

# THE **Physiologist** MAGAZINE

MAY 2022

## EDUCATION INNOVATOR

Meet Dee Silverthorn, PhD, FAPS:  
pioneering physiology educator  
and 95th president of APS.

COMMUNITY COLLEGES  
OFFER A STRONG  
FOUNDATION FOR  
PHYSIOLOGY **26**

MEMBER-EDUCATORS  
SHARE THEIR PASSION  
FOR TEACHING  
PHYSIOLOGY **32**



# APPLY FOR SOCIETY AWARDS



The American Physiological Society (APS) provides more than \$1 million in awards and fellowships each year as part of our mission to encourage excellence in physiological research and education. These awards are a vital investment in our researchers and educators of all career levels.

View all available awards and apply for our highlighted awards by the deadlines below at [physiology.org/awards](http://physiology.org/awards).

May  
**14**

## **Julius H. Comroe Jr. Distinguished Lectureship**

*\$1,000 honorarium.* Honors a world-renowned, distinguished investigator who has made outstanding contributions toward a better understanding of respiration physiology.

## **Solomon A. Berson Distinguished Lectureship**

*\$1,000 honorarium.* Honors a distinguished scientist for his/her outstanding contributions to the advancement of endocrinology and metabolism research.

May  
**15**

May  
**31**

## **Teaching Career Enhancement Award**

*\$10,000 award.* Honors an individual looking to enhance their career potential through the development of innovative and potentially widely applicable programs for teaching and learning physiology.

## **John F. Perkins, Jr. Research Career Enhancement Award**

*\$20,000 award.* Honors an individual looking to enhance their career potential through the development research skills or special training.

May  
**31**

# CONTENTS

## FEATURES



20

## Education Innovator

Meet Dee Silverthorn, PhD, FAPS: pioneering physiology educator and 95th president of APS.

BY CHRISTINA HERNANDEZ SHERWOOD

26

## Class Appeal

Community colleges are one of the best open secrets for physiology and other STEM majors.

BY CANDACE Y.A. MONTAGUE

32

## Think Like a Physiologist

The next generation of physiologists, doctors and researchers will come from the classes these passionate educators teach.

BY HEATHER BOERNER

# CONTENTS

## DEPARTMENTS

### THE EDITOR'S DESK

#### 4 Celebrating Education

### EVOLUTION WITH SCOTT STEEN

#### 8 The Center for Physiology Education May Change the Way You Teach

APS Executive Director Scott Steen, CAE, FASAE, invited Terry Sweeney, PhD, FAPS, newly appointed chair of the APS Center for Physiology Education, to discuss the encouraging trends in physiology education today, the foundations of the Center and the offerings he's most looking forward to bringing to the physiology community.

### IN REVIEW

#### 10 APS Annual Meeting at Experimental Biology

After years of virtual meetings, the energy of the nearly 9,000 attendees reuniting in person at Experimental Biology was palpable, both in real life and on Twitter.



44



10



14



18

### LAB NOTES

#### MENTORING Q&A

#### 14 Research Rewards

How to get a clinical perspective of your research.

#### POLICY IQ

16 APS Action Alerts; federal funding in 2023; ILAR initiates revision of its lab animal guide; and Switzerland rejects effort to ban animal and human research.

#### UNDER THE MICROSCOPE

#### 18 Rapid Fire Q&A

Josef Brandauer, PhD, shares a borrowed "MacGyver" moment, a near-miss and some fun facts as an Austrian living in the U.S.

### TRANSPORT

40 Career successes and milestones of APS members.

### NEWS FROM THE FIELD

40 An invitation to the Institute on Teaching & Learning; Kidney Camp returns in June; and save the date for the new American Physiology Summit in 2023.

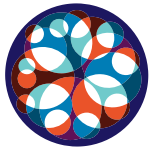
### DATES & DEADLINES

42 Calls for awards and papers and upcoming webinars.

### THE LAST WORD

#### 44 The Making of an Educator

Barbara E. Goodman, PhD, FAPS, shares how she has grown as an educator through student interactions and APS initiatives.



BIOCHEMICAL  
SOCIETY



PORTLAND  
PRESS

# CLINICAL SCIENCE

LINKING BASIC SCIENCE TO DISEASE MECHANISMS



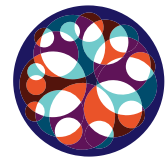
OPEN ACCESS  
PUBLISHING IS AVAILABLE



EXPERT  
PEER REVIEW



TOTAL ARTICLE VIEWS  
IN 2020  
**630K**



INDEPENDENT  
ALL OF OUR PROFITS  
SUPPORT THE  
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INTERNATIONAL  
EDITORIAL BOARD



FREE COLOUR FIGURES  
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OR PAGE CHARGES



IMPACT FACTOR  
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MEDIAN ACCEPTANCE  
TO PUBLICATION  
**13 DAYS**



@PPPublishing #ClinSci

# Celebrating Education

BY STACY BROOKS



**D**ear reader: We're just back from an awesome annual meeting at Experimental Biology (EB) 2022! For all of you who attended, it was great to see you. We so missed seeing our members in person. For those of you unable to make it, take a look at some of the photos on page 10 to see what you missed. We hope to see you at the American Physiology Summit in Long Beach on April 20–23, 2023.

And now that EB is behind us, we turn our attention to the next big thing for the Society: the launch of the Center for Physiology Education later this summer. We are thrilled to bring this new offering to our educators and researchers to help you become the best physiology educators you can be. Stay tuned for much more on this new initiative.

## OUR FEATURES

For our cover profile this month, we introduce you to Dee Silverthorn, PhD, FAPS, the Society's 95th president. An internationally renowned physiology educator, Silverthorn began her presidency at EB.

On page 20, freelance writer Christina Hernandez Sherwood talks with Silverthorn about her unconventional career path and how it all started growing up in New Orleans. Silverthorn eventually found her way to teaching, where she became a leader in education and wrote the bestselling textbook "Human Physiology: An Integrated Approach" in 1997 (now in its eighth edition). We hope you enjoy getting a behind-the-scenes look at her successful career.

We also explore physiology education at community colleges, an important alternative to traditional four-year institutions, which are becoming more expensive and out of reach for more and more students. Community colleges offer a place for "nontraditional students"—those who may be older, working parents, undocumented, first-generation college students or otherwise unable to take a more traditional path to college. In addition, as of 2016, minority students were the largest percentage of first-time students at community colleges. The data show that 19% of students identified as Hispanic, along with 19% Black, 18% American Indian and 15% Asian/Pacific Islander.

In this issue, on page 26, freelance writer Candace Y.A. Montague interviewed several APS members who've also found a home at community colleges, teaching physiology to the next generation of health care workers and scientists. They share their experiences about teaching at community colleges and what they offer students.

Connected to that article, freelance writer Heather Boerner spoke to several APS educators about their passion for teaching. Perhaps they came to teaching in a roundabout way, but these are members who are dedicated and in love with teaching college students. When you read their stories, starting on page 32, you'll feel their excitement and passion jumping off the page.

## We Want to Hear From You

Remember that you, members of the APS community, are the engine that drives *The Physiologist Magazine*. I invite you to email us at [tphysmag@physiology.org](mailto:tphysmag@physiology.org) to share your feedback, suggestions and story ideas. I look forward to hearing from you.

**Stacy Brooks is the editor-in-chief of *The Physiologist Magazine* and APS director of marketing and communications.**

# Institute on Teaching and Learning

June 21–24, 2022  
Madison, Wisconsin

[physiology.org/ITL2022](https://physiology.org/ITL2022)



This biennial conference features best practices in evidence-based teaching and learning and helps faculty and trainees develop publishable educational research initiatives. The conference will include presentations from established educators and researchers who will serve as speakers and workshop facilitators.

Join us as we engage physiologists and STEM educators from diverse institutions, reach underserved students and support collaborations among participants of all levels, including new, mid-career and experienced educators.

# THE Physiologist MAGAZINE

VOL. 65 | MAY 2022

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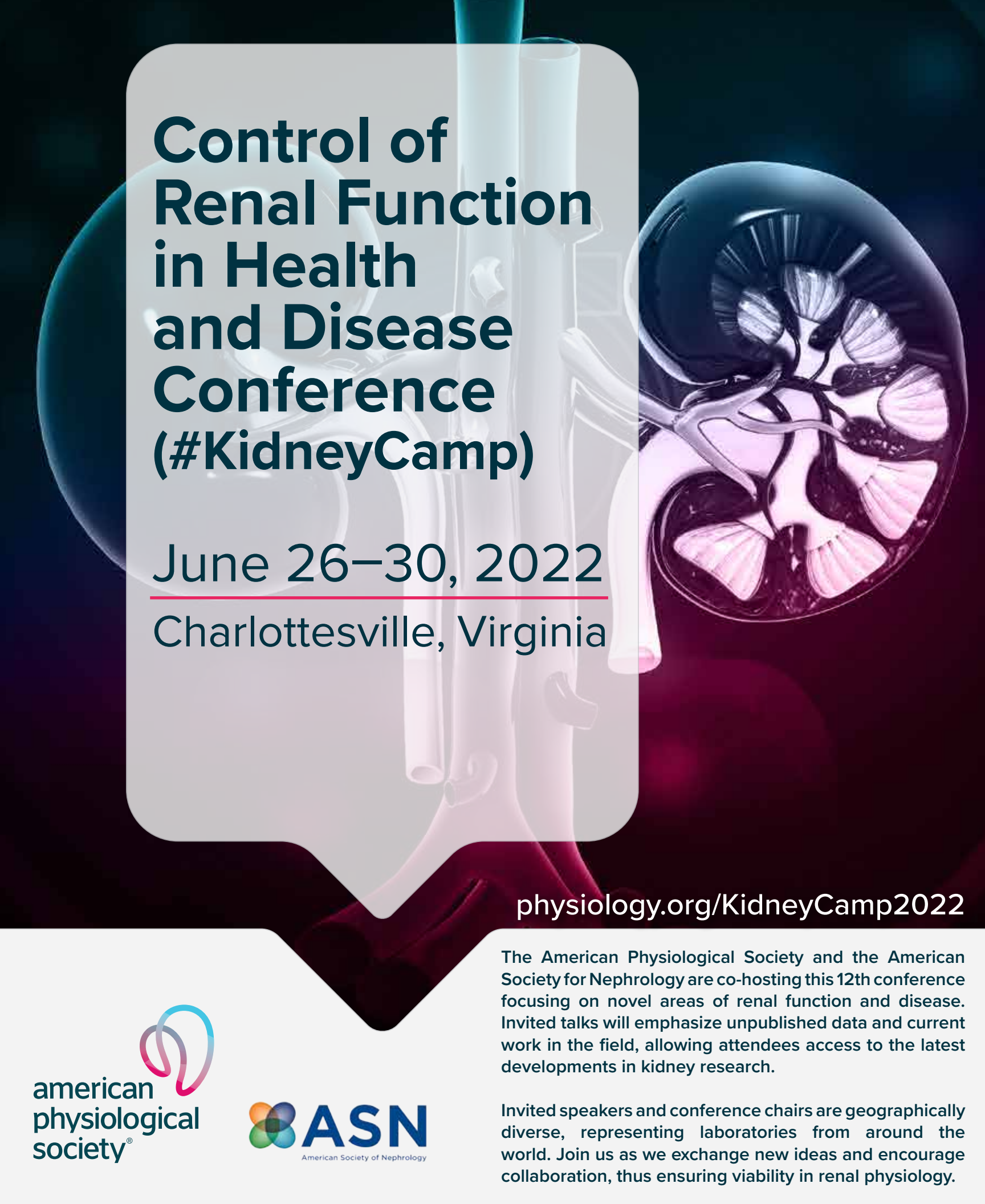
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# Control of Renal Function in Health and Disease Conference (#KidneyCamp)

June 26–30, 2022

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Charlottesville, Virginia

[physiology.org/KidneyCamp2022](https://physiology.org/KidneyCamp2022)

  
american  
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 **ASN**  
American Society of Nephrology

The American Physiological Society and the American Society for Nephrology are co-hosting this 12th conference focusing on novel areas of renal function and disease. Invited talks will emphasize unpublished data and current work in the field, allowing attendees access to the latest developments in kidney research.

Invited speakers and conference chairs are geographically diverse, representing laboratories from around the world. Join us as we exchange new ideas and encourage collaboration, thus ensuring viability in renal physiology.

# The Center for Physiology Education May Change the Way You Teach



APS Executive Director Scott Steen, CAE, FASAE, invited Terry Sweeney, PhD, FAPS, newly appointed chair of the APS Center for Physiology Education (CPE), to discuss the encouraging trends in physiology education today, the foundations of the Center and the offerings he's most looking forward to bringing to the physiology community. Here's an excerpt of their conversation:



**Steen:** How would you characterize the state of physiology education right now in America? And what do you think the biggest challenges we're facing are?

**Sweeney:** For some years, physiology education in America has really been undergoing a considerable amount of change at all the different levels of education. I learned a lot about this in the past year, as we developed the APS Center for Physiology Education, working with the task force and their goals, as well as with focus groups vetting those goals. What I learned through that was at the medical school-level, classic courses in medical physiology have been merging with clinical and problem-based learning approaches.

In the process, the identity of physiology at that level has started to become somewhat obscure. Also, at the graduate level for doctoral master's programs, the focus has been on these amazing discoveries at the cellular and molecular level and utilizing all those amazing techniques that have come about. But a lot of members have expressed concern about the depth of training in integrative physiology, even at the graduate level. In fact, I was talking to a colleague who said that some of the graduate students who come into their physiology graduate program have never even

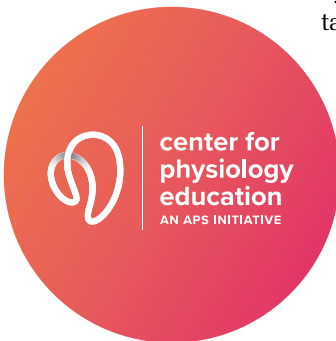
had a physiology course, like an introduction to physiology or a general physiology course.

On the other hand, physiology programs, which were almost completely the domain of graduate education, are now experiencing a huge growth at the undergraduate level, and that, ironically, is helping to reclaim the domain of physiology. Hopefully, that is preparing our next generation of physiologists, not only in the biomedical realm, but in graduate school, in medical education and so forth.

**Steen:** When I was interviewed for my job as APS executive director one of the biggest concerns expressed by the search committee was this idea of the identity of the discipline, that perception of the discipline had shifted. Even though our members were working on all sorts of cutting-edge things, that the public perception of physiology had changed, largely driven by what was happening in medical schools and in other institutions of learning. So, do you think now that identity is going to be defined at the undergraduate level more?

**Sweeney:** Well, I think it is a sort of evolutionary process. It does seem to be most clear right now at the undergraduate level, but of course if we look forward many years, those students are the ones that are going to be populating our graduate programs and ultimately are going to be our medical educators and so forth. So, I feel that it is an opportunity for the reemergence of physiology at those more upper levels as the understanding of what physiology encompasses becomes, once again, more clear.

But we are experiencing that identity crisis because even for the undergraduate programs, when we talk to high school seniors that are coming to evaluate our programs, their understanding of physiology is not good. It's almost in their freshman year when they take their general biology course and they start to study muscle function and nervous function and digestive



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function and so forth that we can then say, “This is physiology. This is why it’s important and why you should take an integrative approach to how you learn these things.”

**Steen: What do you think are the most promising trends in physiology education right now? What makes you hopeful?**

**Sweeney:** I would say one of the things that makes me hopeful is this emergence of physiology as a discipline at the undergraduate level, and in particular, the focus on integrated physiology at that level. Secondly, as you know, APS has begun this emergence of the Center for Physiology Education, one of three APS cornerstone initiatives from its recent strategic plan. And as we worked to launch this, we heard nothing but enthusiasm for building a community that could drive the best practices in physiology education, not just at the undergraduate level, but at the graduate level, at the medical school level, and helping to ensure that our next generation of physiology educators can take that integrative approach and reclaim the identity of physiology in the educational realm.

**Steen: What do you see as the major goals for the center?**

**Sweeney:** Our task force that APS put together to come up with the goals and objectives for the Center for Physiology Education had a broad base, and we got a lot of input. We also then did focus groups to vet the goals and objectives that we came up with. And far and away, the most important thing that people wanted was a vibrant and inclusive community of physiology educators. They wanted to be able to reach out to people that were like-minded, that could contribute new ideas as well, and not only have a place where they could garner information, but a place where they could share their own discoveries about how to best teach integrative physiology and so forth. So, this idea that we could develop a shared vision of physiology education and tailor it for each level of instruction that’s, I think, the most promising idea.

**Steen: I know already there are works underway to develop a host of resources and offerings for the Center. What are your priorities?**

**Sweeney:** Based on the goals and objectives we then went on to develop the key themes that we

hope will be driving the CPE for the next few years. Those include evidence-based teaching practices, inclusive teaching—and inclusive teaching means bringing in ideas like gender and racial differences in physiology and so forth—teaching and learning integrative physiology, promoting physiology research, and finally curriculum development. These are the things that we heard the greatest need for.

We really want to start our offerings with teaching and learning integrative physiology. We’ve started to do this by tapping into the expertise of APS members. We’re asking them to create presentations on teaching and learning of physiology and to link it back to the integrative nature of physiology, as well as link it to these core concepts in physiology that we really feel are the cornerstone of an integrative approach to teaching physiology.

**“One of the things that makes me hopeful is this emergence of physiology as a discipline at the undergraduate level, and in particular, the focus on integrated physiology at that level.”**

—Terry Sweeney, PhD, FAPS

**Steen: You talked about the importance of the Center developing community, and that is a real need within the physiology educator community. What do you think that looks like? How does that manifest itself when the Center is built out?**

**Sweeney:** We want it to have several different aspects. We’d like to have an annual meeting that can allow people to meet face-to-face and talk about their ideas and best practices. But more than that, we have to have something that’s more immediate and available. So, we’re developing a learning management system that can not only be a home for content that we create and we curate, but that will let people interact. We also want to take advantage of some social media tools so that people can actually have that type of community that’s available to them almost on a 24/7 basis.

A lot of these things are still being built out, and we’re trying to figure out the best ways to do that. We want it to be a continuous community, not just something that’s present at a once-a-year meeting, but that people can reach out to, gain information from and contribute to. 🗨️

View the conversation in full at [www.physiology.org/evolution](http://www.physiology.org/evolution).

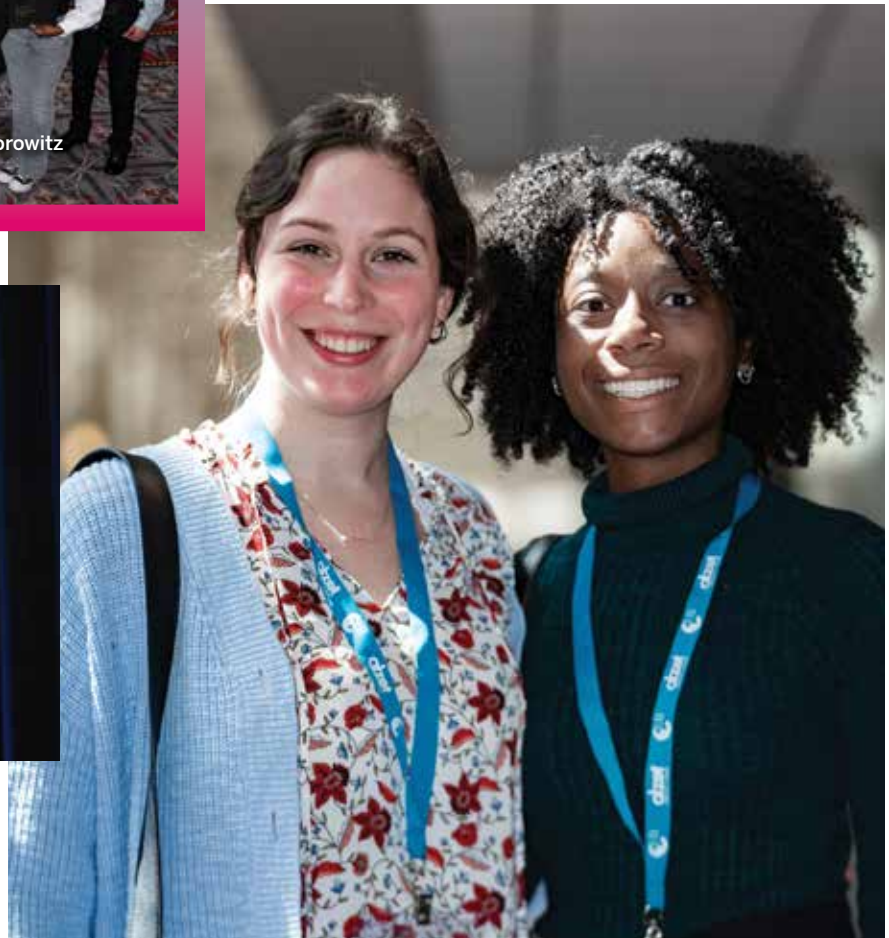
After years of virtual meetings, the energy of the nearly 9,000 attendees reuniting in person at Experimental Biology was palpable, both in real life and on Twitter. Researchers shared their science, received awards, reveled in being together again and got excited about the American Physiology Summit in 2023.



Winners of the 2022 Barbara A. Horwitz and John M. Horowitz Undergraduate Research Awards.



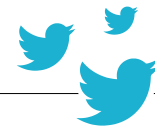
Above: Christin Carter-Su, PhD, (left) delivered the 2022 Walter B. Cannon Award Lectureship, which recognizes lifetime achievement and contributions to the field. Her colleague and APS Past President Linda Samuelson, PhD, FAPS, introduced Carter-Su and presented her award.





From left: APS President Jennifer Pollock, PhD, FAPS; Awards Committee Chair Usha Raj, PhD, FAPS; 2022 A. Clifford Barger Underrepresented Minority Mentorship awardee Robert Hoover, MD; and APS Executive Director Scott Steen, CAE, FASAE.





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 [tphysmag@physiology.org](mailto:tphysmag@physiology.org).



**Julie Bastarache**  
@JulesBass6

Getting my day started early! I forgot how beautiful the Philadelphia convention center is! Seems fitting that my first big conference in 2.5 years is in the City of Brotherly Love ❤️ #ExpBio #APSatEB

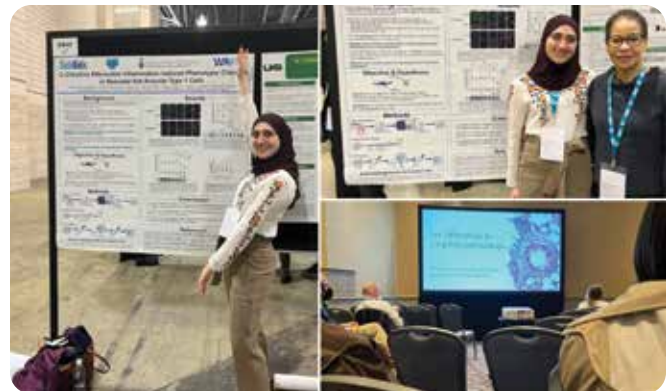


7:54 AM · Apr 2, 2022



**Atefeh Mohammadi**  
@atefehmohdi

Day 2 of @expbio 2022 was an exciting one! I presented my research to other scientists and students at the @APSRespiration poster session (🥰), attended the @APSPHysiology Sex Differences in Lung Pathophysiology session, and met THE Dr. Krithika Lingappan @PennMedicine 🙌



5:38 PM · Apr 3, 2022



**Alyssa Brown**  
@Alyssa\_B\_MDPhD

Started the day off strong with a Women in Physiology mixer, now off to present on Destigmatizing Mental Health then my poster on mitochondrial function in the diaphragm. Thank you to @APSPHysiology for letting me explore all sides of myself! #WomeninPhysiology.

9:34 AM · Apr 4, 2022



**Ann-Katrin (Anka) Grotle, PhD**  
@AnkaGrotle

Ready for @expbio with @RachelSkow in Philly! The @APSPHysiology booth is pretty cool—go check it out! 😊 Also, check out our posters Tuesday!



7:55 PM · Apr 2, 2022



**John Redden**  
@reddenjm

There's something magical about being in a room full of ~100 scientists who are excited to wake up at 6am to learn about the molecular details of urine concentration.

9:04 AM · Apr 2, 2022



**Doctora Patricia Silveyra**  
@patosilveyra

Thanks @APSPHysiology for featuring me 😊



4:18 PM · Apr 3, 2022



**Luc Bertrand**  
@BertrandLuc\_ky

#EB2022 is welcoming all kind of people. Inclusion is so important @ajpheartcirc @merrylindseyphd @DrHelenECollin1 @IREC\_UCLouvain



4:25 PM · Apr 2, 2022

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# LABNOTES

**MENTORING Q&A** YOUR QUESTIONS ANSWERED  
**POLICY IQ** PHYSIOLOGY ON THE HILL AND IN THE HALLS  
**RESEARCH FIZZ** BUZZ-WORTHY RESEARCH  
**STATS & FACTS** PHYSIOLOGY BY THE NUMBERS  
**UNDER THE MICROSCOPE** OUR MEMBERS, UP CLOSE  
**PUBLISH WITH POLISH** BUILD A BETTER RESEARCH PAPER

## RESEARCH FIZZ



### The science and engineering behind sensitized brain-controlled bionic hands

This review looks at the neural basis for motor control in able-bodied people and how to restore sensory information with brain-controlled prosthesis.

*Physiological Reviews*, May 2022

<https://doi.org/10.1152/physrev.00034.2020>

## STATS & FACTS

# 13

### The increase in the number of undergraduate physiology programs in the U.S. and Canada from 2005 to 2019.

*Advances in Physiology Education*

## RESEARCH FIZZ

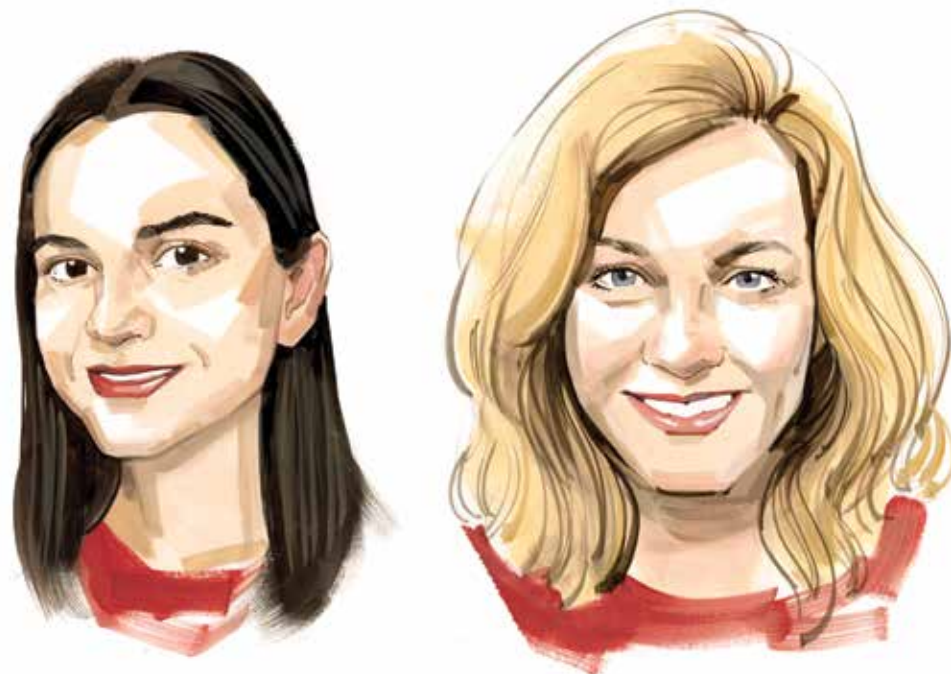


### Fluid transport in the brain

This review explores the structure and role of fluid transport in the brain, including homeostatic requirements for fluid flow.

*Physiological Reviews*, May 2022

<https://doi.org/10.1152/physrev.00031.2020>



## MENTORING Q&A | CLINICAL PERSPECTIVE

# Research Rewards

How to get a clinical perspective of your research.

Each issue, we ask a trainee member to pose their career questions to an established investigator and mentor. Here, Elena Kozlova, a graduate student researcher and neuroscience PhD candidate at the University of California, Riverside, asks Babbette LaMarca, PhD, professor and interim chair of the Department of Pharmacology & Toxicology at the University of Mississippi Medical Center, about her research and career challenges.

**Q: What is your favorite aspect of your research?**

**A:** I enjoy analyzing data from the lab and putting things into a clinical perspective. I enjoy thinking “Why does it matter if we answer this question; will it have a clinical relevance?” My research is flexible in scope in that we answer questions with cell culture



and whole animal models of preeclampsia compared to normal pregnancy and then we think about what impact this could have on a clinical population. In partnership with the field of obstetrics and gynecology, we are able to apply our laboratory science to patient therapies. We currently have four active clinical studies and one clinical trial.

**“I encourage young people to collaborate with clinicians to at least get their perspective on a clinically relevant question and what affects their patients most and incorporate that into your research.”**

**Q: As a physiologist, how does your training give you a unique perspective on how you approach research questions? How is this different from other researchers in your department or institution?**

**A:** I try to bring a clinical perspective into our research. In addition to being a physiologist working with a rodent model of preeclampsia, I also train maternal-fetal medicine fellows in the research portion of their fellowship training. This allows me to interact with clinicians and learn their new findings, and it broadens my perspective of research questions I can pursue in the lab. I feel that this allows us to pursue more of a translational angle to our research. So I encourage young people to collaborate with clinicians

to at least get their perspective on a clinically relevant question and what affects their patients most and incorporate that into your research.

**Q: What are some challenges you encountered in your career path and how did you respond?**

**A:** Having a family can be a challenge for men

or women during their careers. The key is to do your homework when the children are sleeping. My husband and I laugh because there is about 10 years of TV show jokes we don't get because we were raising babies, putting them to bed and getting them off to school. In between, we were on our laptops at night or at 5 a.m.

I encourage you to look for someone that will either understand that these are the hours young faculty members keep or find someone that is career driven too. My husband has his career, and I have mine, but we share in each other's progression, listen to one another about stressful days and, in turn, share in the raising of our family. This is one of the

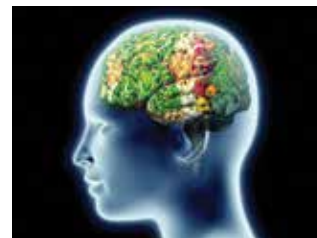
most important choices you will make. After you make it, support each other in your growth as professionals in respective fields.

Other challenges in this career come from not being able to obtain funding. Everyone has grants that are “not discussed” or scored but unfunded. Keep that in mind as this eventually will happen to you as well. Find a mentor in your area, a co-investigator or someone you can trust to read your grants and try to understand your questions and methods and who will give you advice. Maybe you will develop a relationship so that you can support each other on grants and expand your techniques and innovation.

Keep your head high and listen to reviewers' criticisms and try to address some of them in the resubmission. Try not to be stubborn about addressing questions in your area of research that may not be clear to others. This is one way that you can apply others' advice and make your work better based on reviewers' comments. ④

**Got a career question you'd like to submit? Email it to [tphysmag@physiology.org](mailto:tphysmag@physiology.org). We may use it in an upcoming Mentoring Q&A.**

#### RESEARCH FIZZ



### The physiological control of eating: signals, neurons, and networks

This review discusses network models of how different areas of the brain, the vagus nerve and spinal cord work with the digestive system to let animals eat.

*Physiological Reviews*, May 2022

<https://doi.org/10.1152/physrev.00028.2020>

#### STATS & FACTS

# 39%

The portion of all U.S. undergraduate students who are enrolled in community colleges.

American Association of Community Colleges

#### STATS & FACTS

# 1/4

The portion of community college students who go on to study at a four-year institution.

Community College Review

STATS & FACTS

**\$12,300**

The difference in average accumulated debt between students who completed an associate degree (\$20,000) and those who completed a bachelor's degree (\$32,300) in the U.S. in 2015–2016.

National Center for Education Statistics

RESEARCH FIZZ



**Adaptive changes in single-nephron GFR, tubular morphology, and transport in a pregnant rat nephron: modeling and analysis**

This study in rats explores how the kidneys adapt to volume and electrolyte requirements that occur in the different stages of pregnancy.

*American Journal of Physiology-Renal Physiology*, February 2022

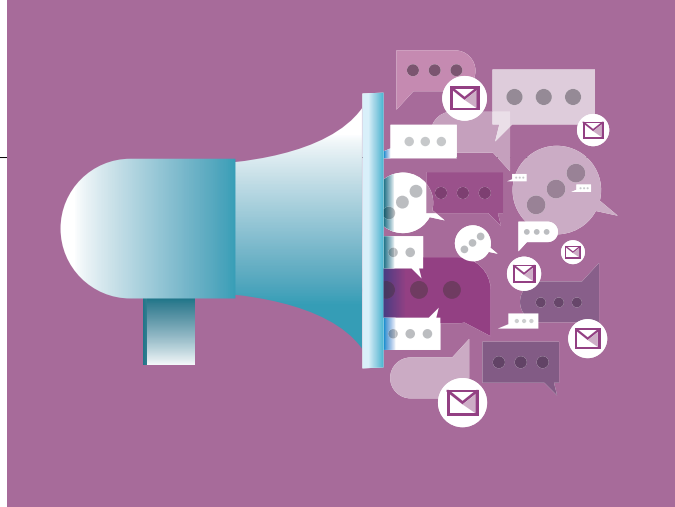
<https://doi.org/10.1152/ajprenal.00264.2021>

STATS & FACTS

**6%**

The portion of bachelor's degrees in the biological and biomedical sciences conferred by U.S. institutions in 2018–2019.

National Center for Education Statistics



POLICY IQ | APS ACTION ALERTS

## APS Advocacy Goes Digital

Last fall, APS launched a new digital advocacy tool for members. APS Action Alerts provides an efficient way for members to raise their voices on the issues that matter most to physiologists and the broader scientific community.

When Congress is getting ready to make key decisions about funding for science or research policies, APS will develop and share a template message for members to send to their congressional representatives and senators.

### HOW DOES IT WORK?

When you receive a message in your inbox or see an Action Alert featured in the

APS News Update, click the link and enter your contact information in the form. The system will automatically determine which offices should receive your messages based on your home mailing address.

### CAN I PERSONALIZE THE MESSAGES?

Yes! APS members have compelling stories to tell about their research and

why it is important to the future of our nation. You can always edit and personalize the messages sent through APS Action Alerts. In fact, personalizing your message will make it stand out and increase the impact of your action.

### MAY I SHARE APS ACTION ALERTS WITH COLLEAGUES?

Absolutely. Messages can be forwarded to anyone with an interest in research advocacy. This is a great way to amplify the power of your advocacy.

### HOW DO I GET STARTED?

Even when there is not an active advocacy campaign, you can sign up to receive future alerts by going to [www.physiology.org/advocacy](http://www.physiology.org/advocacy) and signing up for Action Alerts. 📧

## By the Numbers

When the inaugural APS Action Alert went out asking members to tell Congress to complete funding legislation and pass budget increases for the National Institutes of Health and National Science Foundation, 80 advocates from 29 states sent a total of 241 messages to Capitol Hill.

POLICY IQ | FEDERAL FUNDING

## Looking ahead to 2023

While we are only halfway through fiscal year (FY) 2022 funding, advocates are already looking ahead to what the research community needs in FY 2023 and beyond. Here are the

preliminary research budget recommendations that APS and partner organizations are advocating for this year:

- **National Institutes of Health:** at least \$50 billion

- **National Science Foundation:** at least \$11 billion
- **VA Medical and Prosthetic Research:** at least \$980 million
- **NASA:** increased funding for life sciences research and the Human Research Program 📧



POLICY IQ | ANIMAL RESEARCH

## ILAR Initiates Revision of Its Lab Animal Guide

BY SONNET JONKER, PHD, FAPS, AND GAYLEN EDWARDS, DVM, PHD

The APS Animal Care and Experimentation (ACE) Committee is advocating for scientifically sound, performance-based standards as part of a revision of the Guide for the Care and Use of Laboratory Animals, which is published by the Institute for Laboratory Animal Research (ILAR) within the National Academies.

The purpose of the Guide is notionally “to assist institutions in caring for and using animals in ways judged to be scientifically, technically and humanely appropriate.” In practice, the Guide serves as the de facto regulatory document for institutions receiving federal funding and is one of the primary standards for AAALAC accreditation. Consequently, the Guide has a profound impact on the daily work of most APS members working with animals in U.S. and international labs.

The Guide was first published in 1963 and was

revised five times by 1996. The last revision to the guide was in 2011. The challenge of revising the Guide increased over the years for a number of reasons: More species were included, the subjects under attention expanded (for example, environmental enrichment and personnel management), there was debate about how standards should be set (performance or engineering), and more entities wanted to provide input as the Guide became a de facto regulatory document.

Although the last revision provided for use of more performance standards, which facilitates institutions creating animal care and use solutions relevant to their own particular circumstances, it was also criticized for inclusion of some standards that were poorly supported in peer-reviewed literature.

A new initiative to revise the Guide has begun and appears to be addressing process issues that have

hampered timely and scientifically sound updates in recent decades. The initial phase, underway now, is the creation of a standing committee to address the revision process, not the actual changes to the standards.

This standing committee will consider important overarching questions such as how data availability, rigor and transparency can enhance animal well-being and the quality of research. Importantly, the committee will explore how a phased, iterative review-revision cycle based on scientific evidence could contribute to more timely updates to the Guide in the future and what topics, environments and classes of animals should be considered.

The APS ACE Committee is engaging with ILAR to advocate for the needs of physiological researchers in the U.S. and internationally who will be subject to the standards in Guide revisions. A factor that we feel is critical is scientifically sound, performance-based standards that allow flexibility in how institutions meet the welfare needs of the animals. These standards should reflect the breadth and diversity of research conducted by APS members and incorporate a revision process that facilitates continuity of ongoing research studies.

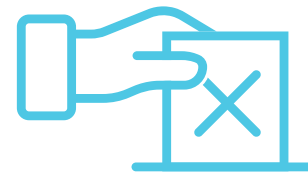
To provide input to the ACE Committee, email comments to [sciencepolicy@physiology.org](mailto:sciencepolicy@physiology.org). 📧

POLICY IQ | ANIMAL RESEARCH

## Switzerland Rejects Effort to Ban Animal, Human Research

On February 13, 2022, Swiss voters went to the polls to vote on a referendum that would have banned all research involving animals or humans and prohibited the importation of new drugs developed through animal or human research. The measure was defeated, with nearly 80% of voters rejecting it.

While this referendum was voted down, it remains part of a troubling trend to introduce new restrictions on research in both Europe and the U.S., highlighting the need to educate the public about the importance of animal research in advancing science. 📧



RESEARCH FIZZ



**Oculomotor freezing indicates conscious detection free of decision bias**

This study shows that a reflexive freezing of small eye movements—oculomotor freezing—can reveal when a person detects a visual stimulus.

*Journal of Neurophysiology*, February 2022  
<https://doi.org/10.1152/jn.00465.2021>

STATS & FACTS

**5,297**

The number of students who enrolled in graduate-level physiology research programs at U.S. institutions in 2019, up 1,502 from 2015.

National Center for Education Statistics

RESEARCH FIZZ



**From heart to muscle: pathophysiological mechanisms underlying long-term physical sequelae from SARS-CoV-2 infection**

This review addresses the pathophysiology of long COVID, including gaps in the literature, and the need to develop evidence-based rehabilitation guidelines.

*Journal of Applied Physiology*, March 2022  
<https://doi.org/10.1152/jappphysiol.00734.2021>



Brandauer and his childhood best friend, Roland Walkner, hike in their native Austria.

UNDER THE MICROSCOPE

**Rapid Fire Q&A**

Josef Brandauer, PhD, shares a borrowed “MacGyver” moment, a near-miss and some fun facts as an Austrian living in the U.S.

**Q: Ever had a “eureka” moment?**

**A:** Definitely the birth of my daughter (now 14).

**Q: What do people call you?**

**A:** My first name is pronounced YO-zef. My family and friends at home call me Sepp (a common Austrian abbreviation of my first name).

**Q: What inspired you to become a scientist?**

**A:** I was not a particularly strong student in high school and early college. That all changed when I met Alfred Aigner, my physiology professor. His excitement about understanding physiology was incredibly infectious.

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

**A:** With most of what I do these days, I’m asking myself whether I’m being flexible, kind, effective and efficient.

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

**A:** There’s some skill in running a smooth VO2 max test using Douglas bags.

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

**A:** Sharp dissection tools, a good set of pointy thick Sharpies and fresh orange lab tape.

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

**A:** There’s a few, but the time when I put my head on my pillow around midnight, closed my eyes and realized at that very moment that I had some samples in a cooler with rapidly evaporating liquid nitrogen. (Got on my bike, rode to the lab in the middle of the night and got there just in the nick of time.)

**Q: Best “MacGyver” moment in the lab?**

**A:** Like most good ideas, it’s borrowed (from Carol Witczak, PhD): Properly folded, lab tape makes excellent dividers for Western blotting membranes within a pipette container lid.

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

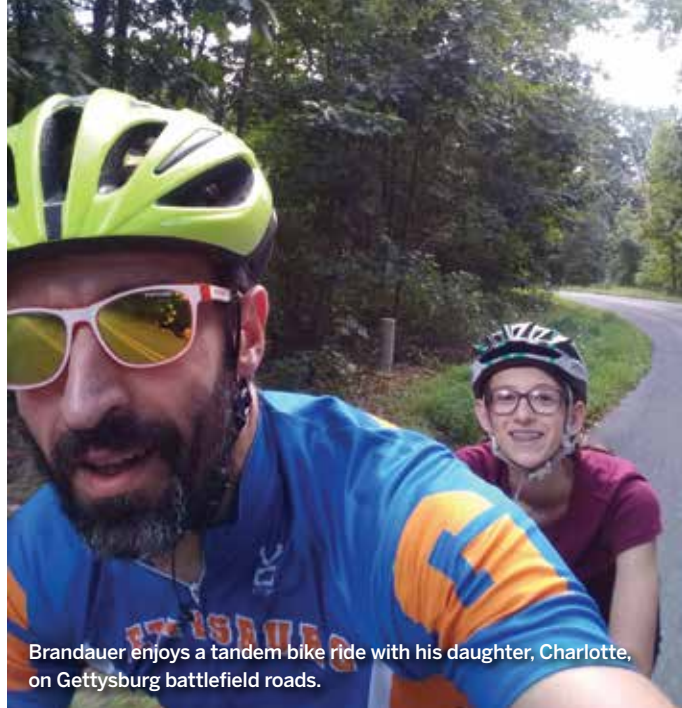
**A:** Changing one’s mind based on new evidence is the right thing to do and takes time.

**Q: Favorite book about science (fiction or non-fiction)?**



Brandauer skies with his dad, Josef Brandauer, and his daughter, Charlotte, in Austria, where he says that almost all mountain peaks in have a cross. “If you look up a mountain in Austria, it’s often indicated as a ‘place of worship’ on Google maps!”

Photos courtesy of Josef Brandauer, PhD



Brandauer enjoys a tandem bike ride with his daughter, Charlotte, on Gettysburg battlefield roads.

**A:** “Being Mortal” by Atul Gawande and “Range” by David Epstein are not hardcore science books per se, but I’ve found them both engaging and thought-provoking.

**Q: Favorite way to spend a free hour?**

**A:** Ride a bike, do some pottery, cook.

**Q: Most valuable quality in a colleague?**

**A:** Trust and kindness (the latter includes honesty).

**Q: Tell us a surprising fact about you.**

**A:** I speak or have learned seven languages (German, English, French, Latin, Italian, Portuguese and a little Danish).

**Q: Favorite part of your job?**

**A:** Any discovery, no matter how small, is still incredibly exciting. Also, through my work with undergraduate students, I get to help young people find their own path and gain confidence. I find this to be an extremely rewarding aspect of my job.

**Q: Notable scientists you follow on Twitter?**

I (@BrandauerJ) follow a large and diverse group of folks on Twitter; it’s been an incredibly

productive professional development tool for me.

**Q: Next book on your reading list?**

**A:** It’s a long list! Right now, I’m simultaneously reading Dolly Chugh’s “The Person You Mean to Be” for a work book club, and Meg Lowman’s “The Arbonaut.”

**Q: Favorite musician/musical artist/band?**

**A:** Anything from punk to country to classical. But I can also hold my own in a Taylor Swift singalong ... which you will never see because #introvert.

**Q: Go-to snacks to get you through long days working from home?**

**A:** Almost anything sweet, plantain chips, copious amounts of coffee and herbal tea.

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

**A:** My parents’ house in Golling, Austria.

**Q: City, suburb, country?**

**A:** Right now, I am enjoying small-town life with relatively easy city access.

**Q: The question we didn’t ask that we should have?**

PUBLISH WITH POLISH | AUTHOR BENEFITS

## APS Helps Speed Up PubMed Central ID Generation

Many funders, including the National Institutes of Health, Wellcome Trust and UK Research and Innovation, require their funded articles be deposited to PubMed Central (PMC). To assist authors with this requirement, APS submits the final-published article to PMC on the authors’ behalf.

APS can now submit content sooner, speeding up PubMed Central Identification (PMCID) generation for authors. To ensure timely delivery of articles, however, APS needs authors to list accurately all funding and grant sources in the submission site in addition to including such details in their manuscript text.



From the detailed information section of the manuscript submission site, funder name or abbreviation can be entered in the indicated field. This will result in a dropdown list of options. Choosing one of the validated funders will result in a green check mark.

If the funder entered does not match one in the database (possibly due to differences in spelling or abbreviation), a yellow warning triangle will appear. Clicking the icon will produce a pop-up window for searching the database of validated funders. If the appropriate funder still does not appear, authors should do their best to enter manually the funder’s name as it appears on their award communications.

Completing these steps will mark the article for PMC deposit if required by the funder, giving authors one less thing to worry about.

For more information on PMC deposits, go to <https://journals.physiology.org/author-info.depositing-articles-in-pmc>. 📄

**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](mailto:tphysmag@physiology.org).**

**A:** Knowing what you know now, would you become a physiologist again? **A:** I think I’d be a physiology-studio art double major. 📄

**Josef Brandauer, PhD, is an associate professor of health**

**sciences at Gettysburg College in Pennsylvania, where he also directs the college’s Johnson Center for Creative Teaching and Learning. A native of Salzburg, Austria, Brandauer completed his PhD under Jim Hagberg, PhD, at the University of Maryland.**



# Education Innovator

Meet Dee Silverthorn, PhD, FAPS:  
pioneering physiology educator and  
95th president of APS.

**BY CHRISTINA HERNANDEZ SHERWOOD**

**A**t several points during her long career, Dee Silverthorn, PhD, FAPS, thought her promising trajectory appeared to be going sideways. There was the time she left a tenure-track position and closed her research lab to follow her husband to Texas. And the time she dropped out of science for six years.

But while her unconventional path seemed at times to mirror the hallmark sideways gait of her preferred research animal, the crab, Silverthorn's zig-zagging road was nevertheless paved with accomplishments. The most recent? She is the new APS president.



Brian Miller, PhD; John Bedolla, MD; and Silverthorn at the launch of the Dell Med Academy of Distinguished Educators. She and Miller are founding members.

“You don’t have to follow the traditional pathway to be successful,” says Silverthorn, distinguished teaching professor of physiology emerita at Dell Medical School at the University of Texas at Austin. “You need to find what you love to do and just follow it.”

Silverthorn grew up in New Orleans where her father, in his time off from working as a physician scientist, built a cabin cruiser boat in the backyard. No surprise that her first love was the marine world. She graduated with honors from Tulane University with a bachelor’s in biology before pursuing a PhD in marine science at the University of South Carolina.

“For years, I worked on blue crabs,” she says. “We would take the gills out—what they call the dead man’s fingers—and the fat body. That was our research tissue. We’d keep the rest of the carcass on ice and take them home and have them for dinner.”

After she married Andrew Silverthorn, a Vietnam veteran stationed near the university, and completed her PhD, Silverthorn became the first woman to join the physiology faculty at the Medical University of South Carolina in Charleston. But she soon left the tenure-track position to follow her husband to Galveston, Texas, where he was matched with a family medicine residency.

Silverthorn landed a one-year visiting professorship in Houston but for a variety of reasons couldn’t continue her research there, which was funded by the National Institutes of Health (NIH). Instead, she took a research scientist position at the University of Texas Medical Branch.

“My husband was saving lives, and I was looking at sodium transport in the rabbit urinary bladder,” Silverthorn says. “I began to question just how much I was contributing to society doing basic research.”

So began Silverthorn’s six-year hiatus from science. She spent her days performing with a dance company, designing and selling needle-



**Silverthorn secured a grant from the National Science Foundation to transition to invertebrate models and to innovate with computer data acquisition systems for the student lab. “That was the beginning of everything,” she says. “I’d cemented my place in the department by taking on the labs.”**

work and multimedia fiber art, and volunteering her time to historic preservation. When her husband launched a solo family medicine practice, she became its manager. She also taught biology at a private high school for a year.

#### **RECONNECTING TO ACADEMIA**

Then a friend from the dance world told her about a one-semester position at the University of Texas at Austin. Silverthorn got the job—and decided she didn’t want to leave teaching again. “I realized that I really liked being there,” she says. “I sat down with the department chair and showed her my CV and said, ‘I’ve been out. I gave up that NIH grant. Have I totally shot my career in the foot?’ And she went, ‘Yeah, you have.’”

But the chair offered Silverthorn a second chance at a career in academia. She took over a physiology course from a retiring professor and found that its accompanying lab courses were in shambles. Silverthorn drew on her expertise with invertebrates—along with crabs, she had experience studying



Top: Silverthorn and her husband, Andrew Silverthorn, MD, on the left, on vacation in Kauai, Hawaii, with friends. Left: At the 2019 Federation of European Physiological Societies meeting in Bologna, Italy, with colleagues Michael Chirillo, MD, PhD, and Jennifer Thompson, MPH.



They are the teachers, and they were just being thrown in the labs and not told how to do anything,” she says. Silverthorn, who had no formal educational training herself, attended the university’s annual conference on teaching and learning, then passed on what she learned to her graduate teaching assistants. “My philosophy for the teaching assistants was: The lab is the only time you’re going to be an independent teacher in the classroom while you’re a graduate student,” she says.

### REINVENTING TEACHING

While she was revamping the labs, Silverthorn was also changing her classroom teaching. Frustrated by the unnecessary tedium of repeating definitions for a class of 200, Silverthorn created a lecture workbook that contained the basics of what her students needed to know. Required reading was assigned before each class meeting, and students were quizzed on the material at the start of class. The rest of the class time was devoted to higher-level skills and techniques.

“Do the basics first,” Silverthorn says. “Then they come to class and

cockroaches—to phase mammals out of the lab curriculum. “I came up with a series of labs that were invertebrate model systems, showing the same principles that all these vertebrate systems had before.” Silverthorn secured a grant from the National Science Foundation to transition to invertebrate models and to innovate with computer data acquisition systems for the student lab. “That was the beginning of everything,” she says. “I’d cemented my place in the department by taking on the labs.”

Silverthorn also found herself teaching her graduate students how to teach their lab sections. “You’re not in the lab with the graduate students.



**Top:** An afternoon learning to make pasta during the 2019 Federation of European Physiological Societies meeting in Bologna, Italy.

**Left:** Silverthorn designs needlework and multimedia fiber art. She was commissioned to design eight different Victorian-style bouquets to be stitched into needlepoint chair seats for the lieutenant governor’s reception room in the Texas State Capitol. This main armchair design includes bluebonnets (the state flower), a prickly pear cactus (state cactus) and a monarch butterfly (state insect).



The University of Texas recognizes faculty-staff authors each year. This display showcases the eighth edition of Silverthorn's textbook "Human Physiology: An Integrated Approach."

work in small groups, and I throw problems at them and teach them how to think and how to apply material." Today, this model is known as "the flipped classroom." Silverthorn called it "the upside-down classroom."

The lecture workbook Silverthorn created for her first "upside-down classroom" turned out to be something of a trial run in book writing. In 1997, she published the textbook "Human Physiology: An Integrated Approach." The book became a bestseller and is now in its eighth edition.

Silverthorn enjoys innovating in the classroom and experimenting with new technologies. She was an early adopter of "clickers," remote control-like technology that allowed instructors to ask questions and immediately tally responses from the entire class. And she taught her class online years before Zoom became a household word. With recurring ice storms canceling her 8 a.m. class in 2014, Silverthorn got creative. "One cancellation a semester, you can work with," she says. "But after

the first one, I said, 'OK, we're doing class online.'" Silverthorn used a web conferencing tool on the teaching platform Canvas to host—and record—class from her home. "I actually ended up doing four online classes that semester," she says.

Silverthorn, who has received more than a dozen teaching awards, stepped into her role as Society president at a moment that plays to her strengths in education. "It was just an amazing time to be elected," says Silverthorn, a longtime APS member and past chair and secretary of the Society's Teaching of Physiology Section.

As the first president with an educational focus, Silverthorn, along with the founding advisory board, will guide the launch of the Society's new Center for Physiology Education, a resource and community hub for members.

Silverthorn says she's keen for the Center to provide something for everyone, not just classroom teachers. "It's not just about classroom education. It's also about training and giving people expertise in different areas of physiology." 📧

## FASTFACTS

### Legacy of APS Service & Physiology Leadership

- APS member since 1977
- Fellow of APS since 2015
- Fellow of the American Association of Anatomy
- Fellow of the American Association for the Advancement of Science
- APS Council (2006–2009)
- Member, Team 2023 Task Force and the Physiology Summit Leadership Committee, which is developing APS' new annual meeting, the American Physiology Summit
- Member, past chair and secretary of the APS Teaching of Physiology Section
- Author of the bestselling textbook "Human Physiology: An Integrated Approach"
- Past chair, APS Book Committee
- APS Arthur C. Guyton Distinguished Educator Award
- University of Texas Regents' Outstanding Teaching Award

### Education

- PhD, University of South Carolina
- BS, Biology, Tulane University



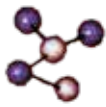
# Class Appeal

Community colleges are one of the best open secrets for physiology and other STEM majors.

BY CANDACE Y.A. MONTAGUE

Greg Crowther, PhD, plays a major role in the future of health care in the U.S. He works with pre-nursing students at Everett Community College in Washington state. He is a tenured instructor in the Life Sciences Department who teaches biology and physiology. If all goes well, most of his students will go into nursing, diagnostic ultrasound or some other pre-health science clinical career. In other words, Crowther's work is critical to the health care of people in the U.S.

"My goal is to give them this foundation in physiology and biology that they can then apply to clinical scenarios in the future," Crowther says. "So, one could think of that as giving them information that will be relevant to their careers. I feel like the most important thing for me to aim for is to give them practical skills that are relevant."



**“It’s where many of them hear the word ‘physiology’ and become engaged. They are most likely to encounter our class in a pre-health prerequisite. So, they might be aiming for pre-nursing or pharmacy and they have never taken a physiology class. After enrolling, they become curious about natural sciences.”**

—Jenny McFarland, PhD

Crowther can offer a quality education on a personalized level to his students, which fosters growth and keeps them engaged in science. He can do that because he has the space and time to get to know his students and their goals and help them gain a solid foundation in biology before moving on to the next level. This is just one of the many benefits of community college learning that can help students prepare for science, technology, engineering and math (STEM) careers.

Community colleges offer coursework and internship opportunities that firmly prepare students for matriculation into a four-year institution or for their careers. For some students it’s a saving grace. With the mass exodus of health care professionals and lack of diversity in STEM, community colleges are the not-so-secret weapon in creating a confident, strong workforce.

### **THE CASE FOR COMMUNITY COLLEGES**

What is the appeal of a community college? This question can be answered through several lenses. For students coming from traditionally underrepresented communities

(Black, Latino and American Indian), community colleges offer a bridge to higher education in a system that locks them out. For students who come from economically disadvantaged backgrounds, a two-year institution can be a way to sidestep student loan debt. The locality and flexible attendance options of a community college can be just the convenience needed for a single parent or caretaker to get necessary credit hours. A student with a learning disability who needs accommodations can be supported in a small college setting.

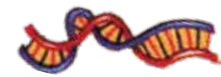
In science, community colleges offer a deeper study. Students are afforded opportunities to work directly with instructors and professors in a small class setting. They have more hands-on lab experiences. And in an intimate setting, students can build their confidence and develop relationships with their classmates. It’s an invaluable part of strengthening the learner.

Jenny McFarland, PhD, emeritus and former chair of the biology department at Edmonds College, a community college just outside Seattle, says two-year institutions can start a new flame.

“It’s an excellent pathway because it breeds stamina, particularly in physiology,” McFarland says. “It’s where many of them hear the word ‘physiology’ and become engaged. They are most likely to encounter our class in a pre-health prerequisite. So, they might be aiming for pre-nursing or pharmacy and they have never taken a physiology class. After enrolling, they become curious about natural sciences.”

McFarland adds that smaller class sizes create a tighter community where faculty and students can bond. “When they are in our classes, often the model is that there are 48 to 50 students in a lecture, with two laboratory sessions. That’s about 24 to 25 students in a laboratory session, so students are with us, not a teaching assistant (TA). They get to know the faculty, and they get that kind of direct one-on-one interaction and mentorship that is not available at a four-year institution. One of my colleagues has 600 students in her class and a bunch of TAs. There’s no way she knows 600 students.”

However, there are various stigmas attached with attending a community college. Students who enroll in a two-year institution are typically considered



“nontraditional.” They may have been out of school for a long period of time. They may be working parents. Some may be undocumented and have prior schooling from their native country that is viewed as substandard. Also, some of the typical requirements for admission in a four-year institution, such as SAT scores, are not necessary for entry into a community college. These and other factors can lead to a biased, one-sided picture of a higher education learner whose transcript and essays may not tell the whole story.

Community college enrollment numbers show that minority students have been continuously making efforts to attain higher education degrees. According to the American Association of Community Colleges, as of 2016, minority students were the largest percentage of first-time students at community colleges. The data showed that 19% of students identified as Hispanic, along with 19% Black, 18% American Indian and 15% Asian/Pacific Islander.

However, postsecondary enrollment across the country has taken a hit since the pandemic began. According to the National Student Clearinghouse Research Center, undergraduate enrollment has declined 7.8% since 2019. Community colleges saw a 15% decrease in enrollment, with a major-

ity of that among full-time students.

While recent stats about community colleges and STEM are limited, in 2010 more than half of all students receiving STEM bachelor’s degrees received at least some of their undergraduate training at a community college, according to the National Science Foundation’s National Center for Science and Engineering Statistics.

### **A BRIDGE FROM TWO-YEAR TO FOUR-YEAR INSTITUTIONS**

The writing has been on the wall for more than a decade: Long before the COVID-19 pandemic arrived, health care professionals have been leaving the workforce in droves. Nursing shortages will continue to grow. Retirements and career changes—particularly during the worst public health crisis in U.S. history—have rapidly shrunk the health care labor pool.

For far too long, the science and technology workforce has been overwhelmingly white and male. Repeated calls for and efforts to increase the number of people of color, women and LGBTQ people who work and lead in STEM have not led to a meaningful increase of underrepresented populations in these fields.

To build a strong and diverse biomedical research workforce, there will need to be investments in recruitment and development. Enter

the National Institutes of Health’s National Institute of General Medical Sciences, which offers several programs designed to support two- and four-year institutions as they cultivate a new group of STEM workers who will be prepared to take science to the next level.

Shakira M. Nelson, PhD, is the program director in the Division of Training, Workforce Development and Diversity. She administers the Diversity Supplement Program and re-entry supplements and manages the Bridges to the Baccalaureate Research Training Program and Initiative for Maximizing Student Development programs.

Nelson explains how the Bridges to the Baccalaureate program helps connect two- and four-year institutions: “This is a training program offered to a two-year or an associate’s degree-granting institution and a four-year or baccalaureate-degree institution. It offers a partnership for them to help community college students with an interest in biomedical studies to bridge from the two-year to the four-year institution and graduate with their bachelor’s degree. We also aim to increase the pool of community college students from underrepresented backgrounds who go on to research careers.”

Nelson discussed some of the expected outcomes of the program, including students having opportunities to conduct research during the summer at a four-year institution. She says these opportunities can help students see the finish line.

“A lot of students are interested in STEM but don’t have the resources or access to allow them to have an immersive experience in the laboratory. Summer research further allows them to see where they can go in their future careers.”

The Diversity Supplement Program supports institutions to

**Community college enrollment numbers show that minority students have been continuously making efforts to attain higher education degrees.**



recruit students from diverse communities with an interest in research in the biomedical sciences. Nelson stressed the importance of using this tool for equity and inclusion. “The diversity supplement can be applied to high school students all the way through to early-career scientists or scientific investigators. It allows for the equipment and training of students from underrepresented backgrounds. This is not necessarily just students who are underrepresented racially and culturally. This also includes underrepresented students who are in certain scientific areas. This can also include those who identify as LGBTQ as well.”

**BEST PRACTICES FOR A MEANINGFUL COMMUNITY COLLEGE EXPERIENCE**

Whether students are aiming for a PhD or entering the workforce after

their two years are up, experts say it’s important for community colleges to adequately prepare students for future endeavors while building their confidence. Recently, the National Institute for the Study of Transfer Students published a guide ([www.nists.org/five-key-faculty-practices](http://www.nists.org/five-key-faculty-practices)) on how faculty members can provide a positive experience for students. Tips such as offering a warm welcome to students and avoiding looking for students’ deficits can help the instructor-student experience be more efficacious.

One of Crowther’s tips for teaching is to get students out of the memorization habit. “A lot of my students come into biology thinking that it’s a big memorization contest and that the way to succeed is to memorize as many facts as possible. So, I try to convince them that the course is really about solving problems

without discounting that, yes, some things need to be memorized.”

At Harford Community College (HCC) in Maryland, STEM students have access to an award-winning program that practically mirrors a four-year institute’s program. Pamela Pape-Lindstrom, PhD, is the dean of STEM at HCC. She says one of the keys to their success is smaller, student-focused classes.

“Our lecture classes have 28 to 48 students. The labs only have 24 students. HCC prepares our students for moving to a four-year school, as the students take the same classes here in science and math that they would take at a four-year school,” she says. “So, if they want a major in biology, they will take a full year of biology with labs. They would take two years of chemistry with labs. They would take physics with labs, and they would take math (precalculus).”

HCC’s STEM program develops partnerships with local four-year institutions to help the matriculation process go smoothly and increase the chances of their students completing bachelor’s degree programs.

Pape-Lindstrom stresses the importance of these relationships: “We have articulation agreements or transfer agreements with many different four-year schools. The majority of our students go to Towson University, so we have relationships with their faculty. Our partnerships with four-year institutions help our students develop a relationship with their faculty. It’s a very important mentoring relationship, and it’s really impactful for the students.”

## Snapshot of U.S. Community College Students

Approximately 6.2 million students attend two-year institutions (2.2 million full-time and 4 million part-time).

Community college students represent:

- 39% of all U.S. undergraduates
- 36% of first-time freshmen
- 53% of Native American college students
- 50% of Hispanic college students
- 40% of Black college students
- 36% of Asian/Pacific Islander college students

Community colleges offer an entry point to higher education for a broad array of students:

- 29% first-generation college students
- 20% students with disabilities
- 15% single parents
- 8% non-U.S. citizens
- 4% veterans

Source: 2022 American Association of Community Colleges Fast Facts, [www.aacc.nche.edu/research-trends/fast-facts](http://www.aacc.nche.edu/research-trends/fast-facts).





# CALL FOR NOMINATIONS EDITOR-IN-CHIEF

## ***Journal of Applied Physiology***®

Nominations are invited for the position of editor-in-chief of *Journal of Applied Physiology* ([journals.physiology.org/journal/jappl](https://journals.physiology.org/journal/jappl)) to succeed Sue Bodine, PhD, FAPS, who will complete her term as editor on June 30, 2023. The American Physiological Society (APS) Publications Committee plans to interview candidates in the fall of 2021.

**Nominations due:** August 1, 2022

**Applications due:** August 15, 2022

## **How to Nominate**

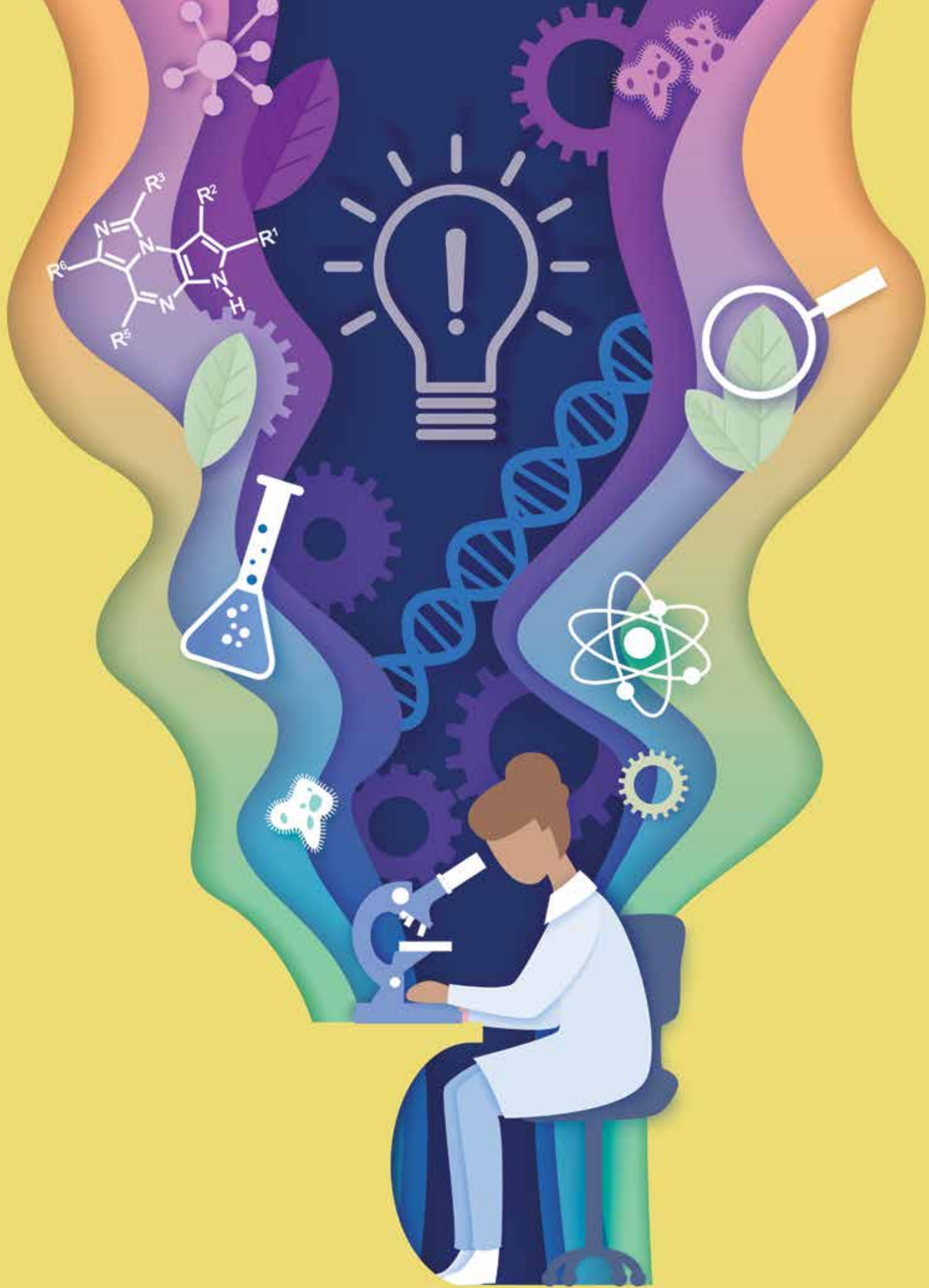
Nominations, accompanied by a curriculum vitae, should be sent to David Gutterman, MD, FAPS, chair of the APS Publications Committee via email, care of the APS Publications Department Administrative Assistant, Charmon Kight ([ckight@physiology.org](mailto:ckight@physiology.org)).

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# THINK LIKE A PHYSIOLOGIST

The next generation of physiologists, doctors and researchers will come from the classes these passionate educators teach.

BY HEATHER BOERNER

**K**atie Johnson, PhD, knew she was doing her job right when her college students swore at her, just a little. She'd warn them about it on the first day of the semester: There's going to be a time, she would say, when you're going to come to me for help, and I'm going to tell you to go back to your group or look for the answer in another place.

"You're going to spin on your heels, and swear at me under your breath, and you're going to go back to your group and say, 'She wasn't helpful at all!'" she remembers telling her students. "Just realize: That's the moment you're learning to learn. That frustration, that thing you're trying to get over, that's what I'm trying to coax out of you." Johnson is an independent education consultant

and former chair of biology at Beloit College in Wisconsin.

Learning to learn—it's a foundational skill for any work in the sciences. And watching it happen, and learning new ways to make it happen, has turned out to be just as compelling as working through a mechanism of action in the lab, say the physiology educators interviewed for

*The Physiologist Magazine*. In science, deciding to focus on education is sometimes considered nontraditional, an unintentional choice. But for these educators, this is not the story at all. As APS launches the Center for Physiology Education this summer, we asked member-educators to share their passion for physiology, for education and for continuing to learn themselves.



Trimby and one of his students retrieve a tray of tiles from a stream near their campus as part of an aquatic ecology lab in his Introductory Biology II class.

## The Hands-on Learner

Chris Trimby, PhD, assistant professor of physiology at the University of Delaware, still remembers his learning about Alaska becoming a state in grade school. That's not because of an abiding love for the 49th state, but because he built a paper-mache relief map of the country's most northerly state for a third grade project, complete with the Alaska Mountain

Range, the Yukon River and the Aleutian Islands drifting off into the Bering Sea. He learned the same things he would have learned had he written an essay, he says, but he doubts he would remember an essay decades later.

Although Trimby had expected to be an engineer when he grew up, his first year in college changed his mind. His introductory engineering classes were nothing like making that relief map of Alaska.

They were dry and frustratingly theoretical. And they didn't stay with him, either.

"As I learned about teaching down the road, I was like, 'Oh right, that's why I got out of engineering,'" he says of how alienated he felt by those professors' teaching styles. But it was a gift, he says, because it got him into a class where he learned to make bacteria glow in the dark to explain human genetic concepts. OK, now this was cool. This he could get into.

That's how he ended up as a PhD student in a traumatic brain injury lab, developing viral gene tools to help treat and investigate those injuries. There, a faculty member was looking for help teaching a section of his applied physiology course. No one was taking him up on it, so eventually Trimby agreed. Suddenly, he got to be the one making the theory real for students. He was hooked. He was still interested in using gene therapy to cure cancer. But now he realized he could have an impact in another way.

"If I teach tens of thousands of students over my career, maybe one of them will get there," he says. "I'm on that same path. I'm just taking a wider view of it."

Today, Trimby continues to find creative ways to engage students. In a science fiction and biology course he designed, for instance, students create a hypothesis for how fast a *Tyrannosaurus rex* ran and back it up with morphometric and physiological references. In another course, students read "Blood Work: A Tale of Medicine and Murder in the Scientific Revolution," a popular science book on the first blood transfusion in 1667, while learning about the physiology of oxygen transport in the blood.

"As a biology undergraduate student, you probably know more about how the human body works than this doctor did in the 1660s," he tells his students. "There's all this stuff swirling around the science. Oftentimes, it's mostly happening in the lab. But that doesn't mean it's a smooth linear course or a coherent process. It's ridiculous."

Trimby likewise likes a challenge. And he gets it in teaching and designing curriculum. "I've seen multiple generations of students over my 10 years, and already things have changed very much in

how we approach topics," he says. "That keeps me motivated because it's different. It's not the same students every semester. They're not a fixed quantity. The material is not a fixed quantity. It's always changing. And that keeps it fresh."

## The Common Thread

Growing up in San Diego, Alice Villalobos, PhD, spent hours peering



Alice Villalobos, PhD

into tide pools, petting calves at the San Diego County Fair and watching whales migrate off shore. She'd marvel: All these animals, perfectly adapted to their environments, thriving no matter where they lived.

Over time, Villalobos started to see that common thread in other parts of her life, like in the way her Mexican American culture was different from that of her Anglo friends but just as valid. It's a philosophy that's found its way into not just her comparative physiology work, but also into how she teaches her physiology students at Texas Tech University Health Sciences Center in Lubbock.

"You don't assume differences are wrong. You assume differences are just simply different but still facilitate success—otherwise they wouldn't continue," she says. "So maybe a student is quirky, or maybe an animal isn't a mammal like a white rat; they're a chicken or a penguin. You observe the difference, appreciate it, embrace it and learn from it."

When Villalobos landed at Blinn College in Bryan, Texas, it was like coming home. Sure, she had worked with students before. But now she was specifically teaching anatomy

**"If you're smart, you really should be able to explain physiology to the average person, and you shouldn't dumb it down. Eventually, we all have to understand it in the exact same way. But how we express it can vary."**

—Alice Villalobos, PhD

and physiology. Soon, to explain load pressure on the aortic valve, she would push against the closed classroom door on one side, asking students of various strength levels to try to push the door open from the other side. Or, she would find herself explaining how a shark's choroid plexus—an organ in the brain that produces cerebrospinal fluid—is flat with epithelia on one side, while mammals' choroid plexus has epithelia on both sides. And don't get her started on the physiology of a desert kangaroo rat's kidney versus that of a rain forest-dwelling animal. Still, years into her teaching career, she lights up at the thought of teaching it.

"If you're smart, you really should be able to explain physiology to the average person, and you shouldn't dumb it down," she said. "Eventually, we all have to understand it in the exact same way. But how we express it can vary."

## The Builder

Adrienne P. Bratcher, PhD, jokes that she was a "sneaky and nosy" kid: sneaky because she would pilfer the anatomy and physiology textbooks from the desk where her mom was studying to be a nurse; nosy because when her mother's best friend, Auntie Mamie, had open heart surgery when Bratcher was around 10 years old, Bratcher needed to know all about it, to the point of shadowing Auntie Mamie's surgeon.

And while she thought she'd be a cardiovascular surgeon when she grew up, she realized early on that her desire to learn why and how changes happened in the heart mattered more to her than doing surgery on humans. Still, she tells friends that she did achieve her childhood goal.

"When I entered a PhD program in cardiovascular physiology, I did

the same surgeries on rats and mice that they do on humans," says Bratcher, assistant professor of biomedical science at the Kaiser Permanente School of Medicine in Pasadena, California. "It's always been

a science road. It just went through a couple of windy towns, some highways, some interstates."

Indeed, teaching was never on her radar. She just knew she loved science and wanted to do some good.



Bratcher presents a workshop on active learning techniques to undergraduate and graduate educators at the 2019 University of Louisville Celebration of Teaching and Learning Conference.



Durocher, second from right, with his lab group at the 2022 Experimental Biology conference.

But then as a doctoral student she found she had a talent for explaining to others the science she was so passionate about. And more than that, teaching and then mentoring allowed her to remain steeped in science while also adapting to every student, every class and every subject.

Instead, she says teaching gives her a chance to help students identify what they're passionate about—like the high school football star who wanted to be a dentist, or the medical students who may find their passion in physiology. Today, as a professor at a new medical school, she says she's become passionate about something new: developing courses to help other educators be better teachers.

"I just love creating," she says. "I'm still that surgeon. I'm still the one wanting to put things together. So now I don't call myself a surgeon. I'm a builder—a science builder."

After all, she says, "Science is the gift that keeps giving."

## The Perseverant One

John Durocher, PhD, likes to start his classes at Purdue University Northwest in Indiana not with physiology but with history—his history. Durocher is now the Nils K. Nelson Associate Professor of Health Studies, with 25 publications under his belt, and leading the university's Integrative Physiology and Health Sciences Center. But in the early 2000s, he was a first-generation college student who drove 100 miles many weeks to the Northern Michigan University campus from his job as a logger in Houghton, Michigan. And that was just one of five jobs he held at one time as he worked to complete his education.

"I try to become relatable," he says, noting that 60% of his current students are first-generation college students and most of them work while attending school. "I let the students know I've gone through some struggles so that they know that if they tell me something, I can understand. I want them to know I care."

Durocher's path to teaching was unconventional. He wasn't exactly an engaged student in high school, preferring mountain bikes and hockey to classwork. His first attempt at college didn't take, and it wasn't until he returned to college a few years later that he decided to turn his love for exercise into a physical therapy degree. But to get there, he had to get through anatomy and physiology first. He didn't expect that would be where he'd stay.

"I fell in love with it immediately," he says. "I couldn't get enough."

Suddenly, the kid who was indifferent to school was an adult who "could not wait to go to class." Then, just as he was doubting he could really stick with school long enough to get a PhD in exercise physiology, his professor at Michigan Technological University walked past him in the anatomy lab and asked, "Would you like to be an undergraduate teaching assistant in the lab next year?"

"That was the life-changing experience," he says. Suddenly, he was in



Johnson, in the back, works with a student to collect physical and endocrine data from a horse to measure its unique responses to becoming obese.

charge of students, guiding them in their studies, and doing with them what his mentor had done with him: sharing, in a very practical way, why the body does what it does and why it matters.

Today, Durocher is still very active in research, working on studies on blood pressure regulation and in areas such as meditation and exercise. But he also has another passion: telling those students how he got where he is today and helping them get to their maybe unexpected futures, too.

“It’s gratifying training future health care professionals so that they have practical skills they can take into nursing or medicine or physical therapy,” he says. “And hopefully they find that love for anatomy and physiology along the way.”

## The Lightbulb Moment

Johnson, the education consultant, was always good at identifying changes in chemical reactions and figuring out the mass of molecules using Avogadro’s number. But for

her, early science education wasn’t just about the molecules and how they bonded. It was the people. When her tough-as-nails high school chemistry teacher showed her that women could be scientists, Johnson thought she might have more options. When her college professor, another woman, pulled her aside and told her, “Science is where you need to be,” she realized it was true.

Even when she was looking for PhD programs after college, Johnson chose the molecular physiology and biophysics program at Vanderbilt University because, during a recruitment poster session, she got a good feeling when talking with her eventual lab mates, even though physiology was a huge transition from chemistry.

“This group seems supportive,” she remembers thinking. “They talked to me like I was a person.” Plus, the lab had sent many graduates into industry, which is where she wanted to be.

But as she was finishing her PhD, her father got sick and she started to search for jobs closer to home. She interviewed for postdoctoral posts

but had to admit to herself that she needed a break from constant lab work. Then she saw that her alma mater, Beloit College, was looking for a visiting professor to teach physiology. She emailed her old college professor for intel. A few months later, she was covering for that professor who was now on sabbatical.

Before Johnson knew it, she was standing in front of a class of first-year college students buzzing with the excitement of new classes and new peers. Although terrified, her focus grew clear. She realized she had this feeling before, standing at center court for tip-off as a collegiate basketball player. The energy of the crowd was feeding her now, just as it had done in her athletic career.

Then she started talking. And explaining. And students started to respond. Now it wasn’t just a lecture. It was a conversation, one where, slowly, she started to see the ideas click into place in the students’ heads.

“I fell in love with it,” she says. “It was amazing.”

Suddenly, her love of people and of science came together. This was what she was meant to do, she says. She stayed at Beloit for 11 years, moving from visiting professor to associate professor to chair of biology, and from studying the endocrine system to studying how to teach physiology better. Today, she is the founder of Trail Build LLC, which helps academic institutions and professional societies implement evidence-based teaching programs, with an emphasis on STEM and creating educational programs that prioritize equity, diversity and inclusion.

“It’s all about students,” she says, “and being part of their journey.”





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## APS Members Elected to the Class of 2021 AAAS Fellows

The following APS members have been named to the Fellows of the American Association for the Advancement of Science (AAAS) Class of 2021. Fellows are elected to this lifetime distinction by their peers serving on the AAAS Council and include Nobel laureates and other scientists who have engaged in pioneering research, leadership, teaching or mentoring.

- **Charles Burant, MD, PhD**, professor of internal medicine, Dr. Robert C. and Veronica Atkins Professor of Metabolism, University of Michigan
- **Lorraine B. Ware, MD**, professor of medicine, pathology, microbiology and immunology, Vanderbilt University Medical Center, Nashville, Tennessee
- **Beth A. Habecker, PhD**, professor of chemical physiology and biochemistry, Oregon Health & Science University School of Medicine



## Zimmerman Receives Distinguished Scientist Award



**Matthew Zimmerman, PhD**, associate professor in the University of Nebraska Medical Center (UNMC) Department of Cellular and Integrative Physiology, received UNMC's Distinguished Scientist Award in February. The award recognizes the most productive researchers at

UNMC during the past five years. Zimmerman's research focuses on hypertension, with the goal of developing new antioxidant-based therapeutics to improve treatment. He has been an APS member since 2001. 📧



**REGISTER NOW!**

## An Invitation to the Institute on Teaching & Learning

Join APS this summer for the fourth APS Institute on Teaching and Learning (ITL). This in-person event will be June 21–24, 2022, in Madison, Wisconsin. Visit the website at [www.physiology.org/ITL2022](http://www.physiology.org/ITL2022) for details about registration, the preliminary program, abstract submission for posters and more.

ITL opens on Tuesday, June 21, with a featured workshop, "Scientific Communication through Improv: Talking about Tough Ideas," led by the Monkey Business Institute in Madison.

We are super excited that APS President Dee Silverthorn, PhD, FAPS, will be giving our keynote lecture later that evening. Plenary lectures and concurrent workshops, which will be held throughout Wednesday and Thursday, will cover topics such as inclusive and anti-racist teaching; mentoring and advising; assessment; helping students cope with failure in research; career transitions to teaching; and tools for teaching challenging physiology concepts. We have invited speakers and presenters from both within and outside of APS.

We end the week with a featured workshop, "Engaging Students and Identifying Barriers to Inclusion in Physiology Classrooms," led by Jeff Schinske, PhD, and Monica Cardenas Guzman. Questions about ITL? Email the conference organizers: Beth Beason-Abmayr, PhD, at [bbeason@rice.edu](mailto:bbeason@rice.edu) or Ryan Downey, PhD, at [ryan.downey@georgetown.edu](mailto:ryan.downey@georgetown.edu).



REGISTER NOW!

## Kidney Camp Returns in June

Join APS this summer for the Control of Renal Function in Health and Disease conference, also known as “Kidney Camp,” June 26–30 in Charlottesville, Virginia.

The conference, which is held in conjunction with the American Society for Nephrology, is the 12th in a series of conferences held every three years since 1989 on kidney research.

The conference will focus on novel areas of renal function and disease. Invited talks will emphasize unpublished data and current work, allowing attendees access to the latest developments in kidney research.

Invited speakers and conference chairs are geographically diverse, representing laboratories from around the world. This will allow for the exchange of new ideas and encourage opportunities for collaboration, thus ensuring viability of the field.

Students, postdoctoral fellows and junior faculty are highly encouraged to attend this conference. Workshops geared toward trainees will facilitate informal interaction and networking with colleagues.

Take advantage of the advanced registration by June 10. Registration ends June 17.

For more details, visit [www.physiology.org/KidneyCamp2022](http://www.physiology.org/KidneyCamp2022).

## american physiology summit

APRIL 20-23, 2023  
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NEW ANNUAL MEETING


## Save the Date for the New American Physiology Summit in 2023

With less than a year until the launch of the Society’s new annual meeting, the American Physiology Summit—to be held April 20–23, 2023—APS members are hard at work planning a stellar event.

In 2020, APS convened the Team 2023 Task Force—a group of APS member-leaders who represent the full scope of the organization—that was tasked with developing the framework for the meeting. Since then, the Physiology Summit Leadership Committee and the Program Working Group have been established to bring the framework set by Team 2023 to life, including setting a new programming timeline, organizing content from APS sections and interest groups, and more.

It’s a tall order, but the thoughtful, dedicated group of members who’ve volunteered to lead this work are seeing their efforts pay off. They are developing what promises to be an impressive slate of speakers and events. The first confirmed keynote will be 2021 Nobel Laureate David Julius, PhD. Jessica Meir, PhD, a NASA astronaut, also has been invited as a keynote speaker.

We’re also excited about providing a top-tier scientific program, an afternoon dedicated to trainees, wine and cheese poster sessions, and the location of Long Beach, California—where there’s an average of 210 sunny days each year!

What else can we do to make the meeting great? Email your ideas to [meetings@physiology.org](mailto:meetings@physiology.org). Stay on top of news about the Summit at [www.physiology.org/APS2023](http://www.physiology.org/APS2023). 

# DATES & DEADLINES

## AWARDS

**Julius H. Comroe Jr. Distinguished Lectureship of the Respiration Section** (May 14)

**Solomon A. Berson Distinguished Lectureship of the APS Endocrinology & Metabolism Section** (May 15)

**John F. Perkins Jr. Research Career Enhancement Awards** (May 31)

**Teaching Career Enhancement Awards** (May 31)

**Claude Bernard Distinguished Lectureship Award** (June 1)

**Ernest H. Starling Distinguished Lecture of the APS Water & Electrolyte Homeostasis Section** (July 1)

**Hugh Davson Distinguished Lectureship** (Apply anytime)

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

**More details:** [www.physiology.org/awards](http://www.physiology.org/awards)



## CALLS FOR PAPERS

**Cross-journal Call** (June 30, 2022)

- Inter-Organ Communication in Homeostasis and Disease

**Advances in Physiology Education** (May 31, 2022)

- Physiology Core Concepts

**American Journal of Physiology-Cell Physiology**

- Advances in GPCRs: Structure, Mechanisms, Disease and Pharmacology (June 1, 2022)
- Cellular and Tissue Clocks (June 30, 2022)
- Mathematical Modeling of Cellular Processes (June 30, 2022)
- Skin Homeostasis: Peptides, Hormones, Proteases and More (July 1, 2022)

**American Journal of Physiology-Endocrinology and Metabolism** (June 30, 2022)

- Deconstructing Organs: Single-Cell Analyses, Decellularized Organs, Organoids and Organ-on-a-Chip Models

**American Journal of Physiology-Gastrointestinal and Liver Physiology**

- Microbiome-based Therapeutics and Their Physiological Effects (May 1, 2022)
- Adaptations of Physiologic Systems to Promote Cancers (June 1, 2022)

**American Journal of Physiology-Heart and Circulatory Physiology**

- Considering Sex as a Biological Variable in Cardiovascular Research (May 31, 2022)
- Myocardial Ischemia and Inflammation (May 31, 2022)
- Deconstructing Organs: Single-Cell Analyses, Decellularized Organs, Organoids and Organ-on-a-Chip Models (June 30, 2022)
- Getting It Right (no expiration)

**American Journal of Physiology-Lung Cellular and Molecular Physiology** (June 30, 2022)

- Lung Diseases in Reverse Translation: Bedside to the Bench



## MEETINGS & EVENTS

**APS 2022 Institute on Teaching and Learning**

Conference dates: June 21–24, 2022, Madison, Wisconsin

- Advance registration deadline: June 3
- Registration deadline: June 10

**More details:** [www.physiology.org/ITL2022](http://www.physiology.org/ITL2022)

**2022 Control of Renal Function in Health and Disease Conference**

Conference dates: June 27–30, 2022, Charlottesville, Virginia

- Advance registration deadline: June 10
- Registration deadline: June 17

**More details:** [www.physiology.org/KidneyCamp2022](http://www.physiology.org/KidneyCamp2022)

**American Journal of Physiology-Regulatory, Integrative and Comparative Physiology** (June 30, 2022)

- Deconstructing Organs: Single-Cell Analyses, Decellularized Organs, Organoids and Organ-on-a-Chip Models
- Don't Deny Your Inner Environmental Physiologist: Investigating Physiology with Environmental Stimuli

**American Journal of Physiology-Renal Physiology** (May 31, 2022)

- Renal adaptations in pregnancy, maternal health disorders and women's health

**Journal of Applied Physiology** (June 30, 2022)

- Long-term Recovery from SARS-CoV-2 (COVID-19)
- Physical Activity and the Brain

**Physiological Genomics**

- Comparative Physiological Genomics (June 1, 2022)
- Gene and Cell Therapy (June 30, 2022)
- Methods for Omics Technologies (June 30, 2022)
- Omics of Sex Differences (June 30, 2022)
- Omics of Viral Infection (June 30, 2022)
- RNA Vaccines for Disease (June 30, 2022)

**More details:** [www.journals.physiology.org/calls](http://www.journals.physiology.org/calls)



## WEBINARS

**JustPhysiology: Human Physiology Simulation Software Designed for Students** May 11, 2022

**APS-Abc Biopply 3D Cell Culture** May 26, 2022

**APS Respiration Section-SCIREQ Plethysmography Tutorial** June 1, 2022

**APS-Heartseed Industry Research Spotlight** June 8, 2022

**APS-Alzet Osmotic Pumps** June 16, 2022

### APS CARDIOVASCULAR WEBINAR SERIES

**Cardiovascular Pathophysiology in the Setting of Spinal Cord Injury** May 4, 2022

**Vascular Contributions to Dementia** May 18, 2022

**COVID-19, Endotheliitis and Long-term Cardiovascular Effects** June 7, 2022

**Moving for a Better Beat: How Exercise Benefits the Heart** June 22, 2022

### DIVERSITY, EQUITY AND INCLUSION WEBINAR SERIES

**Exploring Diversity, Equity and Inclusion (DEI) in Science** June 15, 2022

**More details:** [www.physiology.org/webinars](http://www.physiology.org/webinars)





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# The Making of an Educator

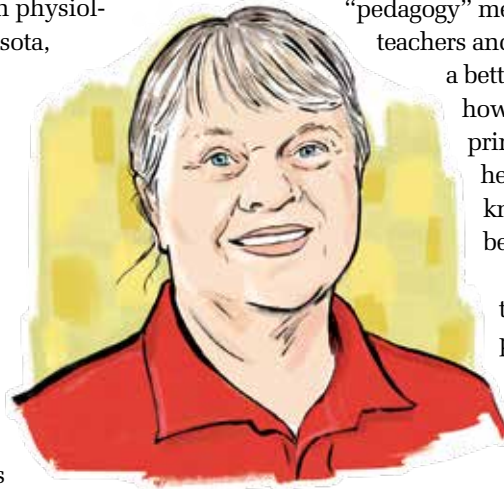
BY BARBARA E. GOODMAN, PHD, FAPS

“Before my involvement with the APS summer research teacher programs, I barely knew what ‘pedagogy’ meant.”

I was a classically trained PhD student in the 1970s. As a graduate student in physiology at the University of Minnesota, I was required to be a teaching assistant for three out of every four quarters during my five years. I completed a six-year postdoctoral research experience at UCLA, where I voluntarily taught in medical student laboratories and as an adjunct professor in the nursing program. When I began my academic position here at the University of South Dakota (USD) in 1986 as a respiratory membrane transport physiologist with my own laboratory, I taught general and membrane transport physiology to the medical students.

Despite consistent assignments and requirements to teach, none of my early experiences involved any educational classes or special training in teaching. In 1990, I became involved in APS education initiatives, first as one of the inaugural research hosts for APS’ first class of high school summer research teachers. I also supported APS K–12 initiatives by writing small grants and curricula for local outreach teams, leading training for K–12 teachers throughout South Dakota and in Montana reservation communities, and serving as a physiologist-in-residence at four APS Science Teaching Forums. In 2000, I volunteered to be the scientist-in-residence for our school district to facilitate bringing university experts into the classrooms.

Thus, I was thrilled to participate in APS’ Physiology Understanding (PhUn) Week when it began in 2005. I conducted physiological activities and experiments in seventh grade classrooms and helped my advanced human physiology under-



graduate students design and teach renal physiology modules to high school students. I also served as a member and chair of the APS Education Committee and as a member and chair of the APS Communications Committee, which worked to help scientists better communicate with non-scientists. These experiences have all helped me hone my professional and mentoring skills.

Before my involvement with the APS summer research teacher programs, I barely knew what “pedagogy” meant. I learned from the K–12 teachers and APS activities how to be a better educator. I also learned how to explain physiological principles to non-scientists and help them understand what is known and what still needs to be investigated.

PhUn Week taught me how to be creative in teaching physiology to middle school students and spark their love for the discipline. It was great to see my seventh graders again when they were in the high school anatomy and physiology class and then when some of them became undergraduates at USD.

I have grown dramatically as a science communicator and educator by interacting with students from age three to high school and with their teachers. The wide variety of physiology teaching opportunities have brought a different depth and dimension to how I teach my undergraduate and graduate students. They have transformed how I teach advanced human physiology to undergraduate pre-professional students, helping me apply numerous student-centered learning opportunities in renal, respiratory, cardiovascular, neuromuscular, endocrine and gastrointestinal systems.

If you and your trainees want to improve your science communication skills, I recommend visiting a second grade classroom to explain how the heart works! ♡

**Barbara E. Goodman, PhD, FAPS, is professor in the Division of Basic Biomedical Sciences of Sanford School of Medicine of the University of South Dakota in Vermillion. She has been an APS member since 1979 and is editor-in-chief of *Advances in Physiology Education*.**

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