context.”

—Craig Plato, PhD

price. With a very modest round of funding from local angel investors, and Plato’s own money, PBI was off and running.

Technology transfer was more complicated. Any data that had been generated when Plato was part of Myogen/Gilead had to be redone. “We regenerated all the model systems, all the assays,” he says. The rigors of earning a PhD—he received his doctoral degree in physiology from the Medical College of Wisconsin—set him up for developing procedures from scratch. Such a disciplined and rigorous approach, Plato says, has been instrumental in winning business as companies use PBI to move down the decision tree of a drug discovery project. The methods and data have to be squeaky clean. “I am part of the whole-animal, old-school blood-and-guts physiology cadre—valuable training in industry,” Plato says.

Entrepreneurship in physiology is particularly challenging because of associated complexities, he says. “We’re using animals to model human diseases, but those diseases are multifactorial and often accompanied by medical comorbidities,” he points out. Heart failure, for example, is not just a cardiac problem; it’s a renal and vascular problem, too.

The good news: These complexities also present an opportunity for physiologists, Plato says. “Physiologists are uniquely positioned to understand the multi-organ system interaction. There is so much opportunity for us to add value, perspective and context.”

Plato advises budding entrepreneurs: “Be passionate about your idea. It’s necessary to engage investors, obtain business and attract talent to grow your business. If the founder’s not passionate, no one else will be.”

Succeeding as an entrepreneur

Physiologists interested in entrepreneurship need to keep up with cutting-edge research and stay involved with APS, says Matthew Zahner, PhD, chair of the Society’s Physiologists in Industry Committee. “Always keep a finger on the pulse of the discipline. This is best achieved through networking.”

Zahner’s own trajectory is proof that networking furthers career goals. After his postdoctoral fellowship studying spinal cord injury at Johns Hopkins University School of Medicine in Baltimore, he worked for Pfizer from 2012 to 2017. There, he put together a lab implementing the neurophysiology models he used in his academic research to be part of a team focused on improving the safety and efficacy of candidate drugs.

Zahner stayed in touch with APS, serving as chair of the Cardiovascular Section Development Committee. “Being plugged in helps; you learn about many opportunities you may otherwise not know of,” he says. “You also have to keep all of your tools sharp, and interacting with a diverse audience will help that.” He is now an assistant professor with a National Institutes of Health-funded research lab in the Health Sciences Department at East Tennessee State University in Johnson City, Tenn.

Zahner says the Society is promoting dialogue between industry and academia to seed entrepreneurship. Programming at future Society meetings could include workshops for academics interested in taking a drug to market, approaching industry when you have a good idea and licensing products. “We want to show academics how important industry scientists can be toward growth of entrepreneurship and vice versa. The Society is interested in nourishing that entrepreneurial spirit, and we’re going to do just that through such professional development workshops.”

To be a successful entrepreneur, Zahner says, “You need to be able to collaborate with other people, and you need to be able to sell your ideas. You have to deliver your ideas in a way that makes other people excited and want to fund them. Above all, you need to be a good scientist, you need to have a specialty and you need to be very good in your own wheelhouse.”

ABSTRACT SUBMISSIONS

Join the community that brings together scientists of all career levels to share cutting-edge research, networking and career advancement. It all starts with submitting an abstract on your latest research and joining us at the American Physiological Society annual meeting at Experimental Biology.

Abstract Submission Deadline: November 14, 2019

Early-bird Registration Deadline: February 5, 2020

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AWARDS

RESEARCHER | EDUCATOR | TRAINEE

Apply for awards year-round at the-aps.org/awards.

American Physiological Society (APS) provides more than $1 million in grants and awards each year as part of our mission to spotlight excellence in physiological research and education. Over 75 awards provide funding toward attending the APS annual meeting at Experimental Biology. These awards are a vital investment in researchers and educators of all career levels.

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SPEAKER SPOTLIGHT

Tang Prize Award — Tony Hunter, PhD

Tony Hunter, from the Salk Institute for Biological Studies, is the British American scientist who discovered tyrosine phosphorylation and that the oncogene Src is a tyrosine kinase. With this discovery, Hunter gave birth to the field of tyrosine kinase inhibitors, which are prototypes of targeted cancer therapies. Its emergence made a milestone of cancer therapy.

APS Nobel Prize Award Lecture — Randy W. Schekman, PhD

During the 1970s, Randy Schekman studied yeast cells with malfunctions in the vesicles transportation system. He demonstrated that the malfunctions were due to genetic defects and explained how different genes regulate different aspects of the transports.

APS/ASPET Joint Presidential Symposium Series on Inflammation and Oxidative Stress

Topics include:

- Workshop on CRISPR-Cas and miRNAs in the Study of Drug Metabolism, Cancer and Other Diseases
- Cardiovascular and Renal Inflammation in Health and Disease
- Inflammation and Drug Disposition
- Central Nervous System Inflammation: Pain and Cognition

View more speaker announcements at apsebmeeting.org.

APS STAFF NEWS

Our New CPO: Colette E. Bean, MA

Colette E. Bean, MA, has been named chief publishing officer (CPO) and will lead the publishing division, which includes all 15 APS journals and the launch of the newest APS journal, *Function*. She replaces Rita Scheman, who led the APS publications program for more than 10 years before retiring in June.

Bean comes to APS from John Wiley & Sons—one of the oldest and largest scholarly publishing companies in the world—where she spent over 25 years serving in a variety of roles. She most recently served as vice president and society publishing director for the U.S. In this role, Bean oversaw the management of more than 350 society-owned journals spanning the life sciences, physical sciences and social sciences and humanities. Before that, she served as publishing director for life, earth and environmental science journals. Bean first joined Wiley in 1992, where her previous roles included executive editor, publisher and associate publishing director. During her career, she has collaborated with numerous societies to successfully launch new subscription and open-access journals. She also previously served as chair on the executive committee for the professional and scholarly publishing division of the American Association of Publishers.

"The CPO role is enormously important for APS. Our journals are responsible for the majority of our operating revenue. They represent our most visible and prestigious offerings," said APS Executive Director Scott Steen, CAE, FASAE. "As the scholarly publishing business undergoes tremendous change—with open access becoming the dominant publishing model around the world—we are fortunate to have someone with Colette's vast experience and ability joining us to help us navigate this challenging and exciting time."

From left, Scott Steen, APS executive director; Ole Petersen, founding editor-in-chief of the APS journal *Function*; Colette Bean, APS' new chief publishing officer; and Dennis Brown, APS chief science officer.

JUST ANNOUNCED

Ole Petersen, CBE, FRS, Named Founding Editor-in-Chief of *Function*

APS has tapped Ole Petersen, CBE, FRS—professor at Cardiff University School of Biosciences in Wales and director of Academia Europaea—Cardiff University Knowledge Hub—as founding editor-in-chief of *Function*. The newest publication in the APS family of journals, *Function* will provide an open-access, multidisciplinary home for high-profile publication in the biological sciences.

As the journal prepares to launch, Petersen will be involved in every detail of the new publication, including appointing a top-tier editorial board, setting submission and peer-reviewing criteria, planning for outreach to potential authors and other factors related to the journal's short- and long-term success.

"From the inception of *Function* in 2018, the Publications Task Force and APS Publications Office staff have understood that selecting a working scientist with impeccable credentials for the editor-in-chief role was of critical importance," said APS Publications Committee Chair Curt Sigmund, PhD. "In hiring Ole, we have secured an esteemed researcher who has the vision, confidence, scientific pedigree and broad global network to ensure the success of this new enterprise. As both a Commander of the Order of the British Empire (one step below knighthood) and a Fellow of the Royal Society—one of the most prestigious distinctions in the world for scientists—Ole easily meets the criteria we originally set for the position."

Among his many scientific achievements, Petersen pioneered single channel current recordings in epithelial cells, discovering hormone-evoked, messenger-mediated ion channel activation and voltage-activation of epithelial ion channels. This led to the now generally accepted concept of how ion channels control exocrine fluid secretion. He has received numerous awards and honors, both in the U.S. and abroad, including the 2018 Walter B. Cannon Memorial Award, the most prestigious award APS bestows, and election to membership of several very selective science academies such as the German National Academy of Sciences Leopoldina.

Learn more at www.physiology.org/function.

GOVERNANCE AND BYLAWS TASK FORCE

Your Vote Matters

The Governance and Bylaws Task Force was established to ensure that the Society's bylaws are up-to-date and reflect current practices and regulations. After careful examination, the amended bylaws are now ready for your review and vote.

All dues-paying members, including students and trainees, were sent a ballot via email on October 28. As you review the ballot, please note that deleted language is indicated by strikethrough and new language is highlighted in red.

Please take a moment to vote and help guide the future of the Society. Your voice matters!

If you did not receive a ballot or need assistance voting, please contact members@the-aps.org or 301.634.7171.

MARION J. SIEGMAN LECTURESHIP AWARD

Awarding Advances in Muscle Contraction Research

The annual Marion J. Siegman Lectureship Award recognizes an established investigator who has made outstanding contributions to our understanding of the contractile process that has opened the way for new avenues of investigation in the field. The award's benefactor, APS member Marion Siegman, PhD, explains why she established the award:

"It became painfully clear to me a half-century ago when I submitted my first grant application to the NIH for the study of the mechanical properties of smooth muscle that research on muscle operated in silos. The background section of that proposal was devoted to what was then known about smooth muscle, which was little compared to the striated types. Much of the literature focused on vascular smooth muscle compared to a handful of papers on visceral muscles.

Despite my diligent summary of all that was relevant to mechanics and elaboration on gaps that needed to be filled in the proposed studies, the grant was not funded because I failed to include a review of cardiac and skeletal muscles. Needless to say, the resubmitted grant proposal included a tome on the mechanical properties of all muscle types, and, happily, was funded. Lesson learned, and it gave me a deeper perspective on the contractile process in general.

Today, it is clear that as technology has developed—allowing new approaches for the study of the contractile process—the silos remain. So many processes are common to all muscle types and the motility of cells in general. Sharing and cross-talk is necessary for us to learn from each other and recognize the genius of design in nature. My hope is that this special lecture series will facilitate a dialog among all researchers interested in this fascinating and far-reaching topic and lead to new discoveries and collaborations."

For more information and to apply by November 14, visit www.the-aps.org/siegmanaward.

OPPORTUNITY KNOCKS

Check out these featured job listings. To find your next career opportunity or to list your job announcement with us, visit www.the-aps.org/jobs.

ASSISTANT/ASSOCIATE PROFESSOR OF PHYSIOLOGY
ARKANSAS COLLEGE OF OSTEOPATHIC MEDICINE

The assistant/associate professor of physiology will be responsible for developing interactive and didactic osteopathic medical education curricula centered around clinically relevant, systems-based physiological mechanisms of health and disease. Faculty duties will also include maintaining a viable scholarly/research agenda and engaging in institutional, community and professional service.

Read more at www.the-aps.org/ARCOM.

PHYSIOLOGY FACULTY
CALIFORNIA UNIVERSITY OF SCIENCE AND MEDICINE

California University of Science and Medicine is seeking a full-time physiology faculty member. Faculty will participate in teaching, service and scholarly activities in the School of Medicine. The incumbent will establish learning objectives and competency standards, teach medical physiology, contribute to the process of student assessment, developing, implementing and evaluating assessment materials and procedures. The incumbent will promote and use active learning techniques in the classroom. **Read more at www.the-aps.org/CUSM.**

TENURE TRACK FACULTY POSITIONS—PHYSIOLOGY
WAYNE STATE UNIVERSITY

The Department of Physiology at WSU School of Medicine (SOM) invites applications for two tenure-track assistant/associate professor positions. We seek candidates that employ molecular, cellular or systems approaches to explore research interests in cardiovascular, metabolic, respiratory and other areas of physiology, pathophysiology and biophysics. WSU SOM is a state-of-the-art research environment, rated in the top third of all U.S. research institutions by the Carnegie Foundation.

Read more at www.the-aps.org/WSUSOM.

DATES & DEADLINES

AWARDS

- **Cardiovascular Section Outstanding Postdoctoral Trainee Award** (Deadline November 10, 2019)
- **Cardiovascular Section Outstanding Graduate Student Trainee Award** (Deadline November 10, 2019)
- **Cardiovascular Section Clinical Science Young Investigator Award** (Deadline November 10, 2019)
- **Cardiovascular Section New Investigator Award** (Deadline November 10, 2019)
- **Cardiovascular Section Research Recognition Award** (Deadline November 10, 2019)
- **Annual Marion J. Siegman Lectureship Award** (Deadline November 14, 2019)
- **Environmental and Exercise Physiology Section CANTROL Environmental Systems New Investigator Research Award** (Deadline November 14, 2019)
- **Environmental & Exercise Physiology Section CANTROL Environmental Systems Postdoctoral Research Award** (Deadline November 14, 2019)
- **Environmental & Exercise Physiology Section CANTROL Environmental Systems Predoctoral Research Award** (Deadline November 14, 2019)
- **Environmental & Exercise Physiology Section Gatorade Sport Science Institute Postdoctoral Research Award** (Deadline November 14, 2019)
- **Environmental & Exercise Physiology Section Gatorade Sport Science Institute Predoctoral Research Award** (Deadline November 14, 2019)
- **Environmental & Exercise Physiology Section New Investigator Award** (Deadline November 14, 2019)
- **Environmental & Exercise Physiology Section Nike Loren G. Myhre Postdoctoral Research Award** (Deadline November 14, 2019)
- **Environmental & Exercise Physiology Section Nike Loren G. Myhre Predoctoral Research Award** (Deadline November 14, 2019)
- **Environmental & Exercise Physiology Section Partnership for Clean Competition Anti-doping Postdoctoral Research Award** (Deadline November 14, 2019)
- **Environmental & Exercise Physiology Section Partnership for Clean Competition Anti-doping Predoctoral Research Award** (Deadline November 14, 2019)
- **Environmental & Exercise Physiology Section Postdoctoral Research Award** (Deadline November 14, 2019)
- **Environmental & Exercise Physiology Section Predoctoral Research Award** (Deadline November 14, 2019)
- **Michael J. Brody Young Investigator Award** (Deadline November 14, 2019)
- **Neural Control & Autonomic Regulation (NCAR) Experimental Biology Trainee Award** (Deadline November 14, 2019)
- **Neural Control & Autonomic Regulation (NCAR) Research Recognition Awards** (Deadline November 14, 2019)
- **Neural Control & Autonomic Regulation (NCAR) Data Sciences Outstanding Graduate Student Award** (Deadline November 14, 2019)
- **The NCARnation Trainee Presentation Award** (Deadline November 14, 2019)
- **Professional Opportunity Abstract Awards (Caroline tum Suden/Frances A. Hellebrandt, Steven M. Horvath, Fleur L. Strand)** (Deadline November 14, 2019)
- **Respiration Section New Investigator Award** (Deadline November 14, 2019)
- **Respiration Section Outstanding Trainee Award** (Deadline November 14, 2019)
- **Respiration Section Research Recognition Awards** (Deadline November 14, 2019)
- **Respiration Section Trainee Poster Presentation Awards** (Deadline November 14, 2019)
- **Translational Research Awards for Predoctoral Students and Postdoctoral Fellows** (Deadline November 14, 2019)
- **The Usha Awards** (Deadline November 14, 2019)
- **Arthur C. Guyton Awards for Excellence in Integrative Physiology** (Deadline November 15, 2019)
- **Beverly Petterson Bishop Award for Excellence in Neuroscience** (Deadline November 15, 2019)
- **Dean Franklin Young Investigator Award** (Deadline November 15, 2019)
- **Giles F. Filley Memorial Awards for Excellence in Respiratory Physiology and Medicine** (Deadline November 15, 2019)
- **Lazaro J. Mandel Young Investigator Award** (Deadline November 15, 2019)
- **S&R Foundation Ryuji Ueno Award** (Deadline November 15, 2019)
- **Shih-Chun Wang Young Investigator Award** (Deadline November 15, 2019)
- **Central Nervous System Section New Investigator Award** (Deadline November 21, 2019)
- **Central Nervous System Section Research Recognition Award** (Deadline November 21, 2019)
- **Central Nervous System Section Van Harreveld Memorial Award** (Deadline November 21, 2019)
- **Graduate Student Ambassador** (Deadline November 21, 2019)
- **Juan Carlos Romero and Water & Electrolyte Homeostasis Section Postdoctoral Research Recognition Award** (Deadline November 21, 2019)
- **Martin Frank Diversity Travel Award** (Deadline November 21, 2019)
- **Robert W. Berliner Award for Excellence in Renal Physiology** (Deadline November 21, 2019)
- **Renal Section New Investigator Award** (Deadline November 21, 2019)
- **Renal Section Postdoctoral Excellence in Renal Research Awards** (Deadline November 21, 2019)
- **Renal Section Predoctoral Excellence in Renal Research Awards** (Deadline November 21, 2019)
- **Renal Section Research Recognition Awards** (Deadline November 21, 2019)
- **Water & Electrolyte Homeostasis Section New Investigator Award supported by Data Sciences International** (Deadline November 21, 2019)
- **Water & Electrolyte Homeostasis Section Portland Press Predoctoral Research Recognition Award** (Deadline November 21, 2019)
- **APS Early Career Advocacy Fellowship** (Deadline November 22, 2019)
- **Campbell Awards in Endocrinology & Metabolism** (Deadline November 22, 2019)
- **Endocrinology & Metabolism Section New Investigator Award** (Deadline November 22, 2019)
- **Endocrinology & Metabolism Section Research Recognition Award** (Deadline November 22, 2019)
- **Mead Johnson Research Award in**

Endocrinology & Metabolism (Deadline November 22, 2019)

- **Virenda B. Mahesh Award of Excellence in Endocrinology** (Deadline November 22, 2019)
- **ADInstruments Macknight Innovative Educator Award** (Deadline December 1, 2019)
- **Arthur C. Guyton Educator of the Year Award** (Deadline December 1, 2019)
- **Orr. E. Reynolds Award** (Deadline December 1, 2019)
- **Horace W. Davenport Distinguished Lectureship** (Deadline December 15, 2019)
- **Gastrointestinal & Liver Physiology Section New Investigator Award** (Deadline December 15, 2019)
- **Gastrointestinal & Liver Physiology Section Distinguished Research Award** (Deadline December 15, 2019)
- **Gastrointestinal & Liver Physiology Section Predoctoral and Postdoctoral Poster Awards** (Deadline December 15, 2019)
- **Gastrointestinal & Liver Physiology Section Trainee and Junior Faculty Research Recognition Award** (Deadline December 15, 2019)
- **Data Sciences International Physiological-Omics Trainee Research Award** (Deadline December 21, 2019)
- **The Physiological-Omics Distinguished Lectureship Award** (Deadline December 21, 2019)
- **Physiological-Omics Groups ADInstruments New Investigator Award** (Deadline December 21, 2019)
- **Cell and Molecular Physiology Section New Investigator** (Deadline December 31, 2019)
- **Cell and Molecular Physiology Section Postdoctoral Research Recognition** (Deadline December 31, 2019)
- **Cell and Molecular Physiology Section Robert Gunn Student Awards** (Deadline December 31, 2019)
- **Comparative and Evolutionary Physiology Section New Investigator Award** (Deadline January 2, 2020)
- **Comparative and Evolutionary Physiology Section Research Recognition Award** (Deadline January 2, 2020)
- **Comparative and Evolutionary Physiology Section Scholander Award** (Deadline January 2, 2020)
- **Comparative and Evolutionary Physiology Section Travel Award sponsored by Dr. Dolittle** (Deadline January 2, 2020)
- **Comparative and Evolutionary Physiology Section Travel Award sponsored by Novo Nordisk Foundation** (Deadline January 2, 2020)
- **Barbara A. Horwitz and John M. Horowitz Outstanding Undergraduate Abstract Awards** (Deadline January 12, 2020)
- **Porter Physiology Development Fellowship** (Deadline January 15, 2020)
- **Leonard Share Award of the APS Water & Electrolyte Homeostasis Section** (Deadline January 19, 2020)
- **Dale J. Benos Early Career Professional Service Award** (Deadline January 24, 2020)
- **Frontiers in Physiology** (Deadline January 31, 2020)
- **G. Edgar Folk Senior Physiologists Award** (Apply anytime)
- **Ray G. Daggs Award** (At the Committee's Discretion)

More details: www.the-aps.org/awards

CALLS FOR PAPERS

Advances in Physiology Education (Deadline December 31, 2019)

- Curricular Integration of Physiology
- K–12 Outreach

American Journal of Physiology—Cell Physiology (Deadline December 31, 2019)

- Extracellular Vesicles in Cell Physiology
- New and Nontraditional Roles of the Cytoskeleton

American Journal of Physiology—Gastrointestinal and Liver Physiology (Deadline December 31, 2019)

- Cellular Organelle Interactions in Homeostasis and Disease
- Extracellular Vesicles in Homeostatic and Disease States of Digestive System
- Microbially Generated Metabolites in the Gut Ecosystem and Their Interface With Host Physiology
- Neural Development of the GI Tract
- The Physiology of Immune Therapies and Their Application in Treating Gastrointestinal Cancers

American Journal of Physiology—Lung Cellular and Molecular Physiology (Deadline December 31, 2019)

- Electronic Cigarettes: Not All Good News?
- Extracellular Vesicles in Lung Health, Disease and Therapy
- Senescence in the Lung

American Journal of Physiology—Regulatory, Integrative and Comparative Physiology (Deadline December 31, 2019)

- Cardiovascular and Neural Adjustments to Exercise in Chronic Disease States
- Mechanisms Underlying Greater Propensity for Cardiovascular Disease in High-risk Populations

Journal of Applied Physiology (Deadline December 31, 2019)

- Highlighted Topic: Mechanisms of Respiratory Modulation of Cardiovascular Control

Journal of Neurophysiology (JNP) (Deadline December 31, 2019)

- Auditory and Vestibular Efferents
- Modulation of Dynamic Neural Networks: From Sensory Inputs to Motor Outputs
- Society for the Neural Control of Movement

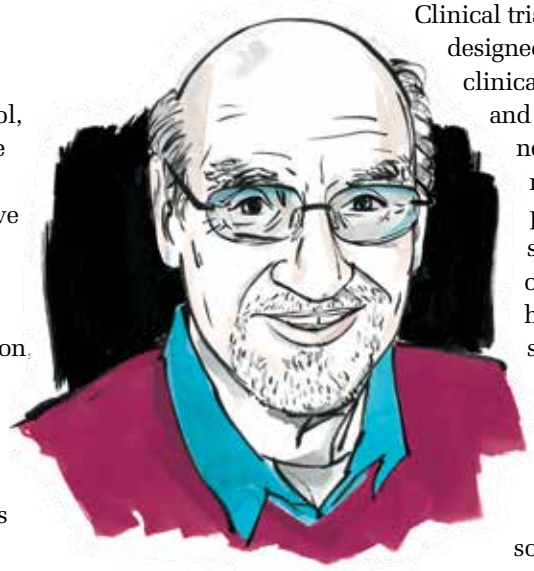
Physiological Genomics (Deadline December 31, 2019)

- The Microbiome-human Host Interactions Contributing to Cardiovascular and Inflammatory Disease
- Big Data Integration to Understand Complex Disease
- The Microbiome and Metabolic Health

More details: www.physiology.org/calls

When Negative Is Positive

IRVING H. ZUCKER, PHD



When I was in high school, I thought I would become a physician. After all, physicians save lives, have a challenging profession and understand how the body works. But as I progressed in my education I realized that the history of medicine has clearly demonstrated that understanding the function, the mechanisms and the complexity of life required something that was not easy to achieve as a physician. That something is experimentation.

Experimentation, beyond pure anatomical observations, requires concepts that today seem almost obvious and intuitive. The scientific method has been refined over the centuries to include a testable hypothesis, proper controls, detailed notations, high-quality reagents and methodologies, blinding and statistics. But as any life scientist will tell you, most of what we do—in spite of a sound rationale, a good hypothesis and well-designed protocols—does not work.

"An unexpected result can lead to great insight, but what about experiments that show a negative result or support null data? What good are they and what should you do with the data?"

What does not work may be dependent on two different things: that the result did not come out as expected or that the result was negative, meaning there was no difference between the groups or treatments examined (i.e., the null hypothesis was not accepted). An unexpected result can lead to great insight, but what about experiments that show a negative result or support null data? What good are they and what should you do with the data? This is at the center of a lot of current discussion.

The reality is that negative data rarely see the light of day. They are rarely cited, which dissuades journals from accepting papers that provide only negative results. Funding agencies are not impressed with negative data, which have the potential to lessen the impact of a grant. Clinical trials based in part on poorly designed and non-reproducible pre-clinical research also may be negative and thus not published. But valid negative results are important to report and can be a positive in providing information! These studies may save millions of dollars, countless work hours and—assuming a sound study—can actually result in saving lives by preventing bias in a specific direction. The problem is that there is no repository for negative data. Funding agencies, scientific societies and journals are discussing the issue of scientific rigor and reproducibility and have all championed a reevaluation of how we design experiments in order to reduce bias and transparently report data. Journals play a key role in ensuring that data and methodology are reported in such a way that they can be reproduced and that important insight can be garnered from the raw data. The scientific community is making rapid progress toward this goal.

However, the life sciences community needs a peer-reviewed resource where good quality studies that report negative data are published or at least provided for public scrutiny. One is getting underway in Britain (*Experimental Results*). If scientific rigor is of high quality and negative results are acceptable to an open-minded scientific community, basic and translational research will benefit and facilitate new knowledge and therapies. It will be up to us to decide how we turn these negatives into positives.

Irving H. Zucker, PhD, FAHA, FAPS, is the Theodore F. Hubbard Professor of Cardiovascular Research in the Department of Cellular and Integrative Physiology at the University of Nebraska Medical Center and editor-in-chief of the *American Journal of Physiology—Heart and Circulatory Physiology*. He is an APS past president.

Illustration by Brett Affrunti

american physiological society

Graduate Student Ambassador Fellowship Program

Each year, the American Physiological Society (APS) selects five students to serve as our Graduate Student Ambassadors (GSA), sharing the importance of involvement in professional societies with other students in their community.

Our GSAs:

- receive travel support for two years to attend the APS annual meeting at Experimental Biology,
- receive outreach training and materials,
- present at local institutions on the importance of involvement in professional societies,
- promote the Society programs and awards and careers in physiology,
- encourage involvement in the Society chapters and meetings and
- mentor the incoming GSA cohort.

Apply by **November 21, 2019**, to be a 2020 GSA at **the-aps.org/GSA**.

register for our upcoming conferences

american physiological society

A NEXUS OF COLLABORATION AND DISCOVERY

APS Annual Meeting at Experimental Biology 2020
April 4–7, 2020
San Diego
apsebmeeting.org

Institute on Teaching and Learning
June 21–26, 2020
Minneapolis

Eleventh International Conference on Heme Oxygenase and Related Enzymes: From Physiology to Therapeutics
June 28–July 1, 2020
Los Angeles

Integrative Physiology of Exercise
October 2020
Location TBD

APS members enjoy discounted registration.

the-aps.org | physiology.org