

THE Physiologist MAGAZINE

JANUARY 2021

OVERHAULING EDUCATION

The pandemic magnified the growing challenges in higher education—and the need for change.

HOW STRESS
AFFECTS
YOUR BODY
24

BLACK IN
PHYSIO
30





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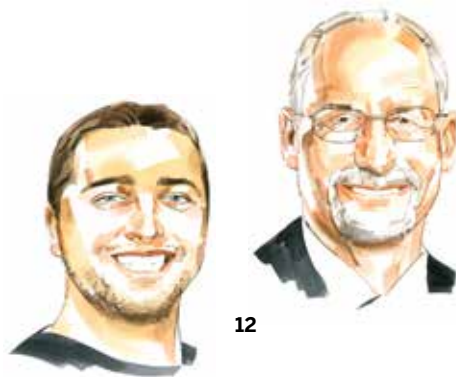
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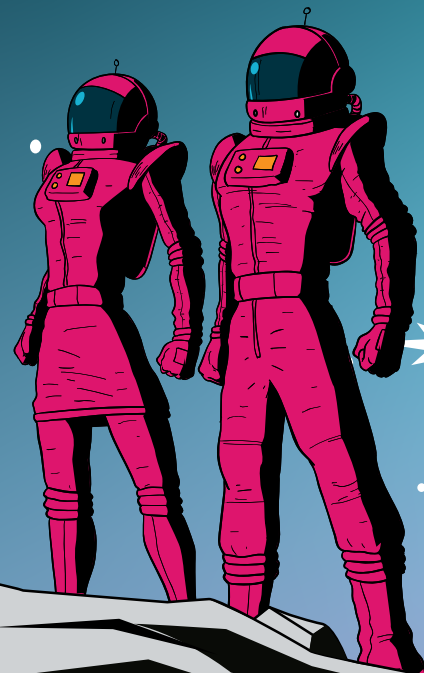
Jason R. Carter, PhD, reflects on a tough year, calling for a time of compassion, kindness and healing.



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The Benefits of Early Engagement

BY SCOTT STEEN, CAE, FASAE



In December, I had the opportunity to speak to a group of physiology graduate students and postdocs about getting involved in APS, as part of our Next Generation Scientists webinar series.

As part of my preparation for the talk, I asked our APS Council members, section chairs and others to reflect on their early experiences with the Society and the impact it had on their careers. These leaders view becoming engaged with APS as a pivotal—even defining—event in their careers.

For APS Councilor **Ann Schreihofner, PhD, FAPS**, professor at the University of North Texas Health Science Center in Fort Worth, finding APS was finding a scientific home. “I was first introduced to APS as a graduate student and my attendance at my first annual meeting,” Schreihofner said. “APS has been my scientific home ever since. I honestly believe APS was essential for my career development, and I do

not think I would have been successful as an academic scientist without the network I developed as a member, participant and leader in APS activities.”

APS Publications Committee Chair **David Gutterman, MD, FAPS**, Northwestern Mutual Professor of Medicine at the Medical College of Wisconsin in Milwaukee, spoke about APS providing his earliest opportunities to both present his science and meet his heroes.

“APS is where I presented my first oral abstract and where I submitted (and eventually got accepted) my first paper (*American Journal of Physiology-Heart and Circulatory Physiology*),” Gutterman said. “What I remember as the

attraction to APS that lured me in and kept me involved was the prestige of the Society and the annual meeting. All the researchers who I admired came to the meeting. Not only did I get a chance to present to them, but also to meet them personally and talk science.”

Teaching Section Chair and physiology educator **Patricia Halpin, PhD**, associate professor at the University of New Hampshire at Manchester, draws a direct line between her involvement in APS and her career success. “The colleagues I met in the Teaching Section encouraged me to present my work at APS meetings, apply for awards, apply to serve on APS committees and run for chair of the Teaching Section,” Halpin said. “They have also collaborated with me on symposia both in the U.S. and abroad, on grants and on manuscripts. All of this helped me to be granted early tenure and promotion.”

Respiration Section Chair **Melissa Bates, PhD**, assistant professor of health and human physiology, internal medicine and pediatrics at the University of Iowa in Iowa City, also believes that getting engaged early in the Society has had a tremendous impact in launching her career. “As a first-year postdoc, I was recruited to be the trainee representative for the Respiration Section and found people incredibly welcoming,” Bates said. “It amazes me that I am now chair of the section I started with as a trainee! I’ve formed collaborations, found help writing grants and papers, and made connections for my faculty job search and promotion among APS members. There is no doubt in my mind that my involvement in APS has catalyzed my career.”

Trainees face enormous time pressures and stress navigating the first steps of their careers. They face considerable demands in both the classroom and the lab, and getting involved in a scientific society can often seem like a luxury they cannot afford. But the reality is that for many highly respected leaders in the field, getting engaged early in APS was not merely a nice extra, but an essential ingredient for a successful career in science. ☞

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

“I’ve formed collaborations, found help writing grants and papers, and made connections for my faculty job search and promotion among APS members. There is no doubt in my mind that my involvement in APS has catalyzed my career.”

—Melissa Bates, PhD

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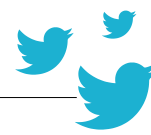
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CALLS FOR PAPERS

Many American Physiological Society journals are looking to publish papers on featured topics. View the open calls for papers and see if there is a fit for your latest research.

journals.physiology.org/calls



Spoiler alert: Most people are continuing to work from home, but physiologists and other scientists are figuring out how to adapt as they connect, teach and learn online or in safe, physically distanced ways.

What are you most looking forward to in 2021? Share your story with us and it may appear in the next issue of *The Physiologist Magazine*. Email your thoughts—and links to your tweets and posts—to tpysmag@physiology.org.



Melanie Gareau
@gareaulab

Beautiful day for a socially distant, COVID-19 friendly, lab celebration lunch 🍷🌿



10:32 PM · Nov 5, 2020



Joshua E. Gonzalez
@JoshEGonz

My first, first-author paper has been published in [@ajpheartcirc](https://doi.org/10.1152/ajpheart)! I'm beyond excited to share this work! [#AcademicChatter](#) [#ecig](#) [#research](#) Acute effects of electronic cigarettes on arterial pressure and peripheral sympathetic activity in young non-smokers [journals. physiology.org/doi/abs/10.1152/ajpheart](https://doi.org/10.1152/ajpheart)

9:52 AM · Nov 10, 2020



Casey Derella
@derella_casey

I've attended more [@APSPHysiology](#) and other society sponsored training activities this year than ever before because they all have been virtual. They've also become so smooth and well constructed. I hope these continue to be more accessible to all trainees

11:03 AM · Dec 1, 2020



Luc Bertrand
@BertrandLuc_ky

👍🤔 A new week starts in the lab. Natasha working hard, a train of WBs, how many samples? [#cardiac](#) research [@UCLouvain_ADRE](#) [@UCLouvain_be](#)



8:53 AM · Oct 19, 2020



Ardem Patapoutian
@ardemp

Finding that quote to start the manuscript was my most significant contribution to the paper.



Leslie Vosshall PhD @pollyp1 · Oct 14

Henry Miller stated that "to relieve a full bladder is one of the great human joys".
SO TRUE twitter.com/LROLE/status/1...

11:33 AM · Oct 14, 2020



Derek Scott
@Prof_DerekScott

I've solved the RSI pain I was getting by sitting at my desk so much. I made myself a new standing desk and it's working. No more arm pain.



4:51 AM · Nov 11, 2020



Dr. Sharona Gordon
@ProfSharona

So, lightning strike during class I was teaching briefly zapped my computer, switching ppt display to alt monitor and freezing me. The world did NOT end!



2:33 PM · Oct 21, 2020

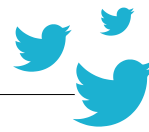


Adrienne Lester King, PhD
@AdrienneLeste19

I am Clinical Assistant Professor Dr. Adrienne King an #Integrativephysiologist @GeorgiaStateU @PHGSU. I am committed to training the next generation of physiologist. #BlackinPhysiology #YouCantTouchThisChallenge #BiPWeek



9:55 AM · Oct 13, 2020

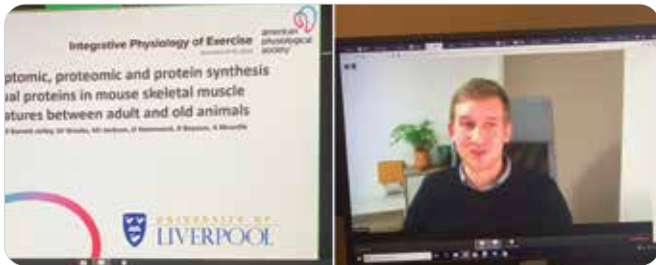


The first virtual APS Integrative Physiology of Exercise conference, held in November 2020, received rave reviews from attendees.



Anne McArdle
@Anne91011

Fab virtual presentation @APSPHysiology IPE by PhD student @EuanDOWen on his omics work. As the chair said, 'no small task'. Great collaboration with @astacus, Dean Hammond, @CazStaunton @RichardBJ1 @malcolm_mjj loving Boris the plant pot in the background too 🤔😂 @LivuniILCaMS



1:17 PM · Nov 11, 2020



Jess Scott
@cardiac_fitness

Excited for the next #IPE2020 session: Mission to Mars: Astronaut Health and #exercise where @astro_aggie shares his perspective on testing and training in space @APSPHysiology



2:18 PM · Nov 9, 2020



Katsu Funai
@KatsuFunai

Integrative Physiology of Exercise is hands down the best conference series I have been to. The conference will be kicked off by a session dedicated to Dr. John O. Holloszy. I am honored to be one of the speakers with @JuleenRZierath, Amira Klip, and Jacob Haus.



3:18 PM · Nov 6, 2020




Anaissa Ruiz
@shethescientist

Very excited about this week's Integrative Physiology of Exercise meeting! Great start of DAY 1 #IPE2020

12:41 PM · Nov 9, 2020

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LABNOTES

MENTORING Q&A YOUR QUESTIONS ANSWERED
POLICY IQ PHYSIOLOGY ON THE HILL AND IN THE HALLS
RESEARCH FIZZ 2020'S TOP TRENDING RESEARCH
STATS & FACTS PHYSIOLOGY BY THE NUMBERS
UNDER THE MICROSCOPE OUR MEMBERS, UP CLOSE
PUBLISH WITH POLISH BUILD A BETTER RESEARCH PAPER

STATS & FACTS

\$12.5 Billion

The appropriation for the Higher Education Emergency Relief Fund, the part of the Coronavirus Aid, Relief and Economic Security (CARES) Act aimed at supporting colleges and students.

The Chronicle of Higher Education

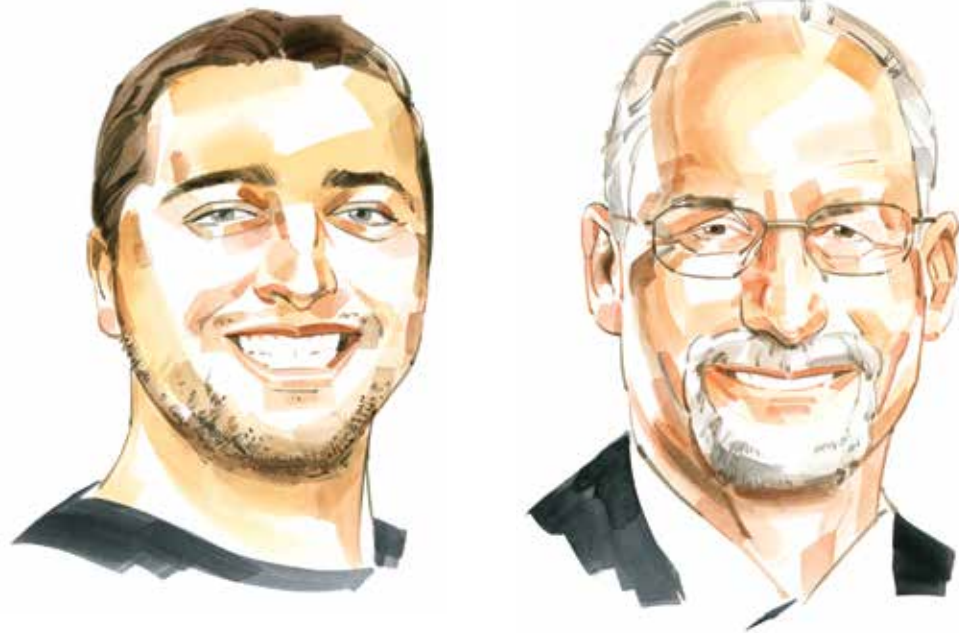
RESEARCH FIZZ



Physiological demands of running at 2-hour marathon race pace

This article provides new information on the oxygen needed to run at a two-hour marathon pace.

Journal of Applied Physiology, November 2020
<https://doi.org/10.1152/jappphysiol.00647.2020>



MENTORING Q&A | BEYOND THE PHD

Progressing to Postdoc

Tips on how best to transition from PhD to postdoc to faculty.

Each issue we ask a trainee member to pose their career questions to an established investigator and mentor. Here, Luke Schwerdtfeger, a PhD student in the biomedical sciences program at Colorado State University in Fort Collins, asks Victor A. Convertino, PhD, FAPS, senior scientist for combat casualty care and director of the Battlefield Health & Trauma Center for Human Integrated Physiology at the U.S. Army Institute of Surgical Research in Fort Sam Houston, Texas, about the transition from student to postdoctoral researcher.

Q: I have heard from some that doing a postdoc with a more junior faculty (e.g., assistant professor) can be more difficult than with a more senior person. Do you find this to be true?

A: This is an important question because it will lay the foundation for the progression of your career. In an effort to avoid

defining a “junior” versus “senior” faculty member, I prefer using the term “established investigator.” For instance, during my career, I’ve seen senior faculty who had not established themselves as national and international leaders in their fields of research, while I’ve seen more junior investigators rise to prominent recognition for being subject matter

“You want to work for a person who can pick up the telephone and recommend you for a job.”

experts early in their careers. In this regard, it is most important to choose a postdoc mentor who has established herself or himself with adequate funding, a nationally recognized research program and laboratory, regular publications in the scientific literature, and experience with mentoring other postdocs.

I recommend that you identify and talk with former postdocs as references for a candidate faculty member you are considering working with. I remember the advice given to me by one of my mentors when I was considering postdoc positions: You want to work for a person who

can pick up the telephone and recommend you for a job.

Q: Did you find the transition from graduate student to postdoc to be a difficult one?

If so, do you have any strategies for managing the new stressors of being a postdoc?

A: My transition from graduate student to postdoc was rather easy because my equivalent postdoc position was a continuation of research working with the same, as well as new,

scientists at the same institution responsible for providing me with funding and mentoring during my doctoral work.

So, I was fortunate to “transition” to an established laboratory and research program that was well-funded and provided opportunities to publish and attend professional meetings, allowing me to broaden my professional network.

However, it was my transition from a postdoc to my first faculty position that I found the stressors associated with being a young scientist to be more challenging, but these were likely self-imposed. I recommend minimizing stress by choosing a postdoc position

that involves conducting research in an area for which you have passion. Don’t settle! It is my experience that if you really like the research you’re doing and the colleagues you’re doing it with, the perception of stress will be minimal.

Q: Did you find time management and balancing life and work more difficult during your postdoc compared to graduate school?

A: Although the emphasis on studying and working were different, I did not find that managing my time in an effort to balance life and work was much different between postdoc and graduate school.

Time management in our profession is a challenge that can be met by developing a habit that builds in time for recharging from the stress of having a career in science. In addition to providing a break away from the intensity of research, I’ve found that being involved in youth sports activities and regularly scheduled exercise—playing basketball, tennis, jogging—has helped me maintain balance with family and friends without compromising my professional commitments. 🏀

Got a career question you’d like to submit? Email it to education@physiology.org. We may use it in an upcoming Mentoring Q&A.

RESEARCH FIZZ



Dysregulation of endocytic machinery and ACE2 in small airways of smokers and COPD patients can augment their susceptibility to SARS-CoV-2 (COVID-19) infections

The compromised airways in people who smoke and have chronic obstructive pulmonary disease can increase their susceptibility to COVID-19 infection.

American Journal of Physiology-Lung Cellular and Molecular Physiology, November 2020

<https://doi.org/10.1152/ajplung.00437.2020>

STATS & FACTS

\$2.78

The portion of spending that would go to historically Black colleges and universities if the Higher Education Emergency Relief Fund were \$100.

The Chronicle of Higher Education

RESEARCH FIZZ



Potential role of oral rinses targeting the viral lipid envelope in the setting of SARS-CoV-2 infection

Readily available dental mouthwashes have the potential to destroy the lipid envelope of coronaviruses, combating virus replication in the mouth and throat.

Function, June 2020

<https://doi.org/10.1093/function/zqaa002>

STATS & FACTS

4%

The portion of surveyed universities planning to be fully in-person in fall 2021.

The Chronicle of Higher Education

RESEARCH FIZZ



Skin tattooing impairs sweating during passive whole body heating

Tattooed skin does not sweat as much as non-inked areas of the body, which may have implications for the body's ability to cool in people with extensive tattooing.

Journal of Applied Physiology, October 2020

<https://doi.org/10.1152/jappphysiol.00427.2019>



POLICY IQ | SCIENTIFIC BREAKTHROUGHS

Golden Goose Awards Recognize Obscure, Important Research

In the 1970s and 1980s, Wisconsin Sen. William Proxmire frequently grabbed headlines by criticizing wasteful government spending. Some of the “winners” of his monthly Golden Fleece Awards were scientific studies. Then, as now, the titles and abstracts of research funded by the National Institutes of Health (NIH) and the National Science Foundation (NSF) didn’t necessarily convey the significance and potential of the research.

Other fiscally conservative politicians have since followed Proxmire’s example. In 2010, Oklahoma Sen. Tom Coburn began publishing an annual “Wastebook.” One of Coburn’s most infamous targets was College of

Charleston researcher Lou Burnett, PhD, who was accused of wasting half a million dollars to see how long shrimp can run on a treadmill.

In reality, Burnett was an expert in the comparative physiology of marine

animals whose NSF grant was intended to provide a broad assessment of environmental threats to an economically significant species. One aspect of the research was a novel attempt to measure how shrimp were

Bottom left: iStockphoto; above: Golden Goose Award

affected by deteriorating water quality by studying their performance on a miniature treadmill. Burnett subsequently told NPR's Nell Greenfieldboyce that a colleague built the first such treadmill out of scraps for virtually nothing, while a second, more sophisticated iteration cost all of \$1,000.

This science bashing offended Tennessee Rep. Jim Cooper—a research advocate—because it created a negative climate on Capitol Hill. Members of Congress would excuse their unwillingness to support research funding with claims that the funds were being wasted. Cooper wanted to push back, and in 2012, several scientific organizations took up his suggestion to establish an award for “seemingly obscure, federally funded research [that] had

led to major breakthroughs in biomedical research, medical treatments and computing and communications technologies.” They named it the Golden Goose Award as a much-delayed rebuttal to Proxmire’s Golden Fleece Awards.

Until 2020, the Golden Goose Awards ceremony was held annually at the Library of Congress. Members of Congress from both parties attend the event, which shines a spotlight on important but unanticipated breakthroughs resulting from basic research. In 2020, the awards were presented in a virtual ceremony on December 1. (APS has been



Rep. Jim Cooper announces the creation of the Golden Goose Award in Spring 2012 at a press conference in the Gold Room of Rayburn House Office Building on Capitol Hill.

a co-sponsor for the past several years.)

One of the 2019 awardees was David Sachar, MD, who was funded by NIH and other federal agencies. His research on the electrical potential of frog skin as a model for the human intestine led to the development of oral rehydration therapy as a treatment for cholera.

To read about other Golden Goose awardees’ projects, visit www.goldengooseaward.org/awardees. 📧

Following Rep. Jim Cooper’s suggestion, several scientific organizations established the Golden Goose Award award for “seemingly obscure, federally funded research [that] had led to major breakthroughs in biomedical research, medical treatments and computing and communications technologies.”

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Interested in science policy? The APS Office of Science Policy offers a monthly, subscription-based e-newsletter exclusively for members. This newsletter focuses on action items that advance the interests of the scientific community. Topics regularly include federal funding for research, policies that regulate the use of animals in research, and reduction of regulatory burden, among others. The newsletter arrives on the third Tuesday of each month. Sign up by emailing sciencepolicy@physiology.org.

STATS & FACTS

8

The total number of non-Hispanic Black faculty members in physiology departments in 2018, out of a total 998 faculty.

Association of Chairs of Departments of Physiology 2018 Annual Survey

STATS & FACTS

10%

The portion of surveyed universities planning to be fully online in fall 2021.

The Chronicle of Higher Education

RESEARCH FIZZ



Understanding the age divide in COVID-19: why are children overwhelmingly spared?

Differences in lung physiology and immune function are possible reasons why children are often spared from severe illness associated with SARS-CoV-2, the virus that causes COVID-19.

American Journal of Physiology-Lung Cellular and Molecular Physiology, June 2020

<https://doi.org/10.1152/ajplung.00183.2020>

RESEARCH FIZZ



Effects of carbohydrate restriction on postprandial glucose metabolism, beta-cell function, gut hormone secretion, and satiety in patients with type 2 diabetes

A low-carb, high-protein diet reduced improved beta-cell function and increased satiety in people with type 2 diabetes.

American Journal of Physiology-Endocrinology and Metabolism, October 2020

<https://doi.org/10.1152/ajpendo.00165.2020>

STATS & FACTS

53%

The percent of U.S. adults who report that coronavirus-related worry has negatively affected their mental health.

Kaiser Family Foundation

STATS & FACTS

68%

The percent of Black adults in the U.S. who report that coronavirus-related worry has negatively affected their mental health.

Kaiser Family Foundation

UNDER THE MICROSCOPE

Rapid Fire Q&A

Michael Hedrick, PhD, FAPS, shares his respect for the cane toad, his love of music and what he wishes more people understood about science, especially biology.

Q: Ever had a “eureka” moment? Tell us about it.

A: Discovering that lung ventilation plays a major role in lymph movement in frogs.

Q: How has the pandemic changed the way you work?

A: Like everyone else, I am online all day every day with teaching and meetings. It’s exhausting, and I miss the face-to-face interactions.

Q: “Old school” technique you’re most proud of mastering?

A: Cannulating small blood vessels to measure blood pressure.

Q: Items on your lab bench that you are most possessive of?

A: Surgical instruments. I’m convinced that students can bend forceps without touching them—they put Uri Geller to shame.

Q: Favorite lab mishap story that you can share without incriminating the innocent?

A: When I was a grad student, I helped a postdoc with a project studying cardiovascular physiology in a diving bird. One of the birds managed to escape the enclosure and was tragically flattened by a city bus.

Q: If you could meet any scientist (living or dead) who would it be and why?

A: August Krogh. This year is the centennial of his Nobel Prize for Physiology. He is perhaps the most influential comparative physiologist in our field and made many important discoveries. Besides, he has a “principle” named after him.

Q: If you were a model organism, which model organism would you be?

A: A cane toad—they are indestructible.

Q: Briefly, what do you wish the general public understood about science or research?

A: Evolution. The amount of time and effort biologists spend explaining and defending

the central tenet of biology is frustrating. Physicists don’t have to defend gravity, do they?

Q: No. 1 guilty pleasure?

A: Spending several hours practicing my bass guitar, although I don’t feel too guilty about it.

Q: Most influential scientist on your career?

A: Stan Hillman, professor emeritus at Portland State University. He taught me the importance of basic principles in physiology.

Q: The scientific discovery or invention (made by someone else) that you wish you had made?

A: Microwave popcorn.

Q: Favorite way to spend a free hour in quarantine?

A: Watching an episode of the “The Great British Baking Show” with my family.

Q: Title you’d use on your autobiography?

A: “The Frog Never Wins.”



Hedrick with his band, The Third Reviewers, at Experimental Biology 2018 in San Diego.



Hedrick with his wife, Julie, in Point Reyes, California.

Q: How would you describe your job to a child?

A: I try to figure out how frogs work.

Q: One thing every researcher/scientist should try at least once in their life?

A: Learn to play a musical instrument, if they haven't already.

Q: Next book on your reading list?

A: "Clean: The New Science of Skin" by James Hamblin or "The Lying Life of Adults" by Elena Ferrante.

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

A: My wife and I recently binge-watched "The Sopranos."

We hadn't seen it since it first came out, but it's still an amazing series. Current binge: "Lovecraft Country."

Q: First place you want to visit once the pandemic-related travel restrictions are lifted?

A: Japan—I haven't been there yet.

Q: City, suburb, country?

A: City. Born and raised in Portland, Oregon, and now in Oakland, California, for the past 25 years (with stops in Vancouver, British Columbia; Madison, Wisconsin; and Denton, Texas). Oakland is a wonderful city with fantastic people and great weather. 🍷

Michael Hedrick, PhD, FAPS, is a professor in the Department of Biological Science at California State University, East Bay, in Hayward. He is an APS councilor; has served on the APS Nominating, Section Advisory and Publications committees; and is on the editorial board of the American Journal of Physiology-Regulatory, Integrative and Comparative Physiology and the selection board for APSselect.



Hedrick and his family on vacation in Rome, Italy, in July 2019.

PUBLISH WITH POLISH | JOURNAL ARTICLE REVITALIZATION

APS Journals Enhance Content through 'Crossmark' Feature

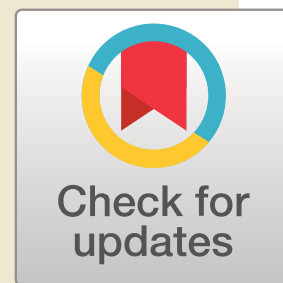
As we start the new year, the pdf and print appearance of APS journal articles is getting a facelift, which will provide more standardized information to readers and improve readability through design tweaks. The biggest addition to informational content is the inclusion of Crossref/Crossmark data on all articles.

Crossref is a digital object identifier, or DOI, registration agency that interlinks millions of items from a variety of content types, including journals, books, conference proceedings and data sets. For years, the Society has been assigning DOIs to our journal articles and including the DOI links of citations in the bibliography, ensuring a simple reciprocity that links articles between sources.

Beginning in 2021, APS articles will include the Crossmark feature. Working with Crossref, Crossmark provides a wealth of information on an article at the click of a button. By clicking on the Crossmark button, readers will be directed to a link that includes a full history of the article, including any corrections, retractions or updates.

Aside from these information-tracking additions to the pdfs of articles, there are various format changes to help with interpreting and digesting article data. Chief among these changes are layout updates that modernize the article appearance, visual tweaks to tables to help with readability, and the movement of data availability and ethical statements to enhance transparency and compliance with rigor. The reference citation format is also being streamlined to prepare for future technological features, such as enhanced proof processing. 🍷

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@physiology.org.





OVERHAULING EDUCATION

The pandemic magnified the growing challenges in higher education—and the need for change.

BY GLENN COOK

Statements you have probably heard about higher education: The cost is too high. The rules are too rigid. Students, if they graduate, finish with astronomical debt and without the skills they need for today’s global workforce.

All of those statements were made before COVID-19 and the global reckoning over issues of racial justice and systemic racism. What does that mean for the future of higher education? And how will it affect PhD and postgraduate programs?

“PhD programs that continue to pump out graduates ready for traditional faculty jobs do so at their peril—and that of their students,” says David Soo, PhD, chief of staff for JFF (Jobs for the Future). “If there is to be a fundamental shift in education and training, the nature and shape of the roles of educators will drastically change.” JFF is a national nonprofit that drives change in the American workforce and education systems to achieve economic advancement for all.



“Educators of the future should consider how they might shift more routinely from the sage on the stage to curator of vast troves of educational content.”

—David Soo, PhD

Understanding what those changes will look like, and how long they will take to implement, is very much up for debate. The pandemic has accelerated the shift to online classes and distance learning, but moving to a true multi-channel form of course delivery will be required, say those who support changing the current system. Higher education also needs to take a hard look at the changing demographics of students, many of whom are leaving school or taking longer to graduate in

part due to the skyrocketing cost of college.

“Our current higher education system was designed for a very different world and a very different student population,” says Shawn Hulsizer, vice president of advancement and impact for the Council for Adult and Experiential Learning (CAEL). “It was designed with the idea that a college student enrolls early in life, right after high school, and studies full time until completing a degree and then going on to 40 or more

years in the working world. That’s not the reality of today’s student.”

FINDING FLEXIBILITY IN HIGHER EDUCATION

One word used frequently when discussing an overhaul of higher education is “flexible.” Case in point: While three-fourths of PhD and postdoctorate recipients are age 26 to 35, according to the most recent data from the National Center for Science and Engineering Statistics, Hulsizer notes that nearly 40% of undergraduates today are over the age of 25. That’s a chief reason she says higher education should move into a “more learner-centric operational

model” that meets students “where they are in their life and career.”

“We should build this new system with the assumption that workers will be cycling back and forth between learning and work,” Hulsizer says.

Ernest Ezeugo, policy analyst with the State Higher Education Executive Officers Association, says the current credit hour system and lack of diverse and flexible transfer pathways contribute to a “completion epidemic” that higher education must address.

“The credit hour system as designed is rigid and problematic, especially for returning and adult students with considerable professional experience that doesn’t always translate to faster completion,” Ezeugo says. “And credits that students have already earned and paid for often get lost in the transfer process because of accreditation, small differences in learning objectives and course requirements, and other disconnects between institutions.”

Hulsizer points to new CAEL research that shows adult students “are significantly more likely” to finish college or a postsecondary credential when they can earn credit for job, military or other life experiences.

“Another great way forward is to rethink the degrees and other credentials being offered and how they could be more closely aligned with skills and credentials that employers are looking for,” she says. “This doesn’t mean scrapping the bachelor’s degree, but rather making sure that all graduates are building competencies that will help them succeed in the labor market, both in the short term and the long term.”

Like Hulsizer, Soo says students need “a foundational experience” in which they learn “key skills, context and the habit of learning.” That would be complemented by layers of additional learning throughout an individual’s life.

“If we are overhauling the system, we need to think about the purposes of education—skills, ability to learn, networks, maturation, socialization, etc.—and then think about the optimal ways to deliver them,” Soo says. “Sure, a four-year degree is a great way for some individuals to get these things, but it’s not—and never has been—the only way to get there. We must develop a new system with flexible pathways that lead to successful learning, careers and lives.”

PROVIDING THE EDUCATION STUDENTS NEED

For PhD candidates, universities can change by doing a better job of promoting all types of different careers instead of solely focusing on research, says Patricia Halpin, PhD, an associate professor at the University of New Hampshire at Manchester and chair of the APS Teaching of Physiology Section.

“Too often, they are only trained for one track, to be a bench researcher at an R1 institution, and are unaware there are a diversity of career opportunities,” Halpin says. (Read about business careers in physiology in “Entrepreneurial Endeavors,” in the November 2019 issue of *The Physiologist Magazine* at <http://bit.ly/EntrepreneurialEndeavorsTPM>.)

Halpin says universities also should look to provide more diversity in undergraduate degrees because it will lead students to seek master’s and PhDs in those fields. She notes that undergraduate physiology programs are growing with the goal of filling that pipeline. (Read “The Undergraduate Physiology Boom,” in the May 2020 issue of *The Physiologist Magazine* at <http://bit.ly/UndergradPhysiologyBoom>.)

“Doctoral students and postdoctoral fellows should be pleased with this growth as it provides them with

research assistance as well as mentoring experience,” Halpin says. “By providing an opportunity to mentor an undergraduate or MS student, they gain assistance in their own research and develop their mentoring skills. These skills are important for their own professional development for when they are independent researchers with their own labs or in other professional positions.”

Soo says universities also need to be more flexible and allow faculty members to “design innovative approaches and models for the next century of learning.”

“Educators of the future should consider how they might shift more routinely from the sage on the stage to curator of vast troves of educational content,” he says. “The ability to select and deliver learning experiences that meet the needs and are relevant to individual students is a possibility, especially with [artificial intelligence] and personalized learning paths, and educators should ensure they are steering that ship.”

That creativity is necessary because universities have come under increased scrutiny due to soaring tuition costs. According to *U.S. News & World Report*, in-state tuition prices among public universities have jumped 72% since 2008. A 2020 Sallie May survey, “How America Pays for College,” says financial considerations have become almost as important as current academic offerings when deciding where to go to school.

Cost is especially critical to Ezeugo, who says that robust state-federal partnerships are needed to drive down the overall cost of college. He believes financial aid should be connected to public assistance programs “to make sure that students trying to navigate higher education while facing food, housing and other resource insecurities could get their needs met.”

“If we settle on thinking that the changes we’re seeing now [during the pandemic] are the silver lining of a bad situation versus a necessary adaptation we must scrutinize and critique, the only disruption we will be responsible for is that to the livelihood of millions of students from backgrounds that are already marginalized in higher education,” Ezeugo says.

THE CAMPUS OF THE FUTURE

What will college campuses look like post-pandemic? Some undoubtedly will stay the same, but much like consumption of music, television and film is now driven by the niche and not the masses, higher education institutions will be forced to evolve toward serving a variety of audiences in different ways.

“Campuses can look radically different in the future,” Soo says. “But if learning is to happen anywhere and everywhere throughout an individual’s life, the need for a traditional campus will vary by student and by the phase of their life.”

As an example, Soo points to students in the advanced manufacturing sector. In some cases, they will learn about physics, programming and interpersonal communication through projects at the job site or via online modules and group discussions with peers who are stationed across the world.

“That same learner, additionally, might have the opportunity to take a ‘sabbatical’ from work and go to a ‘campus’ to learn,” Soo says. “But that campus may resemble more an Apple Store, where they are meeting with different groups of other learners and using augmented and virtual reality devices and other tools they would not have at home.”

Halpin believes the current infrastructure will be maintained because some students still want the

“It is imperative that, in order to remove this economic and geographic divide and provide equal access to higher education for all Americans, a new inclusive infrastructure for all students is established and maintained.”

—Patricia Halpin, PhD

residential college experience, but she says the traditional college curriculum also will be expanded with more remote and online courses. When this occurs, she says colleges “have an obligation to the remote students to ensure access to the same level of student learning resources and services,” such as tutoring, writing centers, libraries and academic advisement.

“Both robust Wi-Fi and technology are required for students to access off-campus courses, yet they are not always available in low-income, minority and rural communities,” Halpin says. “It is imperative that in order to remove this economic and geographic divide and provide equal access to higher education for all Americans a new inclusive infrastructure for all students is established and maintained.”

Ezeugo says campuses must “become places where students’ needs are met and they are comfortable enough to learn.” One way to do so, he says, is to use in-person facilities to “mitigate the strain of intractable problems that complicate equity in higher education today, like food and resource insecurity, racism, mental health and more.”

The key to reopening, Ezeugo says, is context, especially in the wake of ongoing unrest over social and racial

injustice. He says the decision by some colleges and universities to open in person last fall was “troubling” given the disproportionate impact the pandemic has had on racial and ethnic minorities. Historically Black colleges and universities, as well as other institutions that serve large numbers of underrepresented students, opted for online classes “presumably because they realized the risks outweighed the reward.”

“It will be critical for colleges to consider what their decisions communicate through other lenses,” he says. “Colleges were committing or recommitting to fighting racial injustice on their campuses following a tumultuous summer for Black Americans while making decisions that were, quite frankly, putting their Black students at risk.”

“To be sure, it’s a tough time to be a college leader doing the political calculus around these decisions,” Ezeugo says. “But I do think that colleges that take risks in the near term to protect their students will be remembered favorably.”

THE BOLD NEW WAYS HIGHER EDUCATION CAN ADAPT

If anything, the pandemic has highlighted both the promise and

the inequities of distance learning in education. The shift from face-to-face instruction to online learning was difficult for students who lacked broadband access, a laptop or tablet, or a quiet place to do their work.

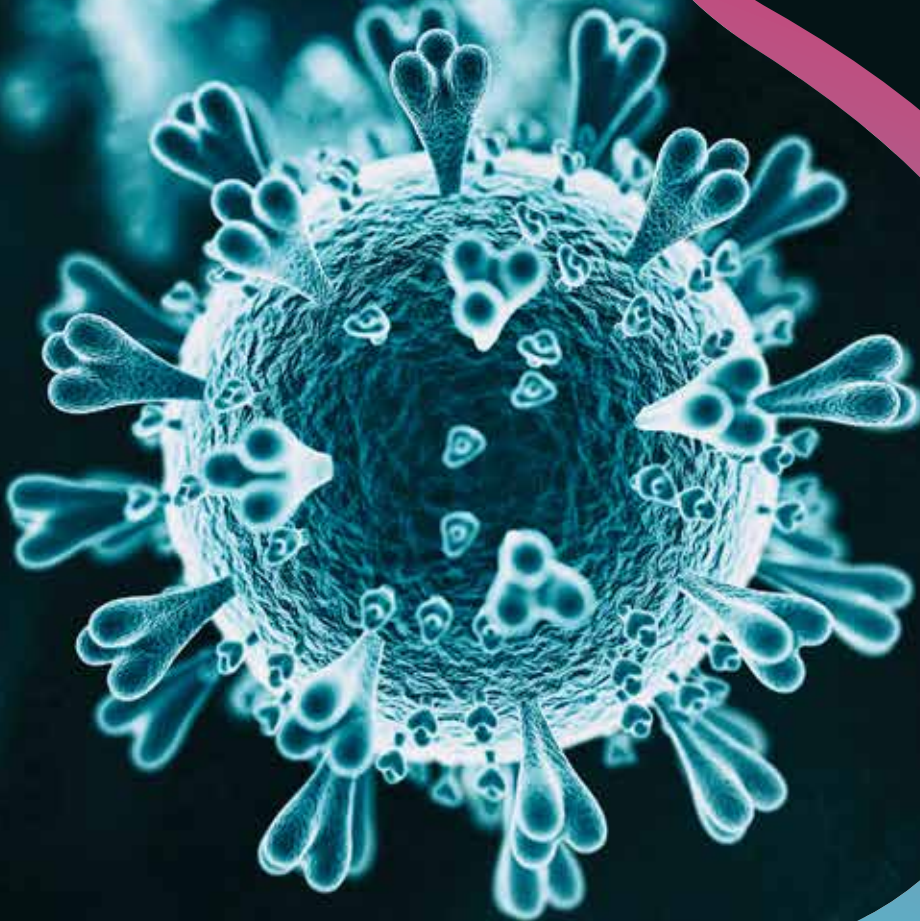
“Technology can only help us solve as much as we are willing and capable of seeing,” Ezeugo says. “If you pay close attention, you can see who is being left behind, a ‘lost generation’ of learners on the have-not end of the digital divide who have been left in the lurch by a sudden and unplanned move to digital instruction.”

If access issues can be addressed, Soo believes technology allows universities to “fundamentally rethink teaching and learning over the next generation, though not in the sense of simply learning from robots or downloading information into our brains.”

“Technology allows educators to assess the best and highest leverage ways to impact a student’s education—and to find other people or tools to deliver other components,” he says. “Technology deployed smartly can free up more educator time for interpersonal engagement and mentorship—and spark creativity and inspiration.”

Soo believes colleges and universities have the capacity to develop “bold new ways” to provide education to students at all levels.

“Colleges and universities must question everything and be prepared to augment, if not replace, their degree programs with much more flexible, nimble, dynamic and equitable educational offerings that meet the needs of our rapidly changing economy,” he says. “They have to do it in a way that is educationally rigorous and provides the context necessary for success in career and life. Colleges should figure out some alternatives before other organizations fill the void and cater to the enormous and growing market for learning throughout life.”



COVID-19 Resources

APS has collected journal articles, resources, news articles and other information to keep you informed and help you work smarter and more efficiently from home. Check out our compilation of government agency resources, advice on how to stay healthy and ways to get involved around your community.

Find out how your fellow physiologists are faring through the pandemic. See the results of the COVID-19 survey at [physiology.org/covid19survey](https://www.physiology.org/covid19survey).

[physiology.org/covid-19](https://www.physiology.org/covid-19)

Take a De



ep Breath

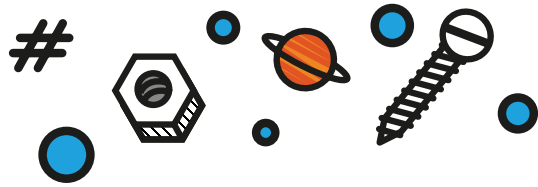
Stress can throw your body into overdrive.
Your breath can help slow things down.

BY LAUREN ARCURI

It's no surprise that most of us experienced increased stress in 2020. In the initial stages of the pandemic, many of us went through acute stressors: changes in work, school and caregiving responsibilities and disruption to our daily routines as we sheltered at home. Then, a steady stream of COVID-19 updates and worries, protests against systemic racism and police violence, and ongoing political unrest contributed to a state of more chronic stress.

With so many of us suffering from acute and chronic stress in the past year, what is happening in and to our bodies? *The Physiologist Magazine* asked several researchers to explain what triggers stress in our bodies, what problems it causes and how we might all calm ourselves down during these challenging times.

Gary Sieck, PhD, FAPS, researches inflammation in the lung and the impact that has on the resilience of the cell. Sieck is professor at the Mayo Clinic in Rochester, Minnesota, and editor-in-chief of the APS journal *Physiology*.



When a virus like SARS-CoV-2 invades the lungs, the immune response includes production of chemicals called cytokines, some of which promote inflammation. This is a natural, resilient response to an invader, but if the response is exaggerated, what results is the phenomenon known as a “cytokine storm,” which can be harmful.

Sieck’s team is looking at the response of airway cells to a specific cytokine called tumor necrosis factor alpha, or TNF α . TNF α triggers the production of reactive oxygen species, which occur naturally in the body and also assist in the repair process—but in excess they can cause further injury. “So, you can see a cascade of problems. If you have a diminished stress response, your cell might continue to be injured and not be able to restore itself—its resilience has decreased,” Sieck says.

If the reactive oxygen species cause damage to proteins within the cells, either by causing the unfolding of proteins or damaging their structure directly, another homeostatic response

kicks in within the endoplasmic reticulum (ER), known as the ER stress response. “It’s been known for a number of years, but we’re very interested in how it might feedback just like a thermostat, how it might trigger a response,” Sieck says. The damaged proteins need to be refolded correctly, a process that happens when chaperone proteins rush to the scene. If the proteins are too damaged to repair, the cell marks them to be carried away, broken down and recycled—a process called autophagy.

Reactive oxygen species are produced in the mitochondria, so Sieck and his colleagues have turned their attention to these energy powerhouses of the cell. “If we reduce mitochondrial activity, we can reduce the amount of reactive oxygen species they produce,” Sieck explains. “We’re very interested in mitochondria as a signal of stress within the body.”

Mitochondria can be the source of stress, but they also respond to the stress. For example, if you put your body under stress by doing physical exercise, the damage to the muscle

fibers will trigger the cells to make more mitochondria so that you have more energy to power your muscles.

In looking at acute versus chronic stress, Sieck says it is important to remember the role of resilience. “Getting a cold virus is an acute stress,” he says. “I have an immune response, I get over it and recover. That’s resilience. But if I don’t quite recover, and it persists at a low level, or if it’s layered on top of another issue like aging, then I can have longer-term stress.”

Chronic stress causes the level of circulating cytokines to increase. Sieck hypothesizes that chronically elevated cytokines may diminish our ability to respond fully to an acute stressor—our resilience may be decreased. Circulating cytokine levels increase with age as well. “This may explain why older people are more susceptible to coronavirus infection—not necessarily to becoming infected, but how they fare with it,” he says.

CHRONIC STRESS AND THE SYMPATHETIC NERVOUS SYSTEM

Jeanie Park, MD, a nephrologist and clinical specialist in hypertension, studies the physiology of post-traumatic stress disorder (PTSD), a chronic condition that develops after an individual experiences or witnesses a very traumatic event. People with PTSD often experience nightmares, flashbacks and other symptoms related to the trauma that cause disruption and disability in their lives. Park is an associate professor of medicine and physiology at the Emory University School of Medicine in Atlanta and staff physician at Atlanta VA Healthcare System.

Part of our normal physiological reaction to stress is an increase in the activation of the sympathetic nervous system, our so-called “fight-or-flight” response. This activation includes increased blood pressure, increased

Tips for Combating Stress during the Pandemic

Gary Sieck, PhD, FAPS: “One thing I’ve done and continue to do is exercise more. I think getting out and exercising helps relieve the psychological stress that’s going on. And I have my watch that tells me four times a day to take deep breaths. It takes one minute to take about 10 deep breaths—that’s not an extraordinary amount of time. That seems to help. It’s a form of meditation.”

Jeanie Park, MD: “I exercise regularly and practice mindful breathing techniques to combat stress.”

Jack Feldman, PhD: “I exercise daily—a mix of serious cardiovascular challenge (HIIT, Peloton) where I get my heart rate up to 85 to 90% of max for at least 20 minutes, resistance training, and on some lower level days, walking or doing yoga. I take at least one rest day per week. I try to meditate several times a week. I also try to eat foods that give me joy; have one glass of wine, beer or a cocktail several times a week; and get enough sleep. I talk to or see my grandsons (ages 1, 2, 3, 4) as often as I can. I try not to worry about things I cannot control.”

“I think we need to do epidemiologic studies to see what is happening at a population level to people who are living through this pandemic. Also, those that are not coping as well, or have more stress during this time—what are their clinical outcomes going to be? What is their physiology? Are we seeing heightened sympathetic activation, inflammation or decreased parasympathetic activation?”

—Jeanie Park, MD

heart rate and other physiological changes. But what happens with PTSD or a chronic stress situation, Park says, is that the individual is in a long-term state of fight-or-flight. Their sympathetic nervous system is chronically overactivated. “We believe that can cause deleterious effects to your body over time,” she says. “In particular, we believe that it contributes to increased risk of developing hypertension, cardiovascular disease and metabolic disease long-term.”

While the epidemiologic connection between PTSD and developing these diseases is known, what is not yet understood is the mechanisms that connect the two. Park’s lab uses a method called microneurography to measure sympathetic activation. This method involves placing electrodes into the peroneal nerve, which is below the knee on the outside of the fibula, to measure sympathetic impulses in real time in humans.

When Park used microneurography to study patients with PTSD, she found something a little surprising at first. The patients didn’t show higher baseline sympathetic nerve activity. But what their systems did show is higher sympathetic reactivity

when under mental stress, whether that stress was related to their PTSD symptoms or not.

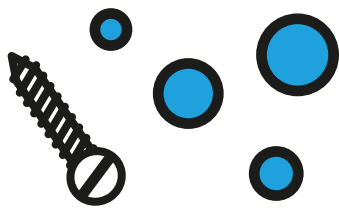
“So, what we think is that if you have these repeated episodes of mental stress, and repeated episodes of heightened blood pressure and sympathetic responses, over time that could lead to an increased risk of hypertension and cardiovascular disease,” she says. This is the beginning of unraveling the mechanisms that link chronic stress to developing cardiovascular disease.

Why should exposure to a stressor not related to their PTSD symptoms still cause an overreactivity of the sympathetic nervous system? Park and her colleagues discovered that patients with PTSD have an impairment in their baroreceptor activity. Normally, when your blood pressure rises, the baroreflex acts to dampen sympathetic activity. “But in people with PTSD, that mechanism is impaired, so the baroreflex that should be bringing down sympathetic activity is not working,” she says. “We’re not sure why, but we think that inflammation may have something to do with it because we also found that these patients have higher inflammation. And the more severe

your PTSD symptoms are, the more inflammation you have.”

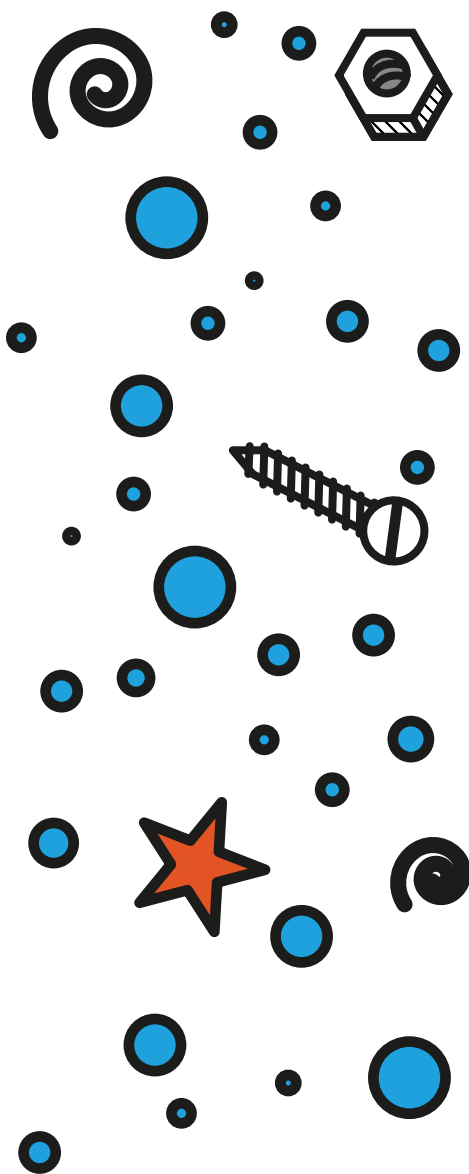
Park is still trying to figure out the mechanisms that connect inflammation and PTSD, but her work has already yielded some hints. “It’s unclear what happens first—if you have higher sympathetic nerve activity, there is greater release of norepinephrine, which has a pro-inflammatory effect. So, if you have higher sympathetic tone, that can increase inflammation. But inflammation itself can increase sympathetic activity directly through central effects, but also by impairing the baroreceptor nerve endings that detect changes in blood pressure and modulate sympathetic activity,” she explains. “Our hypothesis is that this increase in inflammation could be impairing the baroreceptors that then prevents a dampening of sympathetic activity during stress.”

While Park’s research focuses on people with PTSD, she says there is also evidence that chronic stress is associated with an increased risk of hypertension, cardiovascular disease and likely abnormalities of the sympathetic nervous system regulation. “I think we need to do epidemiologic studies to see what is happening at a



Slow breathing can be done anywhere and is noninvasive. “That’s the wonderful thing about it. There are no side effects. It’s cheap. And everyone has had the experience of taking a single deep breath—you take one, and you feel it; it’s relaxing. Imagine doing that for 30 minutes and on a regular basis.”

—Jack Feldman, PhD



population level to people who are living through this pandemic,” she says. “Also, those that are not coping as well, or have more stress during this time—what are their clinical outcomes going to be? What is their physiology? Are we seeing heightened sympathetic activation, inflammation or decreased parasympathetic activation?”

SLOW BREATHING AND STRESS

Understanding the effect of chronic stress on our physiology is important so that we can find out ways to help mitigate those negative effects. One approach being studied by researchers is breathing manipulation. Conscious control and manipulation of the breath is part of many different existing therapies and centuries-old healing practices, such as the yogic breathing practice called pranayama, as well as mindfulness meditation and cognitive behavioral therapy, which are currently used to treat PTSD.

Park and her colleagues have been studying something called device-guided slow breathing to see if and how it may help improve autonomic nervous system function in patients with PTSD. The biofeedback device Park employs measures the user’s breathing rate and guides them to breathe more slowly.

When breathing slowly, several things happen in the body. When you slow your breathing rate, you increase your tidal volume—or the amount of air you take into your lungs—so that your body maintains the same amount of air exchange. When you do that, the pulmonary baroreceptors are activated, and that leads to decreased sympathetic activity.

Park says another mechanism that may be at play is that controlling your breathing increases your interoception, or the awareness of your breathing. “If you can increase the awareness of your breathing, that also seems to have the effect of decreasing your sympathetic activity.”

Researchers saw a rapid reduction in both blood pressure and sympathetic activity in patients who practiced device-guided slow breathing. Park conducted a clinical trial comparing the intervention to a sham device without guided breathing, measuring sympathetic activity over eight weeks. “What we found was there was no difference in resting sympathetic activity between the groups,” she says. “But there was amelioration in the exaggerated sympathetic response to mental stress.”

Park and colleagues are also studying mindfulness-based stress

reduction, which has been shown to reduce blood pressure in healthy individuals and in other patient populations, such as those with hypertension. They found that the practice of mindfulness itself leads to a natural reduction in breathing rate, even if participants are not instructed to specifically slow their breathing. Their study showed a reduction in sympathetic activity during mindfulness compared to sham intervention in patients with chronic kidney disease. But when patients were simply instructed to breathe at 12 breaths per minute without the mindfulness component that increases interoception or awareness of breathing it did not have any beneficial effect on nervous system activity. “What that suggests is that increased interoception of breathing was necessary to reduce sympathetic activity in that mindfulness study,” Park says. “But if you slow down to five breaths per minute, that is enough to reduce overactivity even without the mindfulness component. So, I think an intervention, which we haven’t tested yet, that combines slow breathing to subphysiologic rates of five breaths per minute, with a mindful component to increase interoception of breathing, may have a more beneficial effect.”

SLOW BREATHING AND THE BRAIN

Other researchers are also studying breathing and how it relates to physiological and emotional stress via the brain. Our breathing happens in a rhythmic way, without our conscious control most of the time. This breathing rhythm is a type of wave or oscillation. In the brain, there are a whole range of other oscillations—gamma waves, delta waves, theta waves and so on—that help the brain synchronize activity.

“Over the past decade or so, it’s become apparent that rhythms

at the frequency of breathing are present throughout the brain,” says Jack Feldman, PhD, distinguished professor in neurobiology at the University of California, Los Angeles. “And these rhythms are not about breathing for oxygen and carbon dioxide regulation; they are found in regions involved in emotional function and cognitive function. These rhythms seem to be playing a role in this kind of signal processing.”

However, breathing is a slower rhythm than most brain rhythms, which occur anywhere from a few per second to approximately 100 per second, while breathing in humans happens about once every five seconds.

A region in the brainstem of mammals, discovered by Feldman and colleagues in 1991 and dubbed the pre-Bötzinger Complex, contains neurons that fire rhythmically, driving each breath. These neurons are basically our breathing pacemaker. But unlike the cardiac pacemaker, the pre-Bötzinger Complex can produce a variety of patterns, such as a yawn, a gasp or a sigh.

Feldman and co-authors conducted an experiment in which they eliminated a subgroup of the pre-Bötzinger Complex neurons in mice. They discovered that while the primary breathing patterns of mice were unchanged, they behaved in a much calmer way. Upon further investigation, they discovered these neurons project to another area of the brain, the locus coeruleus, implicated in arousal, attention and panic. Thus, they have found a direct link between our breathing control center and higher-order brain functions, including our response to stress.

While there is much more to be learned about the mechanism by which slow breathing positively affects the brain, Feldman’s hypothesis is that by disrupting the

one set of oscillations in the brain we can control—our breathing—we’re affecting the signal processing in the brain in areas that are important in emotion and cognition.

Feldman explains that a complex state such as depression can be thought of as a kind of “locked-in” circuit in the brain, a loop that fires repeatedly, forming something akin to a rut worn into the ground from walking in the same circle over and over. As it deepens, eventually it becomes nearly impossible to break out of the rut. But “heroic” measures (such as electroconvulsive shock therapy and deep brain stimulation) that disrupt all the activity in the brain transiently, including the locked-in loop, can “reset” the connections, making them weaker and allowing new connections to form. “Disrupting these circuits is a little bit like filling in the rut,” Feldman says. “And if you fill it in bit by bit, eventually it gets to the point where it’s at surface level and it’s not an issue anymore.”

It seems that deep, slow breathing—the specific kind doesn’t matter so much, Feldman says—helps disrupt these circuits and get the brain out of well-worn but maladaptive ruts. But compared to deep brain stimulation, slow breathing can be done anywhere and is noninvasive. “That’s the wonderful thing about it. There are no side effects. It’s cheap. And everyone has had the experience of taking a single deep breath—you take one, and you feel it; it’s relaxing. Imagine doing that for 30 minutes and on a regular basis.”

While exactly why and how it helps so much is still a matter of speculation, deep, slow breathing seems to be a powerful way we can mitigate the effects of the chronic stress that many of us are living through right now and increase our resilience. 🌀



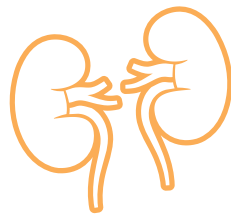
BEING Black IN SCIENCE

In August 2020, a group of Black physiologists teamed up to organize a community dedicated to promoting Black scientists in physiology-related fields. Using the Twitter handle @BlackInPhysio and the hashtags #BlackinPhysiology and #BlackPhysiologistsMatter, these scientists facilitated a conversation and started a movement around diversity and inclusion and being Black in physiology-related fields.

During their newly launched Black in Physiology Week, held October 12–16, they organized a series of online events that showcased and highlighted Black physiologists. Notably, the week included a panel discussion focused on providing real strategies to increase recruitment, retention and promotion of Black physiologists and other scientists. The following is an excerpt of that discussion, which has been condensed and edited for clarity.

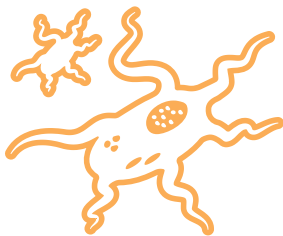
You can watch the full discussion at <https://bit.ly/BiPWeekPanel>. To learn more about Black in Physiology, visit www.BlackinPhysiology.com and look for Black in Physiology on Twitter, Facebook, Instagram and LinkedIn.

Black physiologists share what it's like to navigate a majority white academic culture.



“Not having anyone help you and champion you and mention your name to get you that seat at that table ... there are systemic roadblocks that are meant to create exclusivity across all populations.”

—Karla Haak, PhD



Clintoria Williams, PhD: “According to surveys conducted by the Association of Chairs of Departments of Physiology, the percentage of Black faculty averages 1% for the past 20 years. What do you see as an underlying reason why the number of Black faculty in academia does not reflect U.S. population? What can we do to fix this problem?”

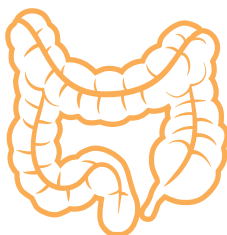
Mildred A. Pointer, PhD: “I believe it has to do with the fact that the scientific community in general does not recognize the value that African Americans can bring to the scientific community. ... Then what gets felt by African Americans is that we are not welcomed. ... If that is the feeling and impression that one is getting, then the question becomes ‘why do I want to be a part of a community that does not see the value I’m bringing to the table? Let me go somewhere where people do value me.’

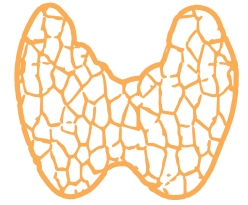
“[A few years ago] I was working with a majority institution, and one of the things that I got from that interaction is [the idea] that African Americans—because we are intuitive learners—have an inferior way of learning and that what [institutions want] is logical thinking because that’s what science is. We see that we are intuitive learners

and that is not of value. ... The scientific community doesn’t see any value that we’re bringing to the table. They see us as less than, so they don’t welcome us.”

Karla Haak, PhD: “The hurdles that come with navigating in an academic faculty position are numerous. Those hurdles exist for everyone irrespective of color ... from the initial opportunity and access, to seeing what life would be like as an academic faculty member, to navigating all of the other things that need to be on one’s CV in order to be competitive for those tenure-track faculty positions. Because there’s only 1% of all those faculty that are persons of color to begin with, having someone that’s going to help you at every single phase doesn’t exist.

“Not having anyone help you and champion you and mention your name to get you that seat at that table ... there are systemic roadblocks that are meant to create exclusivity across all populations. Take that and magnify it significantly across our communities of color because we don’t have anyone to say, ‘Hey, come with me. Let me show you how this is done. Let me help you. Let me bring you into this network.’”





Robert Hoover, MD: “You’ve got institutional racism; there’s no doubt about that. It’s pervasive. It’s throughout systems. It is a weight that’s always there that is going to inhibit African Americans to move forward. ... The other part—and these two things are interrelated—is pipeline. You’ve got to have the people coming up who are interested in science in general, and you got to get there early. ... By the time you get to undergrad, it’s really almost too late because they’ve already decided that science is too hard for them. ... You’ve got to try to get down to that middle school, elementary school, high school level. And you’ve got to try to break down the institutional barriers that are in place once we get to the undergrad level that prevent us from going from that undergrad level to the grad level to the postdoc level to the faculty level. It’s really a multilayer problem, and you’ve got to attack it from all levels if you’re going to be successful.”

Jan Michael Williams, PhD: “One of the major problems with that transition to postdoc and to faculty member is it’s hard if you don’t have the right mentoring team. Minorities really don’t get that support. There are not a lot of [underrepresented minorities or URMs] that sit on these search and recruiting committees that will vouch for a certain person. We don’t even necessarily get into the conversation, and those are some of the things that need to be changed.”

Recruiting Black Students

Dexter Lee, PhD: “It’s a great transition to our second question ... recruiting Black students to physiology and physiology-related disciplines is the key to increasing

Black faculty in academia. In other words, it’s hard to convince someone to be what they can’t see. Representation does matter. How do we recruit Black students when the number of successful Black faculty examples are so few?

Haack: “Frankly, a challenge is encouraging majority scientists that this is important because we [as Black scientists] are already overburdened with this work. We are already sitting on all of those committees doing all the

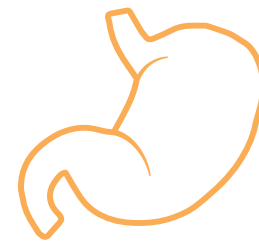
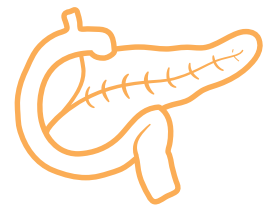


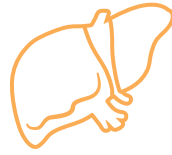
“You have to have a diverse search committee. And these committees need to start actively and aggressively recruiting minority candidates.”

—Jan Michael Williams, PhD

outreach, doing all the [diversity and inclusion] stuff. ... We work really hard, but we are not enough. We need white scientists to say this is important, and we need them, and us, to show the younger generation that it is possible. We can’t be what we can’t see. We know that’s true, but we also need other people to help us because if that burden is solely placed on our shoulders, we know that hinders our success. We have to have everybody working together to bring more younger people into the fold.”

Hoover: “Most of the time these efforts are local efforts that have to spread out and start at the





institution level. You need to, first of all, get the leadership on board. That is critically important because if the leadership is not on board, you're dead in the water. You have no shot of actually establishing any kind of a program that's going to successfully recruit minorities because ... if the chair or the dean or whoever is guiding the effort is not making it clear that this is very important, then the majority scientists are not going to actually participate and are not going to actually take it as something of value. So, the first thing you have to do is convince your leadership."

Recruiting Black Faculty

C. Williams: "A lot of us consider that navigating academia is a game, and most Black faculty and students indicate that they're not taught how to play this game. What innovative strategies would you use to increase the number of Black faculty in physiology and physiology-related departments?"

Hoover: "My experience has been that there are large institutional differences in the way that places approach this. That winds up being the difference between the places

that do wind up being diverse and the places that don't. I come back to being intentional, making a program, establishing diversity as a core belief, getting the senior faculty and the chair on board that diversity is going to be a priority. ... From there, you've got to be honest with the people that you're recruiting as you're starting from a relatively low number. You tell them that this is going to be a new day ... and you make sure that they get to meet with the people of color that are on campus so they can give their perspective. You lay out to them how you're going to be different, how you're going to go from where you are at the low point you're at to this higher, better point of diversity. What I find is that once you get the critical numbers the program tends to take care of itself. It tends to be self-sustaining as those people recruit the next generation."

J. Williams: "You have to have a diverse search committee. And these committees need to start actively and aggressively recruiting minority candidates. Put different things in place—maybe sending teams out and talking with these individuals to seriously be aggressive at recruiting. Call these candidates on a regular basis because, at least for me when

I was applying for different faculty positions, I didn't necessarily think that I was the one that they were choosing. ... One example: I went on a faculty recruitment, and I didn't even get picked up from the airport. It's one of those things. If you say you want a diverse department, then actively recruit. I think you need to be aggressive with that."

Finding Mentors and Sponsors

C. Williams: "Relationships are key. How do you build them and identify the individuals you should develop these relationships with?"

Haack: "We need good mentors, but I also want to stress the importance of having good sponsors. Nothing will get us further in our career than having somebody who brings up your name when you're not in the room. ... They don't have to be your friends. They may not even necessarily be in the same section of science as you are, but somebody that's always going to advocate for you whether or not you're in that room speaks volumes."

Hoover: "Even at this stage of my career, I've got a mentorship committee, essentially a group of

“What’s important to you? What are your key values? Is honesty big for you? Is fair play key for you? Know who you are, and then follow your gut, and that usually will lead you to who you need to form a relationship with.”

—Mildred A. Pointer, PhD

people that, for different things, I can go to for advice: ‘How do I navigate this?’ You have to, over the years, cultivate these relationships. The one thing I tell every minority student ... is don’t be afraid. Most people are going to actually try to help you if you ask for help.

“It’s important to have multiple mentors that can guide you in different ways and give you different sets of advice. ... And if your mentor is not also a sponsor, then he’s not a very good mentor. ... I can’t tell you how many times I’ve been on committees that started looking to fill spots on the committee and no one has mentioned diversity. No one has mentioned candidates of color at all. Invariably, I’m always the person who says, ‘Well, we’ve got to think about diversity here.’ ... People usually say, ‘Oh, yeah, yeah, right, you’re right.’ ... So, make those connections. Don’t be afraid. Approach people. People will help you.”

Pointer: “This is what I’ve learned: Select people who share common values with you. Listen to your gut. Intuition is invaluable. ... Currently, for example, I belong to what I call a breakfast club. We meet every two weeks. One of the people is Jewish. Another person is Brazilian, and I’m African American, but you would think we were related. Why? Because we share common values. ... We got to talking, and we just felt it. You select individuals based on your gut feeling and your common values, so you’ve got to know you. Who are you? What’s important to you? What are your key values? Is honesty big for you? Is fair play key for you? Know who you are, and then follow your gut, and that usually will lead you to who you need to form a relationship with.”

Advising Your Younger Self

Lee: “What one piece of professional advice would you give to your younger self?”

J. Williams: “Negotiate, negotiate and negotiate, and make sure you have everything on paper.”

Pointer: “At all times, I am enough. Accept positions that are beyond your capability. ... Don’t wait to have all of the qualifications for something before you say, ‘Oh, yeah, I can do that.’ Step out and say, ‘I am enough. I can do this, and I will learn what I need to learn.’”

Hoover: “You have to know what the important things are to do. Say yes to the important things, but you’ve got to learn how to say no to those things that are not necessarily important and are not necessarily going to advance you because they will just eat your time up, and your time is really, really valuable. One of the things about being a minority in these areas is they always want you for something because they need a minority on this committee. ... [Ask] ‘are you going to protect my time if I lead the diversity effort, or am I doing it for free?’ ... [Related to networking], I preach this all the time that you’ve got to get out there. You’ve got to go meet people. You’ve got to shake hands. You’ve got to go to that reception. You’ve got to go to that dinner. You’ve got to meet people because this is part of institutional racism, which is that if they don’t know you, you’re not going to get that leg up.” ☎



PANELISTS



Mildred A. Pointer, PhD, chair and professor



Jan Michael Williams, PhD, associate professor



Karla Haack, PhD, lecturer



Robert S. Hoover, MD, associate professor

MODERATORS



Clintoria R. Williams, PhD, assistant professor



Dexter L. Lee, PhD, associate professor

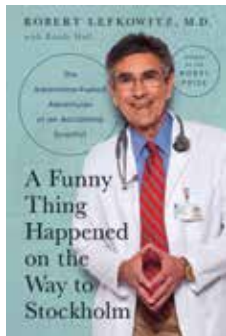
PRODUCER



Keisa Mathis, PhD, assistant professor

Nobel Prize Winner Lefkowitz Publishes Memoir

Nobel laureate and longtime APS member Robert Lefkowitz, MD, has written a memoir, “A Funny Thing Happened on the Way to Stockholm: The Adrenaline-Fueled Adventures of an Accidental Scientist.” The book tells the story of Lefkowitz’s training as a physician at Columbia University College of Physicians and Surgeons and Harvard’s Massachusetts General Hospital, his first foray into research as a “Yellow



Beret” in the U.S. Public Health Service during the Vietnam War, and his scintillating research career at Duke.

The memoir also includes funny anecdotes, such as the tale of how Lefkowitz

was credited on the game show “Jeopardy” with a discovery he didn’t actually make and the story of how he was portrayed on “Late Show with David Letterman” as a drug- and sex-crazed jerk.

Lefkowitz is best known for showing how adrenaline works via stimulation of specific receptors. He was awarded the Nobel Prize in Chemistry in 2012. Learn more about the book—to be published on February 2, 2021—on the Pegasus Books website: <https://bit.ly/RobertLefkowitzMemoir>.

McConnell Promoted to Professor of Pharmacology

Bradley McConnell, PhD, has been promoted to full professor of pharmacology at the University of Houston, College of Pharmacy, Department of Pharmacological and Pharmaceutical Sciences. He has been



on the faculty at the University of Houston since 2008. McConnell’s research focuses on reprogramming progenitor cells to form mature cardiac conduction cells for heart repair. McConnell, an APS member since 2006, is a Fellow of the APS Cardiovascular Section and currently serves on the Translational Physiology Interest Group Programming and the Cardiovascular Section Nominating committees.

Loenneke Receives Distinguished Young Alumni Award

Jeremy Loenneke, PhD, associate professor of physiology and director of the Kevser Ermin Applied Physiology Laboratory at the University of Mississippi in Oxford, is the 2020 recipient of the Southeast Missouri State University (SEMO) Alumni Association’s Distinguished Young Alumni Award. The award honors alumni younger than 37 for

their outstanding service to and support of SEMO. Loenneke earned a bachelor of science degree in health management and an MS in nutrition and exercise science at SEMO before pursuing his doctoral degree at the University of Oklahoma. His work at SEMO helped develop a method of blood flow restriction that is now used worldwide. Loenneke’s research at the University of Mississippi focuses on skeletal muscle adaptations to exercise with and without




the application of blood flow restriction. He has been an APS member since 2014.

Pollock Delivers Lewis K. Dahl Memorial Lecture at American Heart Association Virtual Meeting

Jennifer Pollock, PhD, FAPS, of the University of Alabama at Birmingham (UAB), presented “No news is good news,” the 2020 Lewis K. Dahl Memorial Lecture at the American Heart Association (AHA) Council on Hypertension at the AHA’s virtual annual meeting in September



2020. The Dahl Lecture was established to honor Dahl’s pioneering work on the relationship between salt, the kidney and hypertension. Pollock

is an endowed professor of nephrology in the Department of Medicine, Division of Nephrology, and co-director of the Cardio-renal Physiology and Medicine Section at UAB. She has been an APS member since 1997 and is the Society’s president-elect. 

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

**ASSISTANT PROFESSOR—
HEALTH & EXERCISE
PHYSIOLOGY (TENURE TRACK)
URSINUS COLLEGE**

The Health and Exercise Physiology Department at Ursinus College in Collegeville, Pennsylvania, invites applications for a tenure-track position at the assistant professor level to begin fall 2021. Candidates with expertise in minority health/health disparities are particularly encouraged to apply.

Read more at www.physiology.org/ursinus.

**ASSISTANT PROFESSOR IN
ANIMAL PHYSIOLOGY
CALIFORNIA STATE UNIVERSITY,
FULLERTON**

The Department of Biological Science in the College of Natural Sciences and Mathematics at California State University, Fullerton is seeking to fill a tenure-track assistant/associate professor position for a teacher-scholar with a research program in the area of animal physiology and with a commitment to educational excellence to begin August 2021.

Read more at www.physiology.org/CSUF.

APS DELEGATE

Jonker appointed APS representative to AAALAC International



Sonnet Jonker, PhD, associate professor in cardiovascular medicine at the Oregon Health & Science University School of Medicine in Portland, has been appointed as the APS member organization delegate to AAALAC International, effective January 1, 2021. Jonker is the chair of the APS Animal Care and Experimentation Committee. AAALAC International is a private, nonprofit organization that promotes the humane treatment of animals in science through voluntary accreditation and assessments of research facilities.

APS ELECTIONS

Cast Your Votes for APS Leaders

Elections for the next class of APS leaders—president-elect and three councilors—are open for voting. More information on the candidates, including their bios, listings of APS service and personal statements, can be found on the APS website, www.physiology.org. Check your email for the ballot (sent on January 5, 2021) and **cast your vote by February 2, 2021**.

PRESIDENT-ELECT CANDIDATES



Robert Hester, PhD, FAPS
Billy S. Guyton Distinguished Professor, Professor of Physiology, Data Science and Orthopedic Surgery, University of Mississippi Medical Center



Dee Silverthorn, PhD, FAPS
Distinguished Teaching Professor of Physiology, Dell Medical School, University of Texas at Austin

APS COUNCIL CANDIDATES



Lacy Alexander, PhD
Professor of Kinesiology, Penn State University, University Park, Pennsylvania



Dexter Lee, PhD
Associate Professor of Physiology, Howard University College of Medicine, Washington, DC



Margarita Curras-Collazo, PhD, FAPS
Associate Professor of Neuroscience, University of California, Riverside



Y.S. Prakash, MD, PhD
Professor of Physiology and Biomedical Engineering, Mayo Clinic, Rochester, Minnesota



Jon Harrison, PhD
Professor, School of Life Sciences, Arizona State University, Tempe, Arizona



Paul Welling, MD
Professor of Medicine and Physiology, Johns Hopkins University, Baltimore

DATES & DEADLINES

AWARDS



- Beverly Petterson Bishop Award for Excellence in Neuroscience**
(Deadline: January 7)
- Cardiovascular Section Clinical Science Young Investigator Award**
(Deadline: January 7)
- Cardiovascular Section New Investigator Award** (Deadline: January 7)
- Cardiovascular Section Outstanding Postdoctoral Trainee Award**
(Deadline: January 7)
- Cardiovascular Section Outstanding Graduate Student Trainee Award** (Deadline: January 7)
- Cardiovascular Section Research Recognition Award**
(Deadline: January 7)
- Central Nervous System Section New Investigator Award**
(Deadline: January 7)
- Central Nervous System Section Research Recognition Award**
(Deadline: January 7)
- Central Nervous System Section Van Harreveld Memorial Award**
(Deadline: January 7)
- Comparative & Evolutionary Physiology Section New Investigator Award** (Deadline: January 7)
- Comparative & Evolutionary Physiology Section Research Recognition Award** (Deadline: January 7)
- Data Sciences International Physiological-Omics Trainee Research Award** (Deadline: January 7)
- Endocrinology & Metabolism Section Research Recognition Award**
(Deadline: January 7)
- Environmental & Exercise Physiology Section CANTROL Environmental Systems New Investigator Research Award**
(Deadline: January 7)
- Environmental & Exercise Physiology Section CANTROL Environmental Systems Postdoctoral Research Award**
(Deadline: January 7)
- Environmental & Exercise Physiology Section CANTROL Environmental Systems Predoctoral Research Award**
Deadline: January 7
- Environmental & Exercise Physiology Section Early-career Research Award** (Deadline: January 7)
- Environmental & Exercise Physiology Section Gatorade Sport Science Institute Postdoctoral Research Award**
(Deadline: January 7)
- Environmental & Exercise Physiology Section Gatorade Sport Science Institute Predoctoral Research Award**
(Deadline: January 7)
- Environmental & Exercise Section New Investigator Award**
(Deadline: January 7)
- Environmental & Exercise Section Nike Loren G. Myhre Postdoctoral Research Award** (Deadline: January 7)
- Environmental & Exercise Section Nike Loren G. Myhre Predoctoral Research Award** (Deadline: January 7)
- Environmental & Exercise Section Partnership for Clean Competition Anti-doping Postdoctoral Research Award**
(Deadline: January 7)
- Environmental & Exercise Section Partnership for Clean Competition Anti-doping Predoctoral Research Award** (Deadline: January 7)
- Environmental & Exercise Section Postdoctoral Research Award** (Deadline: January 7)
- Environmental & Exercise Section Predoctoral Research Award**
(Deadline: January 7)
- Environmental & Exercise Section Underrepresented Minority in Physiology Predoctoral Research Award** (Deadline: January 7)
- Environmental & Exercise Physiology Section Women in Physiology Predoctoral Research Award** (Deadline: January 7)
- Environmental & Exercise Physiology Section Underrepresented Minority Postdoctoral Research Award** (Deadline: January 7)
- Environmental & Exercise Physiology Section Women in Physiology Postdoctoral Research Award** (Deadline: January 7)
- Gastrointestinal & Liver Physiology Section New Investigator Award** (Deadline: January 7)
- Gastrointestinal & Liver Physiology Section Trainee Poster Award**
(Deadline: January 7)
- Gastrointestinal & Liver Physiology Section Research Recognition Award** (Deadline: January 7)
- Giles F. Filley Memorial Award for Excellence in Respiratory Physiology and Medicine** (Deadline: January 7)
- Juan Carlos Romero and Water & Electrolyte Homeostasis Section Postdoctoral Research Recognition Award** (Deadline: January 7)
- Neural Control & Autonomic Regulation Section Data Sciences Outstanding Graduate Student Award** (Deadline: January 7)
- Neural Control & Autonomic Regulation Section Experimental Biology Trainee Award** (Deadline: January 7)
- Neural Control & Autonomic Regulation Section Michael J. Brody Young Investigator Award** (Deadline: January 7)
- Neural Control & Autonomic Regulation Section New Investigator Award** (Deadline: January 7)
- Neural Control & Autonomic Regulation Section Research Recognition Awards** (Deadline: January 7)
- Neural Control & Autonomic Regulation Section The NCARnation Trainee Presentation** (Deadline: January 7)
- The Janet and Robert Speth Undergraduate Researcher Award**
(Deadline: January 7)
- The Physiological-Omics Distinguished Lectureship Award**
(Deadline: January 7)
- Physiological-Omics Group ADInstruments New Investigator Award** (Deadline: January 7)
- Renal Section New Investigator Award** (Deadline: January 7)
- Renal Section Postdoctoral Excellence in Research Awards**
(Deadline: January 7)
- Renal Section Predoctoral Excellence in Renal Research Awards**
(Deadline: January 7)
- Renal Section Research Recognition Awards** (Deadline: January 7)
- Respiration Section New Investigator Award** (Deadline: January 7)

Respiration Section Outstanding Trainee Award (Deadline: January 7)

Respiration Section Research Recognition Award
(Deadline: January 7)

Respiration Section Trainee Poster Presentation Awards
(Deadline: January 7)

Respiration Section The Usha Awards sponsored by Dr. Prakash YS
(Deadline: January 7)

Teaching of Physiology Section Research Recognition
(Deadline: January 7)

Teaching of Physiology Section William Galey Professional Skills Training Scholarship Award (Deadline: January 7)

Water & Electrolyte Homeostasis Section New Investigator Award supported by Data Sciences International (Deadline: January 7)

Water & Electrolyte Homeostasis Section Portland Press Predoctoral Research Recognition Award (Deadline: January 7)

ADIstruments Macknight Innovative Educator Award
(Deadline: January 10)

Dean Franklin Young Investigator Award (Deadline: January 14)

Endocrinology & Metabolism Section New Investigator Award
(Deadline: January 14)

Endocrinology & Metabolism Section Virendra B. Mahesh Award of Excellence in Endocrinology (Deadline: January 14)

Graduate Student Ambassador (Deadline: January 14)

Lazaro J. Mandel Young Investigator Award (Deadline: January 14)

Martin Frank Diversity Travel Award (Deadline: January 14)

Shih-Chun Wang Young Investigator Award (Deadline: January 14)

Translational Research Award (Deadline: January 14)

Porter Physiology Development Fellowship (Deadline: January 15)

Dale J. Benos Early Career Professional Service Award
(Deadline: January 24)

Cell & Molecular Physiology Section New Investigator Award
(Deadline: January 31)

Cell & Molecular Physiology Section Postdoctoral Research Recognition Award (Deadline: January 31)

Cell & Molecular Physiology Section Robert Gunn Student Awards
(Deadline: January 31)

Horace W. Davenport Distinguished Lectureship (Deadline: January 31)

August Krogh Distinguished Lectureship of the APS Comparative & Evolutionary Section (Deadline: February 1)

Carl J. Wiggers Award (Deadline: February 5)

Gabor Kaley Memorial Lectureship Award (Deadline: February 5)

Robert M. Berne Distinguished Lectureship of the APS Cardiovascular Section (Deadline: February 5)

Teaching of Physiology Section New Investigator
(Deadline: February 7)

Hugh Davson Distinguished Lectureship of the APS Cell & Molecular Physiology Section (Deadline: February 15)

Joseph Erlanger Distinguished Lectureship of the APS Central Nervous System (Deadline: February 15)

Carl W. Gottschalk Distinguished Lectureship of the APS Renal Section (Deadline: February 28)

Renal Section Young Investigator Award (Deadline: February 28)

Robert W. Berliner Award for Excellence in Renal Physiology
(Deadline: February 28)

Environmental & Exercise Physiology Section Edward F. Adolph Distinguished Lectureship (Deadline: March 1)

Environmental & Exercise Physiology Section Honor Award
(Deadline: March 1)

Environmental & Exercise Physiology Section Impact Award
(Deadline: March 1)

Julius H. Comroe Jr. Distinguished Lectureship of the Respiration Section (Deadline: March 15)

Local Undergraduate Research Awards in Physiology
(Applications accepted on an ongoing, year-round basis)

More details: www.physiology.org/awards

CALLS FOR PAPERS



American Journal of Physiology-Cell Physiology (March 31, 2021)

- Muscle Wasting: Cellular and Molecular Mechanisms

Physiological Genomics (February 28, 2021)

- Extracellular Vesicles: Role in Physiology and Pathophysiology
- Precision Medicine and Complex Disease

More details: www.journals.physiology.org/calls

MEETINGS & EVENTS

CONFERENCES

Experimental Biology

- Virtual meeting dates: April 27–30, 2021
- Abstract submission deadline: January 7

More details: www.physiology.org/EB

WEBINARS

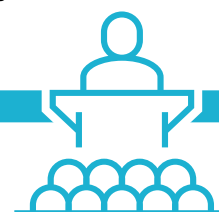
APS/Carolina Biological Supply Webinar

- January 13, 2021
- Remote Products and Instruction for A&P in the Age of COVID-19

Diversity, Equity and Inclusion Webinar Series

- January 21, 2021
- DEI and COVID-19 Clinical Trials

More details: www.physiology.org/webinars



A Time for Optimism

BY JASON R. CARTER, PHD

One of my favorite modern novels is “A Time to Kill” by John Grisham, which was parlayed into a blockbuster movie featuring Samuel L. Jackson, Sandra Bullock and Matthew McConaughey. Both the book and movie are riddled with pain, joy, humor, sadness, anger and all-important twists. By the end of either, you’ve had multiple gut-wrenching emotions and understand the rationale behind Grisham’s title selection.

Speaking of a time of emotions, no one has been immune from the emotional rollercoaster associated with the COVID-19 pandemic. As of mid-December, the U.S. had topped 300,000 deaths, and there had been over 1.6

million deaths globally. In addition to the direct impact of SARS-CoV-2 on individual health, the secondary impacts related to mental health, food insecurity, health and economic disparities, and other social and physical impacts at a population level are being objectively observed. As a member of my leadership team recently put it, “You can feel the cumulative weight of this pandemic on everyone.” When coupled with

what has no doubt been a brutally polarized political season in the U.S., people are simply worn out.

“Acknowledging and embracing imperfections, and consciously replacing negative thoughts with positive thoughts, are cornerstones of a growth mindset. This means replacing judgment with acceptance and hate with compassion.”



As I reflect on “The Last Word,” I’d like to share with my fellows APS members and magazine readers that I am reminded of the power of optimism. I subscribe deeply to the concept of having a growth mindset, where the fundamental concept is that we are not defined by a fixed set of skills, abilities and beliefs, but instead are defined by constantly evolving ideas, beliefs, skills and wisdom. Acknowledging and embracing imperfections, and consciously replacing negative thoughts with positive thoughts, are cornerstones of a growth mindset. This means replacing judgment with acceptance and hate with compassion.

Some of you may be thinking, “Hold on a minute—I’m a scientist, and it is my job to be critical and at times judgmental.” That is true when it comes to the peer review system, but does that need to carry over into every aspect of life? Is it possible we could all stand to benefit from shifting entrenched perspectives and being open to facing challenges differently? In a time where both political spectrums claim “fake news” at one another’s claims, is it possible the truth sometimes lies somewhere in between?

As I write this article, news is breaking that the Pfizer and Moderna vaccine trials for COVID-19 are both reporting roughly 95% efficacy. There are reports of an emergency use authorization for both vaccines, perhaps within weeks, as well as reports of an aggressive distribution plan targeted toward our most vulnerable, high-risk populations. This news is welcomed and much needed given the rising COVID-19 numbers across the U.S. and world.

My friends, no matter where you are in your journey, now is a time for compassion and kindness. Now is a time to heal. Now is a time for optimism. ☺

Jason R. Carter, PhD, is vice president for research, economic development and graduate education at Montana State University in Bozeman and a member of the APS Council.

GRADUATE PHYSIOLOGY & BIOMEDICAL SCIENCE CATALOG



american
physiological
society®



The American Physiological Society (APS) is pleased to announce our new **Graduate Physiology and Biomedical Science Program Catalog**. The catalog is a resource for your students and mentees as they contemplate graduate school and the next step in their education and careers.

This online directory provides undergraduate biology and life science students and early-career physiologists with graduate program profiles that facilitate their search for the ideal institution. We encourage you to share this catalog with your undergraduate and postbaccalaureate students to help grow the next generation of physiologists.

Check out the catalog today at [physiology.org/GraduatePhysiology](https://www.physiology.org/GraduatePhysiology).

Interested in listing your program?

Contact **Jacob White** for more information.

Jacob White
APS Development & Strategic
Partnerships Manager
jwhite@physiology.org
301.634.7991



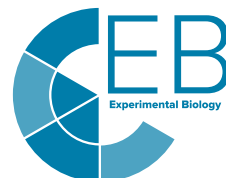
Join us virtually at APS at EB 2021.

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