

THE Physiologist MAGAZINE

JANUARY 2026

Safer to Sleep

Researchers are
uncovering the causes of
SIDS, hoping to prevent
deaths of at-risk infants.





Register Now to Save Up to 38%

Don't miss the opportunity to make vital connections and expand your network at the 2026 American Physiology Summit.

Come together with leaders in your field to share the most recent advances and breakthroughs impacting the research community and the world around us.

APS members who register early receive the best rate. Explore the schedule and register today at physiology.org/APS2026.

Early Registration Deadline: Jan. 30

american physiology summit

**APRIL 23–26, 2026
MINNEAPOLIS**

CONTENTS

FEATURES



16



22



26

16

Safer to Sleep

Researchers are uncovering the causes of SIDS, hoping to prevent deaths of at-risk infants.

BY TYLER SANTORA

22

Teaching in the Age of AI

Professors are beginning to embrace artificial intelligence as a new tool in their teaching playbook.

BY SUCHI RUDRA

26

Science That Serves

Tracy Bale has shaken up her lab to focus on how research discoveries can impact people.

BY DARA CHADWICK

CONTENTS

DEPARTMENTS

THE EDITOR'S DESK

4 A Roman Reset

IN REVIEW

RESEARCH UPDATES

6 Highlights from APS journals.

LAB NOTES

MENTORING Q&A

8 Handling Uncertainties

How to navigate life's unexpected challenges.

STREAMING SCIENCE

10 Born to Count

POLICY IQ

11 Top 5 Advocacy Moments in 2025

UNDER THE MICROSCOPE

12 Running Toward a Career

Researcher's desire to move faster leads to exercise and aging work.

PUBLISH WITH POLISH

13 One Year Open and Counting

With enough support, 2026 can be another year of open access.

IN DEPTH

14 Facing Aging Head-on

Reflecting on a 45-year career, Luigi Ferrucci sees reason for optimism in the quest for healthy aging.



NEWS FROM THE FIELD

31 APS launches national campaign to highlight physiology; Society names new Fellows of APS and Porter Fellows; APS announces election candidates; and more.

DATES & DEADLINES

34 Calls for awards and papers and upcoming events and webinars.

THE LAST WORD

36 Lab Limits Lead to Determination

Douglas R. Seals, PhD, met unconventional challenges decisively to build a successful career.



Submit Your Late-breaking Abstract

There's still time to present your research at the 2026 American Physiology Summit (#APS2026). Submit a late-breaking abstract to participate in our lively poster receptions, where your peers are sharing discoveries on the cutting edge of bioscience.

A late-breaking abstract should contain either:

- New information that was not yet known or fully available by the on-time abstract submission deadline.
- Findings that are of high scientific impact that are especially newsworthy and deserving of consideration.

Submit your late-breaking abstract at physiology.org/APS2026.

**Late-breaking Abstract Submission
Deadline: Feb. 2**

**american
physiology
summit**

**APRIL 23–26, 2026
MINNEAPOLIS**

A Roman Reset

BY AMANDA BERTHOLF, MA



January wasn't always the first month of the year. The first Roman calendar had 10 months, beginning in March. The idea of starting the year fresh in the dark of winter came later. In 45 B.C., the Julian calendar started the new year on January 1, the day the executive branch took office in ancient Rome. Now the day marks, for many of us, a time to pause, check in with ourselves, carry forward what matters most and leave behind what doesn't.

As I look back on 2025, it's awesome to see what this community has accomplished together. We launched Physiology: The Science Life Depends On campaign to elevate the discipline's visibility (read more on page 31). We expanded access to research in APS journals through the successful launch of

the Subscribe to Open publishing model—momentum we hope to carry into 2026 (read more on page 13). And we made a commitment to advance women's health research through conferences, calls for

papers and national partnerships.

These accomplishments reflect the strength of our community. Across the discipline, physiologists continue to tackle urgent, complex problems that affect real lives. That is evident in the stories we're telling this month.

Our cover story focuses on a blunt, sad fact: Every year in the U.S., about 1,500 infants die in their sleep from sudden infant death syndrome (SIDS). Researchers now believe SIDS isn't one condition, but a group of underlying

diseases that cause a baby to stop breathing or their heart to stop. In the article on page 16, we talk to researchers who are working to uncover the causes of SIDS—and save lives.

Artificial intelligence (AI) is an ongoing, frequent topic of conversation in many facets of our lives today. The feature on page 22 looks at the opportunities AI might bring to the physiology classroom in undergraduate and graduate programs. Becoming AI literate is going to become a critical part of college education, and we talked to educators who are kick-starting these conversations with colleagues and students.

In this month's profile, on page 26, we are thrilled to introduce the opening keynote speaker for the American Physiology Summit, Tracy L. Bale, PhD. Bale grew up in a small town in Minnesota that was just down the road from the acclaimed Mayo Clinic, so science was infused in her upbringing. Her path eventually led to her becoming a neurobiologist, sex differences researcher, and the first woman president of the International Brain Research Organization. Her keynote at the Summit will focus on the importance of studying sex differences in research and how physiologists can share their findings in an accessible way with the public and policymakers.

As 2026 takes off, I hope this issue reminds you of the power of your work. And as our team looks ahead, we'd love to hear from you. What should we explore in future issues? What stories have stuck with you? Let us know!

Amanda Bertholf, MA, is APS director of communications and the editor-in-chief of *The Physiologist Magazine*. Send questions or comments to the editor at tphysmag@physiology.org.

“Across the discipline, physiologists continue to tackle urgent, complex problems that affect real lives. That is evident in the stories we’re telling this month.”

THE Physiologist MAGAZINE

VOL. 69 | JANUARY 2026

Scott Steen, CAE, FASAE

*Publisher
Chief Executive Officer*

Meeghan De Cagna, MSc, CAE

*Associate Publisher
Chief Program Officer*

Amanda Bertholf, MA

*Editor-in-Chief
Director of Communications*

Melanie Padgett Powers

Managing Editor

FREELANCE WRITERS

Dara Chadwick, Anne Frances Johnson, Suchi Rudra, Tyler Santora

CONTRIBUTORS

Kathleen Beaulieu; Brooke Bruthers; Audra Cox, PhD, ELS; Kristin Dougher, MBA; Mark Eichelberg, PhD;
Kirsten Gossett; Alissa Hatfield, MS; Coleen Kitaguchi; Rebecca Osthus, PhD; Erica Roth, MS

DESIGN

Latham Creative, LLC

CONTACT US

The Physiologist Magazine is distributed to members as part of their membership. For non-member subscription information or to update your contact information, email subscriptions@physiology.org.

tphysmag@physiology.org | 301.634.7118 | physiology.org/magazine

The Physiologist Magazine (ISSN 0031-9376) is published six times a year by the American Physiological Society (APS), 6120 Executive Blvd., Suite 575, Rockville, MD, 20852-4911. Copyright © 2026 by the American Physiological Society. No part of this publication may be reprinted or reproduced without the publisher's permission. APS assumes no responsibility for the statements and opinions advanced by contributors to *The Physiologist Magazine*.



APS BOARD OF DIRECTORS

Robert L. Hester, PhD, FAPS

*President
University of Mississippi
Medical Center*

Timothy Musch, PhD, FAPS

*Past President
Kansas State University*

Sue C. Bodine, PhD, FAPS

*President-elect
Oklahoma Medical Research
Foundation*

Paul Welling, MD

*Treasurer
Johns Hopkins Medical School*

Scott Steen, CAE, FASAE

*Secretary and Chief Executive Officer
American Physiological Society*

Michael Caplan, MD, PhD, FAPS, Yale School of Medicine; Robert A. Fenton, PhD, Aarhus University; Karla Haack, PhD, Merck;
Patricia A. Halpin, PhD, FAPS, University of New Hampshire; My Helms, PhD, University of Utah School of Medicine;
Beth A. McCormick, PhD, University of Massachusetts Chan Medical School; Farah Sheikh, PhD, University of California San Diego;
Michael Sturek, PhD, FAPS, CorVus Biomedical LLC and CorVUS Foundation Inc.; Gina Yosten, PhD, Saint Louis University

CONFERENCE ABSTRACT

How Exercise Shapes Vascular Health in Endometriosis

Endometriosis is thought of as a reproductive disorder, but research shows it also impairs vascular function and raises the risk of cardiovascular disease. Surgery to remove endometrial tissue from the pelvic cavity is the standard treatment and has been found to improve blood vessel health, but it is not a cure. In a case study, researchers followed one young woman for over a year after she had excision surgery. They looked at how well her vessels responded to signals that promote vasodilation—but also tracked her exercise habits. While surgery alone didn't fully restore her vascular function, it improved dramatically when she walked regularly and performed resistance exercises. These findings suggest exercise may be just as critical as surgery in protecting heart and vessel health in people with endometriosis.

Source: Auni Williams, PhD, et al. "Longitudinal Measurements of Nitric Oxide-mediated Vasodilation and Physical Activity over One Year Following Endometriosis Excision Surgery: A Passive Experiment." *New Trends in Sex Differences and Women's Health Research*, 2025



All images: iStock

CONFERENCE ABSTRACTS | IN BRIEF

Spotlight on Women's Health

Highlights from research abstracts presented at the APS New Trends in Sex Differences and Women's Health Research Conference.



Specialized cognitive behavioral therapy helps improve insomnia and interference of hot flashes on daily life in peri- and postmenopausal women.

Source: Emily Arentson-Lantz, PhD, et al. "Cognitive Behavioral Therapy for Menopausal Insomnia (CBT-MI) Improves Insomnia Severity and Vasomotor Symptoms in Peri- and Postmenopausal Women."



Though both men and women feel happier after a virtual reality exercise session, men have a bigger boost in mood.

Source: Alexis B. Jones, PhD, et al. "Sex Differences in Affective Responses to a Single Session of Virtual Reality Exercise."



People with HIV show sex differences in alcohol and cannabis use and strong relationships among substance use, pain and negative emotions.

Source: Stephanie (Sumin) Lee, et al. "Alcohol and Cannabis Use in Relation to Pain and Negative Affect in People with HIV."

CONFERENCE ABSTRACT



Atherosclerosis Hits Differently in Women

Recent research shows men and women experience atherosclerosis very differently at the blood vessel level. In studies of rodent and human cells, female vessels—despite having healthier cholesterol levels—accumulated more fat in the arteries and developed less stable plaques. Female blood vessel cells also showed higher stress, were less able to form new vessels, and were more prone to inflammation and cell death than male cells. Plaque development followed different patterns in females. These findings highlight that women's blood vessels respond differently in atherosclerosis, pointing to the importance of considering sex as a biological variable in cardiovascular research.

Source: Jonnelle Edwards-Glenn, PhD, et al. "Sex Differences in Atherosclerosis: Divergent Vascular Function as a Central Mechanism." *New Trends in Sex Differences and Women's Health Research*, 2025

CONFERENCE ABSTRACT

Aspirin Might Help Protect Against Preeclampsia

High cholesterol during pregnancy is a normal physiological process, but very high levels can increase the risk of preeclampsia, a dangerous complication linked to imbalances in placental growth factors. One key marker is the ratio of the protein sFlt-1, which can block blood vessel growth, to placental growth factor (PlGF), which promotes it. However, it's not clear how having abnormally high cholesterol during pregnancy affects these placental signals. In a study, researchers found that rats with very high cholesterol led to higher sFlt-1 levels in the mother's blood and an increased sFlt-1/PlGF ratio, signaling higher risk. Low-dose aspirin reduced sFlt-1 levels and restored a healthier balance. Notably, male and female placentas acted differently: Male placentas were the main source of the sFlt-1 rise, while female placentas showed different growth factor changes. These results suggest that the simple addition of aspirin may help correct placental signaling in people with very high cholesterol during pregnancy.

Source: Amanda De Oliveira, PhD, et al. "Excessive Hypercholesterolemia in Pregnancy Induces an Angiogenic Imbalance that Is Improved by Low-dose Aspirin Treatment in Rats." *New Trends in Sex Differences and Women's Health Research*, 2025



Males and females show differences in blood pressure and oxidative stress in the heart in response to early-life stress, increasing heart disease risks.

Source: Jonna Smith, et al. "Early-life Stress During Weaning Induces Sex Differences in Blood Pressure, Autonomic Activity and Cardiac Oxidative Stress and Nitric Oxide Bioavailability."



Resistance training, especially combined with aerobic exercise, helps people with Type 2 diabetes build strength, improve fitness and lower heart disease risk.

Source: Hannah E. Cabre, PhD, RDN, et al. "Sex Differences in Muscle Strength and Cardiometabolic Adaptations to a Nine Month Exercise Intervention in Adults with Type 2 Diabetes."



Research finds estrogen predicts muscle strength maintenance with aging, and hormone replacement therapy helps further preserve strength in older females.

Source: Rachel Logue Cook, PhD, et al. "Strength, Sex Hormones, and the Protective Effect of Hormone Replacement Therapy in Females with Aging."



Females have smaller airways and more inhaled particle deposits in the lungs than males. These findings are important for inhaled medicines and air pollution.

Source: Merryn Tawai, PhD, et al. "Sex Differences in Aerosol Drug Deposition: Structure-Function Modeling Reveals Female Predisposition to Higher Therapeutic Uptake."

LABNOTES

MENTORING Q&A YOUR QUESTIONS ANSWERED
STREAMING SCIENCE APS JOURNAL PODCASTS
POLICY IQ PHYSIOLOGY ON THE HILL AND IN THE HALLS
UNDER THE MICROSCOPE OUR MEMBERS, UP CLOSE
PUBLISH WITH POLISH BUILD A BETTER RESEARCH PAPER
IN DEPTH DIVING DEEP INTO SCIENCE
STATS & FACTS PHYSIOLOGY BY THE NUMBERS



Viet Dinh



Manda L. Keller-Ross, PhD, DPT, PT

MENTORING Q&A | FUTURE PLANNING

Handling Uncertainties

How to navigate life's unexpected challenges.

Each issue, we ask a student or early-career member to pose their career questions to an established investigator and mentor. Here, **Viet Dinh**, a PhD candidate in integrative physiology at University of North Texas Health Fort Worth, asks **Manda L. Keller-Ross, PhD, DPT, PT**, about how to handle uncertain times as a trainee. Keller-Ross is an associate professor in the Division of Physical Therapy and Rehabilitation Science within the Department of Family Medicine and Community Health at the University of Minnesota Medical School.

Q: There has been discussion among scientists about our need to improve scientific communication with the public. How can we do that?

A: Our lab has been working on this for three to four years. There are things we can do, like hold events at local health fairs and festivals, where you set up a booth to talk about your research with the community. Also, it is important to have an “elevator pitch” to convey your research—how you might explain your work to your friend who has no scientific background in two minutes or less.

“It is a challenging time for all. The No. 1 thing to incorporate during these times is joy.”

If you do human research, another thing you can do is share your findings with the research participants. Write an easy-to-understand summary of your research and attach it to the publication with a thank-you note.

Q: We have all been living under this period of uncertainty when it comes to the scientific community and the government. Do you have any advice on how scientists, particularly trainees, can combat these uncertainties?

A: It is a challenging time for all. The No. 1 thing to incorporate during these

times is joy, whether that is driving your research harder, taking more time to exercise, spending more time with family or friends, or engaging in a new hobby. We have to keep ourselves moving and engaged.

This is also a time when we can become creative within our own research. My current focus is on women’s health, and these uncertain times are forcing me to consider alternative approaches to answer my research questions. Be as open and flexible as you can to different opportunities. This may involve

meeting and speaking with scientists at conferences, visiting conference vendors to discuss careers in non-academic spaces, and opening new conversations with your mentor(s).

Q: What advice do you have for a trainee seeking a non-academic career path?

A: Industry or science policy are excellent career paths. We need strong scientists in these spaces. Regardless of the path, I would give three pieces of advice: Talk with people in those spaces to get different perspectives on what it is like to work in

those environments. Be sure the career choice is in line with your values and passion and what you envision for your future self. And remember that nothing is ever permanent; if the position does not suit you for whatever reason (academic or non-academic), it is up to you to create the change.

Q: What drives you?

A: What initially drove me into my PhD was the scientific inquiry. I enjoyed asking questions and then designing a study to answer those questions. Now, it is serving the needs of the community. I talk to many women who are not receiving menopause education from their health care providers. I enjoy conducting research in aging women’s health, partly because there are so many unanswered questions, but also because women suffer with increased prevalence of chronic disease after menopause. Once we understand the mechanisms contributing to these diseases and the role of menopause versus age, we can develop more promising preventive treatment, as well as therapeutics, to improve the health and well-being of women.

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

STATS & FACTS

Sudden unexpected infant deaths by cause of death in 2022:

41%: Sudden infant death syndrome (SIDS)

31%: Unknown cause

28%: Accidental suffocation and strangulation in bed

Centers for Disease Control and Prevention (CDC)

1,529

infants died from SIDS in 2022.

CDC

Highest SIDS rates: Mississippi, Arkansas, Alabama, Louisiana and South Dakota

Lowest SIDS rates: Massachusetts, California, Minnesota, New Jersey and Utah

CDC

90%

of SIDS cases occur in the first six months of life.

National Institute for Children’s Health Quality

STREAMING SCIENCE | SOUNDBITES FROM APS JOURNAL PODCASTS

Born to Count

From infants to renowned mathematicians, our brains are wired for numbers. Even 2-day-old newborns can tell the difference between four dots and eight dots. In this *Physiological Reviews* podcast episode, neuroscientist Andreas Nieder, PhD, shares how the brain processes numbers—starting with an innate sense of quantity and building toward symbolic math. He explores the neural basis for counting, arithmetic and our understanding of zero, which he says is “rather like the eccentric uncle in the series of numbers.” From single neurons tuned to specific quantities to broader implications for dyscalculia, this episode dives into mathematical reasoning and weaves together neurobiology, comparative physiology and neurophysiology.

Catch the full podcast episode and explore the *Physiological Reviews* article behind the discussion:



Top 5 Advocacy Moments in 2025

APS members spoke up throughout the year, calling for more support and funding for science.

From changes to how federal research funds are awarded to delays in peer review, the past 12 months have brought unprecedented challenges to the U.S. scientific enterprise. Through it all, physiologists have remained committed to advancing their research and training the next generation of scientists. At the same time, APS members upped their advocacy game, bringing the perspective of the physiology community to Capitol Hill and the federal government at every opportunity. Here is what they have been up to:

1 Taking to the Hill. In April, just before the American Physiology Summit in Baltimore, members and staff traveled to Washington, D.C., to participate in 84 meetings with congressional offices representing 30 states. Members shared firsthand how federal funding for scientific research supports their work, leading

to economic and health benefits for all Americans. They also shared how pending policy changes at federal research agencies could jeopardize the future of science, particularly by threatening the pipeline of the next generation of researchers.

2 Sending thousands of messages to Congress. Using APS Action Alerts, physiologists sent more than 3,000 messages to Congress urging lawmakers to protect biological and biomedical research. These messages reached offices from all 50 states and Washington, D.C.

3 Rallying for medical research. In September, APS President Robert Hester, PhD, FAPS; President-elect Sue Bodine, PhD, FAPS; and Chief Science Advisor Dennis Brown, PhD, FAPS, joined staff and over 400 advocates from across the medical research community to represent

the physiology community and advocate for more funding for the National Institutes of Health (NIH).

4 Advocating for humane animal research. As NIH announced plans to prioritize human-based research technologies and reduce the use of animals in research, APS wrote to Director Jay Bhattacharya, MD, PhD, and Congress to raise concerns about restricting the use of animal models in research. Emphasizing that physiologists use a variety of models to explore complex biological questions, APS urged NIH to continue funding the most appropriate experimental models for the research being proposed, whether those are animal models or novel alternative methods.

5 Supporting women's health research. As part of the Society-wide initiative on women's health research, APS shared messages in support of additional funding for this area of research at NIH. APS also joined the new Milken Institute's Women's Health Network, which will coordinate future stakeholder efforts to advance this work.

BY THE NUMBERS

APS Advocacy in Action

114

Capitol Hill meetings

86

APS members and staff involved in Hill visits

31

states represented in Hill visits

3,172

action alert messages sent

50

states and Washington, D.C., reached through action alerts

10

policy comments and letters issued on behalf of APS

12+

coalition letters APS was a part of

Stay Informed

View statements and letters issued by APS:
physiology.org/policypositions

Learn how to get involved: physiology.org/getinvolved

UNDER THE MICROSCOPE | EXERCISE PHYSIOLOGY

Running Toward a Career

Researcher's desire to move faster leads to exercise and aging work.

Kevin Gries, PhD, is an assistant professor of physical therapy at Concordia University of Wisconsin. His research interests focus on understanding how best to use exercise as medicine, particularly to combat sarcopenia and metabolic diseases.

FASTER RUNNING, HEALTHY AGING. I wanted to learn how I could become a better runner. In high school, I read papers and used various ergogenic aids and training plans to become faster.

This continued in college as an exercise physiology major. When I realized I eventually needed a job to pay the bills, I finally got serious about my career. I participated and assisted in as many studies as I could and decided I wanted to be a scientist. It's really cool how hard people have to work by exercising just to turn on and off genes to make these tiny organelles called mitochondria that have such an impact on health and performance. As I study the exercise response now, my focus is

more on aging. As I—and the general population—get older, my work helps public health and achieves my personal goals for learning how I can age healthier.

FALL BREAK MISTAKE. During a fall break early in my PhD training, very few people were in the lab. I was

practicing tying single muscle fibers under the microscope. I really struggled learning this skill. I finally did this successfully when Dave Costill, PhD—a giant in exercise physiology—walked in. I was so excited to tell him I did it. He suggested I take the muscle fiber off and do it again. I tried again, but I broke the motor arm off the equipment. My adviser later showed me the bill to fix the equipment and told me (lovingly) that it was an expensive learning opportunity. It was here that I learned to not let your highs get too high or lows get too low.

MEETING A LEGEND.

I would want to meet August Krogh. He was instrumental in our understanding of oxygen diffusion and won the Nobel Prize in Physiology or Medicine in 1922. He was extremely influential in developing equipment and fields within physiology (exercise physiology and experimental physiology). From a personal perspective, I think it is interesting how closely he worked with his wife, Marie. Additionally, he published papers referred to as the “7 Little Devils” refuting his PhD adviser, Christian Bohr. It would be interesting to hear how Krogh politically managed that situation.

CREATIVE PUZZLE-SOLVING.

Brainstorming with other faculty and students on dream projects is my favorite part of my job. I love sitting down with a bunch of data that originally doesn't make sense and then making sense of it. Both tasks allow you to be creative and learn from others' perspectives to put together the puzzle pieces to make sense of a problem.

“As I—and the general population—get older, my work helps public health and achieves my personal goals for learning how I can age healthier.”

A BROAD FIELD. One of the misconceptions of physiology is that thinking that because we know a lot about one area means we know a lot about another area. Physiology is an extremely broad term. How each organ interacts with another is very complex. It is just not possible to know everything about physiology. Therefore, if we do not know the answer to something, it doesn't mean our entire education or advice is invalid. Physiology is just too complex for one person to know everything.

Do you know someone we should meet? Email us at tphysmag@physiology.org and tell us more.



Gries, in the middle, gives Wisconsin Rep. Glenn Grothman a tour of the Exercise Physiology Lab at Concordia University of Wisconsin.

PUBLISH WITH POLISH | OPEN ACCESS

One Year Open and Counting

With enough support, 2026 can be another year of open access.



The first year of APS' Subscribe to Open (S2O) was a success. All 10 of the Society's participating research journals met their targets, making every article in their 2025 volumes available as open access under a Creative Commons license. Now, as we look ahead at 2026, continued support of subscribers, authors and members will be essential to sustaining the momentum.

What Makes S2O Work

S2O makes science more accessible, transforming annual library subscriptions into a model that supports open access. If enough institutions and libraries renew their subscriptions each year, the journal's content is made

open access for that subscription year. If the subscription threshold isn't met, the journal remains accessible to subscribers only.

Institutions that subscribe to the APS Digital Library are guaranteed open access for their corresponding authors in all 10 APS S2O journals, even if the thresholds are not met. This ensures subscribing institutions can support their researchers' open access goals. Check your institution's subscription status and whether it qualifies for the open access guarantee using APS' Institution Lookup Tool at journals.physiology.org/s2o-lookup. Type in your institution's name and see if it's an APS Digital Library subscriber.

Advocate for your Library to Join S2O

If your institution does not qualify you for a guarantee, it's not too late for libraries to subscribe. Contact your library and encourage them to subscribe to the APS Digital Library. Authors and readers are powerful advocates, and your voice matters. Help promote S2O by being an ambassador for APS and sending a personalized note to your library. You can find a sample letter at journals.physiology.org/mailler.s2o.

Why Member Support Matters

Members play a vital role in sustaining the S2O model. Whether you're publishing with us, reviewing for a journal or simply spreading the word—your voice matters. APS journals are committed to reinvesting into the research community we serve. S2O represents a strong part of that commitment by centering on financial sustainability and affordable publishing solutions for the physiology community.

Tell your colleagues that publishing with APS means supporting a fairer, more accessible future for science. Encourage your institution to renew its subscription—or join the APS Digital Library for the first time. Together, we can build another successful year of open access publishing in 2026.

STATS & FACTS

86%

of students use artificial intelligence (AI) in their studies; 54% use it weekly, and nearly 1 in 4 use it daily.

Digital Education Council Global AI Faculty Survey 2025

Forty percent of faculty feel they are just beginning their AI literacy journey, and 17% feel they are at an advanced or expert level.

Digital Education Council Global AI Faculty Survey 2025

49%

of faculty worry about bias in AI models.

Elucian AI in Higher Education Survey 2024

35%

of students want their university to create a space for open discussion about AI's risks and potential.

Student Voice Flash Survey, July 2025



IN DEPTH | EPIDEMIOLOGY

Facing Aging Head-on

Reflecting on a 45-year career, Luigi Ferrucci sees reason for optimism in the quest for healthy aging.

Luigi Ferrucci, MD, PhD, is scientific director at the National Institute on Aging, part of the National Institutes of Health. As a geriatrician and epidemiologist, he has spent his career probing the root causes of aging-related disease and disability.

What sparked your interest in aging?

Early in life, I had an important encounter by serendipitous chance. This person talked to me about the value of life, and I told him I wanted to do something important, something that has social value. He told me that if you want to do something for others, you need to study aging

because aging is already happening, and it's going to change everything in the world. At that time, people were not thinking about aging because it was a young, post-war period. Now, every time you go to the *New York Times*, you find an article on longevity or healthy longevity.

I went to medical school, and I became a geriatrician.

Eventually, I led a group of geriatricians that were mostly working with older patients after stroke. We were working with a patient for hours, days, sometimes weeks. We would help them to walk again, send them home, and they would be back after a couple of weeks, unable to walk. We had very, very difficult successes that were short-lived.

I went to the London School of Hygiene and Tropical Medicine, where there are fantastic epidemiologists who have been luminaries in the field. They injected in me this idea of being an epidemiologist ... and I went to the United States. That is how I switched from being a geriatrician to being an epidemiologist.

How has our understanding of aging changed?

The shift has been conceptual. Medicine is accustomed to thinking in terms of organs—the cardiologist, the urologist, the gynecologist—and they all work separately, and they think that the body is broken into multiple parts. The geriatrician was the one that was pulling

all these things together. So, if we could study the mechanisms of aging and slow down aging, we could prevent not just one disease, but many at the same time.

When I came to the National Institute on Aging, I became the director of the Baltimore Longitudinal Study on Aging. As our technical approach improved, we realized that it was difficult to separate disease from aging because

“Aging does not occur at age 65. There’s emerging evidence that the quality of your aging has a profound root in your young age.”

the same changes occur in the tissue or molecular level—there was a continuum between aging and disease. Then people started to identify what the mechanisms of aging are, and they called them the hallmarks of aging.

A second inflection point is when Steve Horvath published on the epigenetic clock, which is when you look at specific locations in DNA and their percent methylation, you can derive a number that approximates age beautifully. That was the first time we had a biological clock. It was a revolution. We had the evidence that there was something that was changing systematically with aging.

How have these developments affected views on aging?

People are starting to understand that aging does not occur at age 65. There’s emerging evidence that the quality of your aging has a profound root in your young age. For example, if you are eating junk, that junk doesn’t just disappear—it leaves a kind of echo in your body. That is finally gaining attention, which is important at the population-health level.

More progress needs to be done, for example, to uncover how the stress response mechanism affects our health. But the fact

that the topic of aging is present in the media is important. We were kind of hiding from aging, and we don’t do that anymore.

What do you see as exciting opportunities for the field?

One of them is the power of big data. People are creating

databases with biological information from millions of people, and these data can be aggregated. New hints of what is causing this decline of physical and cognitive function are emerging, and new targets are emerging. There is enthusiasm for how artificial intelligence can dig into those data and find the biology we don’t know about.

We are only scratching the surface of the complexity of how our organism remains stable in spite of the millions of damages that occur every day. That to me has enormous potential for development and clinical application. For example, maybe we can find aspects of inflammation that can be modulated to optimize the effects on health.

The other thing that is exciting is that we’re witnessing a revolution in microscopy where we can actually see molecules. With cryo-electron microscopy, we can see molecules, and then with other techniques we can see the molecule moving from one place to another within the cell. Where before we were stuck in a static model, we can now understand the dynamics of what’s happening over time.

Interview conducted by science writer Anne Frances Johnson. Send questions or comments to tphysmag@physiology.org.

STATS & FACTS

93%

of higher education staff expect to expand their AI use.

Ellucian AI in Higher Education Survey 2024

Forty-six percent of students think their college or university should offer training on how to use AI tools professionally and ethically, and 37% think their college or university should provide clearer guidance on ethical use of AI tools.

Student Voice Flash Survey, July 2025

59%

of higher education leaders report increased cheating with the use of AI.

AAC&U/Elon University Survey of Higher Education Leaders 2024

“AI isn’t just about cheating. For some students, it’s like having a 24/7 tutor.”

Student Voice Flash Survey Respondent, July 2025

61%

of faculty have used AI in teaching, but 88% do so minimally.

Digital Education Council Global AI Faculty Survey 2025

FROM THE EXPERTS

Game Changers

Luigi Ferrucci, MD, PhD, was a Game Changer speaker at last year’s American Physiology Summit. Check out the list of 2026 Game Changer topics and the speakers at [physiology.org/gamechangers](https://www.physiology.org/gamechangers).



Safer to Sleep

Researchers are uncovering the causes of SIDS, hoping to prevent deaths of at-risk infants.

BY TYLER SANTORA

Every year in the United States, about 1,500 infants go to bed but never wake up. These unexplained deaths—many in babies who appear perfectly healthy—are caused by sudden infant death syndrome (SIDS), which kills more children ages 1 month to 1 year than anything else. But scientists are only just beginning to understand what happens physiologically to cause SIDS.

Before the 1950s, experts thought that babies who passed away during sleep died from accidental suffocation. Consensus shifted blame to natural causes in the 1970s, when scientists began researching risk factors related to SIDS. A new era began in 1994 when the National Institute of Child Health and Human Development launched the “Back to Sleep” public health campaign (renamed “Safe to Sleep” in 2012) to encourage safe sleep in a face-up position to prevent SIDS. Although the campaign halved these deaths, many children still died, and it became clear that SIDS is much more complicated than once believed.



“The common perception was that these were accidental deaths,” says Hannah Kinney, MD, a brain pathologist and professor emeritus at Harvard Medical School. “That view has not completely ended, but there has been a shift toward looking for a vulnerable infant.”

This shift is reflected by the triple-risk model, which was first proposed in 1994 by Kinney. Her colleague James Filiano, MD, later revised it. The model states that three factors must come together for a SIDS death. First, it happens during a vulnerable developmental stage, namely the first year of life. Second, to Kinney’s point, the infant has an abnormality, such as a brainstem defect, that makes them vulnerable to SIDS. Third, there’s an environmental stressor, such as sleeping face-down, which causes a pocket of air that the child rebreathes until

their oxygen plummets and carbon dioxide surges.

When rebreathing occurs, there are two points of failure that need to happen for SIDS to occur. First, a baby will stay asleep rather than waking up and changing positions to breathe more easily. The hypoxia causes them to stop breathing and their heart rate to dive. After 20 or 30 seconds, an autoresuscitation reflex should kick in, making the child gasp for air. That gasp is often enough to break the air pocket, fill the lungs with oxygen, and return heart rate and blood pressure to normal.

“If that autoresuscitation reflex fails, then that’s when we get a SIDS outcome,” explains Russell Ray, PhD, a neuroscientist at Baylor College of Medicine and director of the Isabel Davis Center for Safe Children.

What SIDS researchers are trying to discover, then, is why the autore-

suscitation reflex fails, which babies are at risk, and what they can do to keep the babies alive.

WHAT MAKES A VULNERABLE INFANT

SIDS is not a uniform condition. There are many biological differences an infant can have that make them susceptible, and some are particularly common.

The best understood is a defect in the serotonin system, which controls breathing, blood pressure, heart rate and sleep, says Kevin Cummings, PhD, director of the Dalton Cardiovascular Research Center at the University of Missouri. There are a few ways the serotonin system is affected. First, neurons don’t make and release enough of the neurotransmitter. Second, there are fewer receptors that bind it. Third, the serotonin neurons don’t develop properly and

are immature. Animal studies have found that these defects lead to apnea, or halted breathing, and a failure to autoresuscitate, Cummings says.

“These changes are so subtle that you wouldn’t see them on a normal medical exam. But if you use very sensitive molecular methods, you can see that in the brain tissue,” Ray explains. He adds that much of contemporary SIDS research revolves around better understanding how serotonin abnormalities may cause SIDS.

But there’s likely more going on in the brain that contributes to SIDS, at least in some kids. For example, research suggests that there may be excess inflammation and immune cells called microglia in the brainstem, says Peter MacFarlane, PhD, a respiratory physiologist at Case Western Reserve University.

Hypoxia from rebreathing can increase inflammation, which may contribute to dysfunction in the brainstem that causes SIDS, he says. This is supported by the fact that infection has long been tied to SIDS, but more research is needed to unpack the role of inflammation.

SIDS IS NOT ONE CONDITION

Other risk factors are common only among certain subsets of SIDS infants—because SIDS likely isn’t one condition at all. “I believe SIDS is a heterogeneous group of underlying diseases and there are subgroups,” Kinney says.

One of these subgroups has seizure-related pathology, she explains. Her team has found a subgroup with abnormalities in the hippocampus, an area of the brain where seizures can originate. But researchers are still uncovering whether fatal seizures implicated in SIDS might be caused by hypoxia, or if they’re simply the results of undiagnosed seizure disorders, she says.

Genetic mutations tied to epilepsy are found in this subgroup.

Another subgroup has cardiovascular defects, says Nino Ramirez, PhD, director of the Norcliffe Foundation Center for Integrative Brain Research at Seattle Children’s. These infants have genetic mutations tied to cardiovascular problems, such as sudden cardiac death and Brugada syndrome, a rare heart condition that causes arrhythmia in the ventricles. A baby with these mutations could have a fever that triggers excess calcium to enter the heart, which then fibrillates and arrests. Or if the child becomes hypoxic after rebreathing, the body may release too much norepinephrine and cause cardiac arrest, Ramirez says. The exact physiology, like with all SIDS cases, is unknown.

In the past, SIDS deaths weren’t attributed to specific disorders like this, but that’s beginning to change.

“Sudden infant death syndrome is turning from a disease of exclusion—if the pathology finds nothing, you say this is SIDS—to now you say this was a child that died of sudden cardiac arrest or sudden epilepsy,” Ramirez says. “It’s turning from SIDS to an explained disorder.”

Much of the evidence for these SIDS subgroups comes from Ramirez’s work identifying genetic mutations common among SIDS infants. “We didn’t have proof until we had genetic sequencing for these babies,” says Savannah Lusk, PhD, a neuroscientist at Baylor College of Medicine and co-director of the Isabel Davis Center for Safe Children.

But still, genetic studies only show correlation, not if or how they cause death. “In many cases, you can see changes in the infant’s genome that strongly suggests those mutations are likely to be pathological,” Ray says. “But what that means for

INSIDE THE STORY

The Challenges of Studying SIDS

For physiologists, there’s a major and tragic hurdle to studying SIDS: “Because this is a diagnosis after death, we’re not looking at physiology anymore by the time we see these post-mortem babies,” Savannah Lusk, PhD, says. “Physiology is the processes of life. Life is done.” The closest researchers can get is studying animal models, but they are far from perfect.

Studying tissues from infants who died from SIDS can help figure out what causes it. Sometimes this means blood samples taken before death, but researchers also need post-mortem samples. Obtaining the latter is very difficult. “A parent has just lost a child suddenly and unexpectedly, and within 12 hours we have to try to get permission from them to collect tissue,” Russell Ray, PhD, says.

To study the role environmental contributors play in SIDS, researchers like Lusk also need details such as the temperature in the room when a child dies, or whether the baby had been given melatonin. But death scene investigators often don’t know to collect this information, she says.

Of course, funding is one of the biggest limitations. “It is the most underfunded child disease that I know of,” Ray says. Sleep-related infant deaths kill nearly fourfold more children than pediatric cancer every year, yet receive a fraction of the funding.

This funding for research, and interventions, is likely to be more challenging to attain in the future: The Trump administration shut down the National Institutes of Health office that runs the Safe to Sleep program—a move experts believe will lead to a rise in SIDS deaths.

Before they can prevent SIDS, experts must know which babies are at risk. Biomarkers will hopefully soon reveal these children so they can be monitored more closely during sleep.

the infant's physiology having that non-functional protein, whether the protein becomes toxic or just doesn't work, is still unclear."

Ray and Lusk are investigating the effects of SIDS mutations using mouse models. But rather than taking the typical approach of modeling one mutation at a time, "we're combining different features together to create a more comprehensive model," Ray says. For instance, other researchers found through blood testing that SIDS infants have less of an enzyme called butyrylcholinesterase, which plays a role in arousal.

Ray's team created a mouse model lacking the enzyme but found no adverse effects. They're now testing the mouse model by exposing it to commonly used neurotoxic pesticides that butyrylcholinesterase typically breaks down to see if the two may interact to trigger a SIDS-like outcome.

"Once we can develop models that are comprehensive in mimicking the very many aspects of SIDS, we can start to validate hypothetical concepts that have been around for a while that, again, are largely hypothetical," MacFarlane says. "That also allows us to explore new mechanisms, which can start opening up avenues for developing biomarkers for early identification of infants that are at risk of SIDS."

GENETIC AND BLOOD BIOMARKERS

Before they can prevent SIDS, experts must know which babies are at risk. Researchers have recently made great strides in identifying biomarkers that will hopefully soon reveal these children so they can be monitored more closely during sleep—and potentially be given interventions that reduce the risk of death.

One way to do this is through genetic testing. Ramirez is currently working on prenatal screening for mutations that increase the risk of sudden cardiac death and sudden death from epilepsy. There are already medications available for some of the conditions, he says, which could be prescribed to these infants. Even if universal genetic testing is too difficult to implement in the near-term, sequencing could be an option for determining whether the siblings of SIDS infants are similarly at risk.

Easier than genetic testing, however, may be screening for blood biomarkers. Several labs across the U.S. have identified potential SIDS biomarkers in blood, including hormones, enzymes and metabolites that are either higher or lower in SIDS infants compared to typical children. Although this work is in the early stages, there are several promising options that may one day help doctors identify at-risk babies.

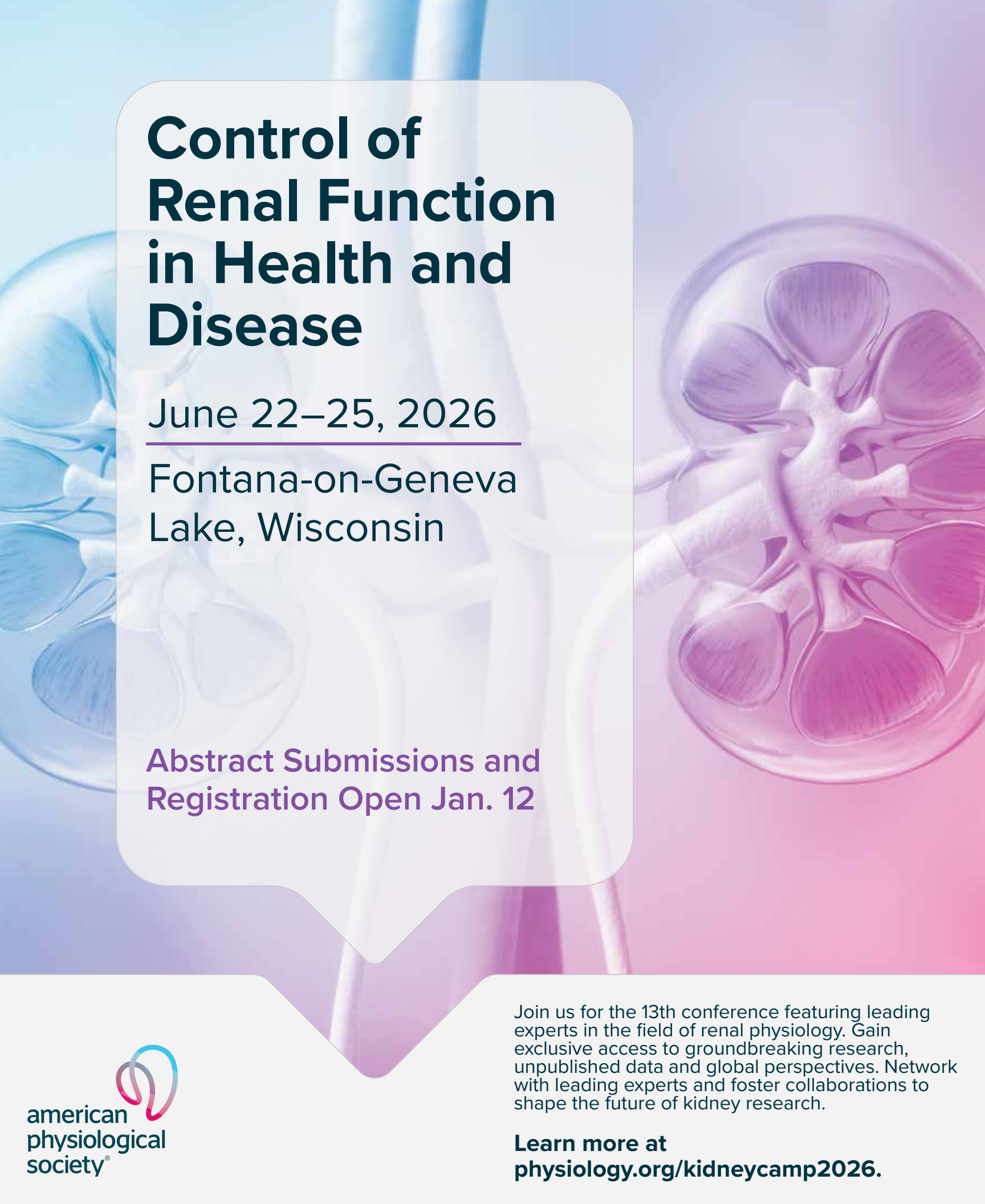
THE HOLY GRAIL: PREVENTION

"The holy grail of SIDS research is to find a drug or behavioral modification that will prevent sudden death," Kinney says. "We're not satisfied until we find something that ends SIDS."

There is a socioeconomic disparity in SIDS deaths, and safe sleep messaging isn't getting to the parents who most need it, Lusk says. So, one prevention method is targeting safe sleep education at disadvantaged parents of at-risk babies. "Unless we start changing the social situation, we will never really solve SIDS," Ramirez says.

Another method is preventive medicine. Ray and Lusk, for example, are using mouse models to test compounds approved by the U.S. Food and Drug Administration that affect the cardiorespiratory system to see whether they benefit SIDS animals. While other researchers may test specific drugs related to the SIDS mechanism they're studying, Ray's team is "trying to do this systematically and go through as many drugs as possible," he says. Already, they have found some that improve function in mice with specific mutations.

One drug used to help pre-term infants breathe is a frontrunner in SIDS prevention research: caffeine. "Caffeine is pretty effective at compensating for defects in the serotonergic system, at least in animals," Cummings says. "You give them caffeine, and they can survive the hypoxia that would normally kill an infant animal that has reduced serotonin." He's not sure why, but it may be because of effects on serotonin, or because it's a stimulant that blocks inhibitory molecules' effects on the cardiorespiratory system. Although promising, research is still in an early phase, and experts are pushing for a clinical trial that hasn't yet been funded. ☞



Control of Renal Function in Health and Disease

June 22–25, 2026

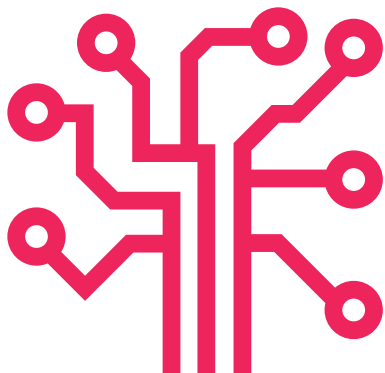
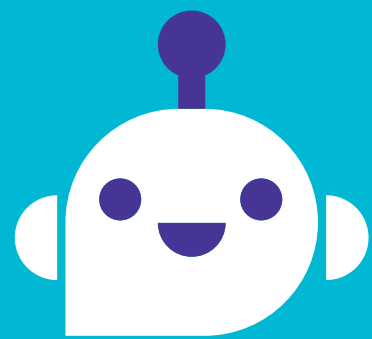
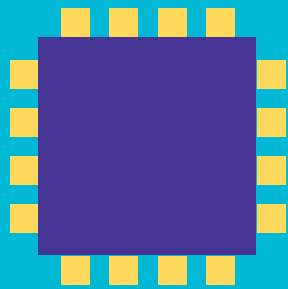
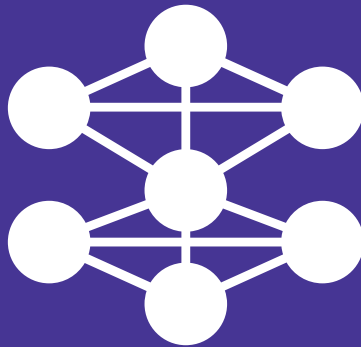
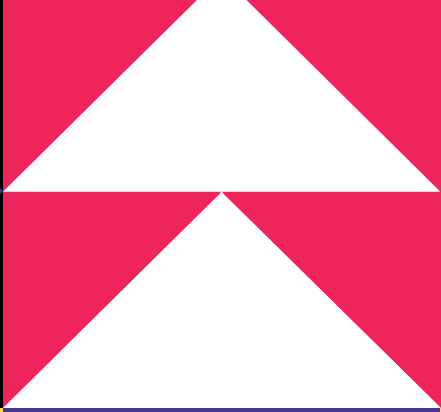
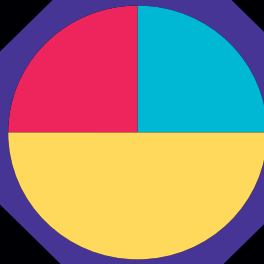
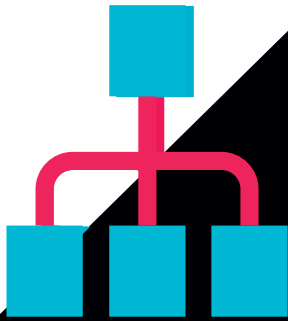
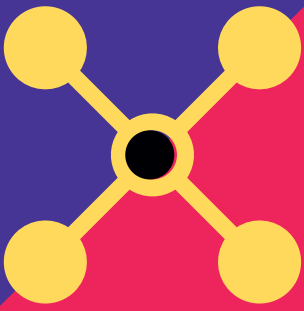
Fontana-on-Geneva
Lake, Wisconsin

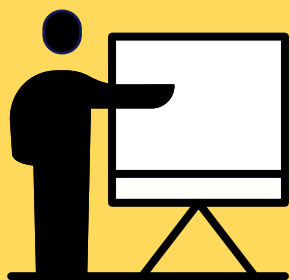
**Abstract Submissions and
Registration Open Jan. 12**



Join us for the 13th conference featuring leading experts in the field of renal physiology. Gain exclusive access to groundbreaking research, unpublished data and global perspectives. Network with leading experts and foster collaborations to shape the future of kidney research.

**Learn more at
physiology.org/kidneycamp2026.**





TEACHING



IN THE
AGE OF

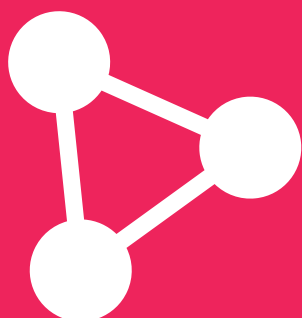
AI



Professors are beginning
to embrace artificial
intelligence as a new tool in
their teaching playbook.

BY SUCHI RUDRA

As the world grapples with the unstoppable integration of artificial intelligence (AI) into everyday life, physiology educators are examining how it can be incorporated into their teaching, while staying mindful of concerns about ethics and reliability.





AI has been around for decades—it's generative AI that is the relative newcomer, causing confusion and some distrust, as any new technology tends to do. Generative AI is a type of AI that generates content, such as text, images, audio and video. The content is not original but created when a large language model responds to prompts and questions by “predicting” the content based on the model it's trained on.

Recent surveys show that between 80% to 90% of college students in the U.S. are regularly using generative AI tools. But what about their professors?

Lina Shehadeh, PhD, a cardiovascular research professor at the University of Miami Miller School of Medicine, began to offer a twice-a-month AI workshop this academic year for the school's students and faculty. Her main goal was to educate the PhD students in the school, so she was surprised when many faculty members—including those in leadership positions—began to attend. That showed her there was serious interest in getting more clarity around the use of AI.

In the workshop, Shehadeh likes to start by saying, “We understand the discomfort and anxiety. We know this is a big issue.” That tends to calm everyone down, she says. “If we encourage them and approach them from this angle, and say, ‘Listen, it is doable; you don't need prior experience’ and that we can define what's right and what's wrong when using AI, I think you win them. Everybody wants to learn; everybody wants to be a better teacher,” she says.

Any hesitation, especially from students, tends to be about ownership: If AI creates content for you, is it still your work? Shehadeh says yes. Part of what she emphasizes in her workshop is the necessity and importance of disclosures when using AI, which can help put the user at ease. “You can

say it's yours, but acknowledge that you used AI to generate the [content]. It's just a method you used. If you used AI to edit your writing, say it; there's nothing wrong with it,” she says.

BECOMING AI LITERATE

Clearing up these kinds of questions is part of AI literacy, which has become a critical part of a college education—for both educators and students. At Gettysburg College, Josef Brandauer, PhD, dean of academic advising and student success, insisted on having his students use AI for certain assignments. “I make them use it because I want to know that they know,” he says.

Before becoming a dean last year, Brandauer was a Gettysburg College professor of health sciences for 17 years. In his physiology courses, he had his students use generative AI to answer a question, which would give them “a very polished, probably excessively wordy and confident answer.” The real task was to evaluate the accuracy of the answer: Was it true, false, complete? Was it missing information or context?

“That's a really, really important skill for any student to obtain, whether AI exists or not. We need to not be confidently wrong, and we can use AI as a tool by which we practice those skills that are important to us,” Brandauer says.

Although the onslaught of AI platforms feels relatively new, Brandauer compares this moment in time to the introduction of the graphing calculator and statistical software programs. “We are teaching statistics differently now than we did 25 years ago. We now have another tool that can be highly effective. One of the responsibilities that we have is to help our students understand how those tools work, ethically, ecologically soundly, and what their flaws and shortcomings are,” he says.

ADJUSTING ASSESSMENTS

While students have embraced AI, educators are also beginning to use it in their course planning. Tools include AI writing assistants, productivity tools and coding agents that can create apps. Mastering these tools could save time and energy—especially when it comes to creating and grading assessments—and transform the teaching experience.

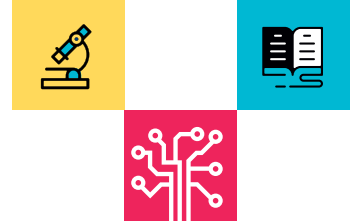
The University of Miami medical school, for example, has a committee dedicated to reviewing all assessment questions for every course and using AI to “fix and perfect” them in collaboration with the professors, Shehadeh says.

Some educators are reacting to students' use of AI by changing their assessment practices to help make sure students are still doing the work. Brandauer says he and his department colleagues changed their assessment structures “for the better, and AI was probably a contributing factor to that.” In his cardio-respiratory class, Brandauer made the decision to switch to an oral final exam, where each student gave a 20-minute teaching demonstration with a visual aid of how oxygen makes it from the atmosphere to the respiring mitochondria, plus a 10-minute Q&A. “There is absolutely no way that they can use AI on the spot, and AI doesn't really help them all that much in the presentation,” he says.

A CLOSER LOOK

AI Is Here. Now What?

As students grow more fluent with generative AI tools, educators face new challenges in teaching and assessment. This four-part video series from APS offers practical insights and strategies to help you adapt your instruction for this new era. Take the course today at bit.ly/genAIseries.



George Kararigas, PhD, professor of physiology at the University of Iceland's Faculty of Medicine, is part of an international consortium testing AI tools in education. He is looking forward to soon testing a third-party AI-driven assessment tool that was developed to grade even essay-based exams, in addition to multiple-choice tests. However, while AI tools might save time, he says, there's also the pain point of constantly learning to use new tools, a process that can be time-consuming and challenging.

SAVING TIME

Indeed, one problem all physiology educators share: never enough time. It makes sense then that the most attractive AI feature is how much time a tool can save. At University of Miami's medical school, Laura Bianchi, PhD, professor of physiology and biophysics, explains one medical school challenge: Basic sciences are

very condensed at the beginning of the curriculum and students are immediately thrown into clinic. "Because the basic science of physiology training is so shortened, there have been concerns that we need to bring back some of these concepts later in that curriculum, in Phase 2 and 3, when they are doing clinics. But it's a huge task," she says.

Enter AI. Bianchi and Shehadeh collaborated on a project to map existing resources of physiology medical licensing exam-like questions onto all the clinical clerkships in Phases 2 and 3. By using AI to scan the questions and curriculum and then suggest the mapping points, the previously insurmountable task was made possible. Without any coding expertise, Shehadeh used Replit, an AI-powered software program, to develop an interactive educational module in several days instead of several months. The module offers a refresher of the basic concepts covered in the United States

Medical Licensing Examination Step 1 exam. Shehadeh says there's an urgent need across the country to create these mini lessons on foundational science, which can help students integrate basic science knowledge into their clinical training.

The module, with content supported by a podcast and simulations, has now been available and active for the past academic year, and so far, student feedback is positive. "They don't just want the same stuff, the same material as when they were first taught the concept," Shehadeh says.

At this point, Shehadeh has created one module for one basic science concept. She says the other 44 still need to be developed. "It would be great if this could be a shared project among other universities as well. This is an enormous task. It's across so many schools in the nation; it's not just us. I call for collaborators. Why don't we have some from other universities and make this a public physiology mini-series? We want to make it available for everyone—for underprivileged students too."

Perhaps educators will turn more readily toward the use of generative AI when it can be used to solve a current challenge, like the creation of the refresher modules. But in any case, it's only a matter of time before AI is fully integrated into every physiology classroom, experts say. So it helps all educators to be ready, to be proactive.

"The worst you can do is ignore AI," Brandauer says, "because it's out there and people are using it. When we used to start doing workshops on my campus and around the country, the people that were most worried about AI generally were the folks who hadn't engaged with it at all. Just taking that first step is important, and then from there, keeping up with the technology and really knowing what its capabilities are is a really important piece." 🗣️

FROM THE EXPERTS

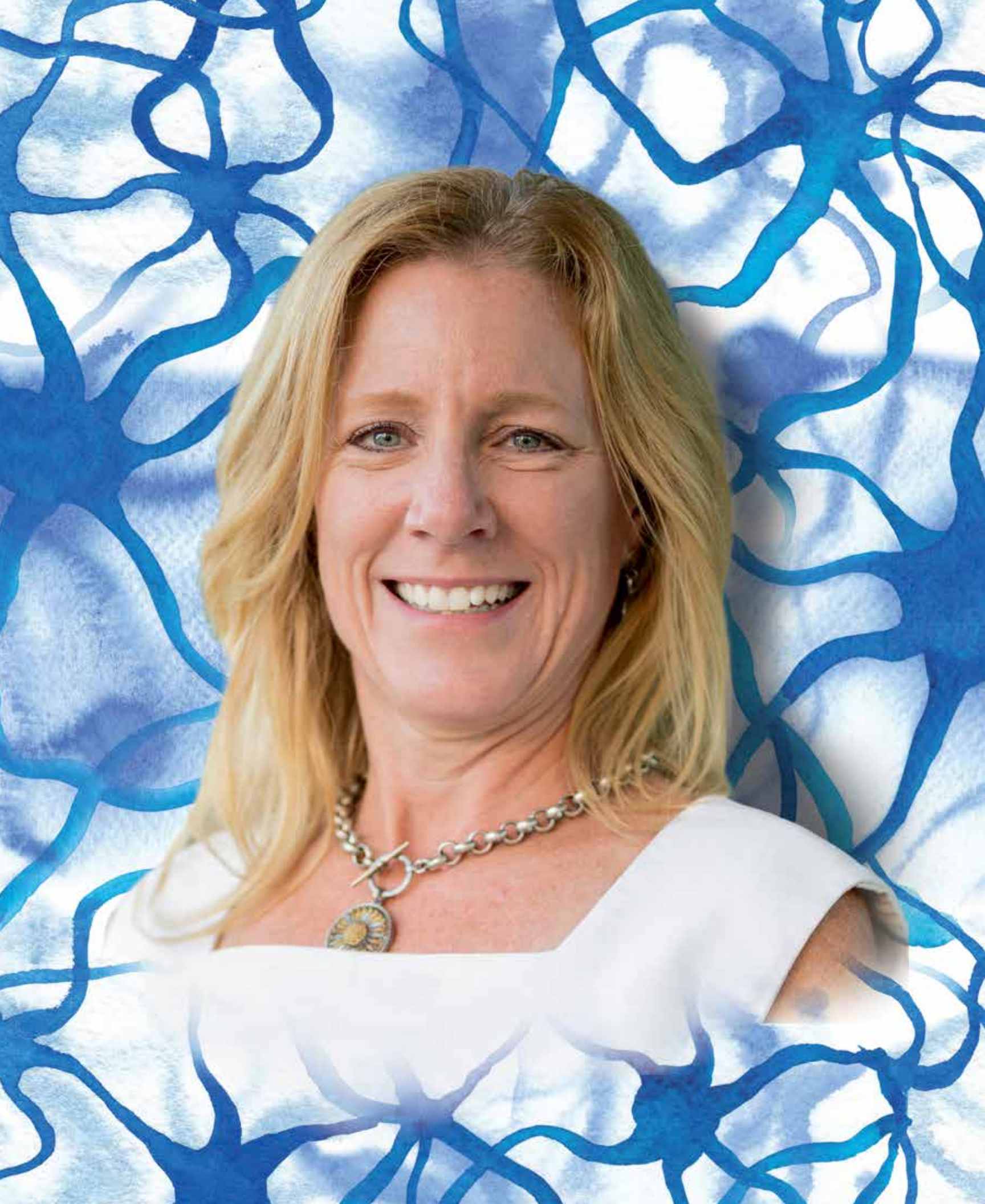
4 Questions to Kick-start AI Conversations

As professors begin to experiment with how generative AI can enhance their teachings, it can be helpful to engage students in questions about the benefits, risks and goals when using AI. Gettysburg College professor Josef Brandauer, PhD, encouraged his students to think about how to use AI responsibly, which, he says, means understanding the difference between tasks that benefit from AI assistance and those that require full student effort.

Some tasks are about the process, not just the outcome, and the work itself is where the value lies, he says. It's the work that leads to growth. So, in those cases, "you either don't use AI or you use it with some guardrails firmly in place."

Here are a few questions to ask students to get them thinking about how they use AI:

- 1 How have you used generative AI, and what did you learn about the process?
- 2 What are your goals for this course, and how can AI help you achieve them?
- 3 What do you feel is acceptable use of generative AI in this course versus what feels more unsettling or uncomfortable?
- 4 How can you use AI responsibly in your education, while ensuring the material is free of bias, inaccuracies or plagiarism?



Science That **SERVES**

Tracy Bale has shaken up her lab to focus on how research discoveries can impact people.

BY DARA CHADWICK

TTracy L. Bale, PhD, describes herself as a “basic neuroscientist.” Yet “basic” is hardly a fitting word for Bale’s career—or for her approach to building connections between science and the community.

She recently helped create a comedy and science showcase event in Denver called Headstrong Comedy, billed as a night of hilarious insights into what’s happening inside our overloaded brains. Bale paired four female comedians from underrepresented groups with four female scientists for an evening designed to “tackle misconceptions about women’s brain health.”

"I partnered the comedians with my science colleagues who I thought could pull off making science engaging and amusing," she says. "The event sold out."

Bale is the Anschutz Foundation Endowed Chair in Women's Integrated Mental and Physical Health at the Ludeman Center, professor and director for InterGenerational Stress and Health, and director for sex differences research in the Department of Psychiatry at the University of Colorado Anschutz Medical Campus in Aurora. She is also the first woman president of the International Brain Research Organization, which was founded in 1961.

Bale classifies much of the work she does in the Bale Laboratory of Translational Psychiatry as physiology, adding that she is trained in neuroendocrinology, neurobiology and pharmacology. "We can't separate the brain from the body," she says. "Many neuroscientists spend their whole careers focusing on very limited parts of the brain. My research takes a step way back to focus on the integration of the brain and body. The immune system, the endocrine system—it's all related. It's all cellular responses."

In April, Bale will deliver the opening keynote address at the APS American Physiology Summit. As she always does, she says, she'll talk about sex differences. She'll also talk about how physiologists can bring science into their communities and why it matters.

"It's so important," she says. "When you talk with colleagues, neighbors and community members about your work, it helps them understand how what we do affects things like drug development or treatment for their diabetes. When we don't engage, people may have no idea. And when they understand,

then when they're voting, they can say, 'I think what they're doing is really important.'"

NO AVERAGE DAYS

Bale grew up in Pine Island, Minnesota, a town of about 2,000 people. The town's proximity to Rochester—home to the Mayo Clinic—created a culture steeped in science that helped drive investments in local schools, according to Bale. She had access to science classes such as zoology and physiology.

Her academic career began at Gustavus Adolphus College, a small liberal arts school in Saint Peter, Minnesota. She later transferred to

Washington State University, where she earned a bachelor of science degree in molecular biology. She went on to earn a PhD in neurobiology in the Department of Pharmacology at the University of Washington and completed a postdoctoral fellowship in neuroendocrinology at The Salk Institute for Biological Studies in La Jolla, California.

Bale says she became fascinated by sex differences early in her career. She encountered research about how hormonal interactions impact brain function and was captivated by the questions raised. Her curiosity on the topic of sex differences has never waned.

A CLOSER LOOK

6 Questions with Tracy Bale

- 1 What's your best piece of career advice for women and girls in STEM?**
Go for it. I'm from a tiny town in Minnesota, and here I am. Do I have some insecurities? Sure. Does my husband sometimes remind me to put on my Jimmy Choo shoes and walk all over them? Sure. But I'm the first woman president of the oldest international brain organization in the world. So, I'd say find good support, grow some thick skin and go for it.
- 2 How do you de-stress?**
I run. I love to run outside, but I live at 7,600 feet up in the mountains. It's not just running uphill but also running uphill and panting because you are at elevation.
- 3 What's a vacation you loved so much that you want to go back?**
For my 50th birthday, my husband took me to Saint Lucia, and we rented a house with a pool on the top of a hillside overlooking the ocean. We ate at this restaurant that was on a rock in the ocean, and the staff used a zip line to send items down. It was amazing.
- 4 What do you most want nonscientists to know about women's health?**
Understanding women's health isn't about singling out women as a vulnerable population—it helps us understand the differences in health discoveries for both men and women.
- 5 What's a fun fact about you that people don't know?**
I have strong Viking roots. My grandfather came here from Denmark in 1918.
- 6 What do we need to improve in this country when it comes to mental health?**
Mental health is health. Why do insurance companies treat it as a separate thing? Mental health is one of the most fundamental aspects of your health. Coverage shouldn't be a separate piece that affects access to care.



Clockwise from top: Bale and her dog Molly on a hike in the Rocky Mountains. For her Presidential Invited Lecture at the 2023 International Brain Research Organization (IBRO) World Congress in Granada, Spain, Bale invited spoken word artist George Mpanga, aka George the Poet; Leymah Gbowee, 2011 Nobel Peace Prize laureate; and Epsy Campbell Barr, former vice president of Costa Rica. Three women presidents of the world's largest neuroscience organizations: Marina Picciotto, PhD, 2023–2024 president of the Society for Neuroscience; Bale, president of IBRO; and Irene Tracey, DPhil, president of the Federation of European Neuroscience Societies. Bale with the IBRO board of directors at its 2023 World Congress.

"In everything we do, we ask if sex is a biological variable," she says. "We make sure it's incorporated in our study design, and we always look at it statistically to determine if there are aspects of differences in things like developmental windows, vulnerabilities and risk resilience. A lot of our focus is on the stress experience, and we see differences in stress responses between males and females in our mouse studies."

She cites the placenta as an example of where stress differences are visible between males and

females. Stressing pregnant mice and then removing the placenta reveals interesting information.

"If you look at transcriptomics as an indication of how a male placenta and a female placenta responded to mom's stress, you'll see that the males experience massive changes. Females are more likely to sit tight, indicating 'this is not something we need to respond to.' We see similarities in humans, but alone, they're just descriptive outcomes.

"What we don't know is what it means to the male or female devel-

FROM THE EXPERTS

Highlighting Sex Differences

Tracy L. Bale, PhD, will open the 2026 American Physiology Summit on April 23 with a keynote about sex differences in research and why it's important for physiologists to talk about science in an accessible way in their communities. Register for the Summit: physiology.org/summit.

“I always remind my trainees that in every discovery, finding or hypothesis you test, for that moment, you are the only person in the world who knows that. That is so powerful.”

oping brain. There are a lot of ways a person might adapt physiologically. Maybe the male is going to respond differently across its lifespan than the female will because of differences that happened early in development. But just because you see a difference doesn't mean it's positive or negative. There are many considerations.”

Bale says her “love of the question” has been a driving force in her career. “There's no such thing as an average day in the lab,” she says. “In science, hour to hour is never the same, much less day to day. I always remind my trainees that in every discovery, finding or hypothesis you test, for that moment, you are the only person in the world who knows that. That is so powerful. How many jobs can you say that about—you get to know something nobody else knows and you hold the potential?”

SCIENCE MEETS REAL LIFE

Bale says she's extraordinarily passionate about psychiatric improvements to mental health. While discovery for its own sake is important in science, she says impact is what matters most to her.

“At this stage of my career, discoveries need to have an impact on our quality of health and health outcomes,” she says. “My passion as a scientist, a human being and

a mother is that we are not doing a great job with coming up with novel approaches to improve mental health. We need to push ourselves to take our science toward impact.”

One area of research that is ripe for impact and of great interest to Bale is biomarkers for psychiatry. “If you have cancer, there are a million different tests. What do we have for psychiatry? Nothing. You have a conversation with a psychiatrist or therapist, and their diagnosis is based on how you answer questions. But many psychiatric conditions directly affect your ability to observe yourself and relay that information. So, diagnosis can be difficult.”

Bale says she wants her research to provide information that can build better models for psychiatric biomarkers. “That's where I've shaken up how I run my lab,” she says. “I tell my graduate students and postdocs that our projects aren't only about getting grants and writing papers. I ask them, ‘Where's the impact? How can we translate this better and faster?’ These are interesting ways to approach our science—it's not only the discovery, but where that discovery can take us.”

ENGAGEMENT MATTERS

Bale spent 15 years as professor of neuroscience at the University of Pennsylvania before she was

recruited by the University of Maryland to develop the Center for Epigenetics Research in Child Health and Brain Development, which focused on building translational research. “We were in Baltimore, a majority Black city,” she says. “And I thought, ‘How are we going to do translational research that's impactful and get community investment if the community doesn't trust us?’”

She began working with different community partners, including members of the Baltimore City Council, to help them learn about the brain and its function. “Trauma, particularly generational trauma, is a big word in majority Black cities,” Bale says, adding that partnering with policymakers with the power to shape laws was rewarding. “The mayor used to use the term ‘hurt people hurting people.’ It was an incredible opportunity to help the community understand more about the brain and develop language that could inform policies.”

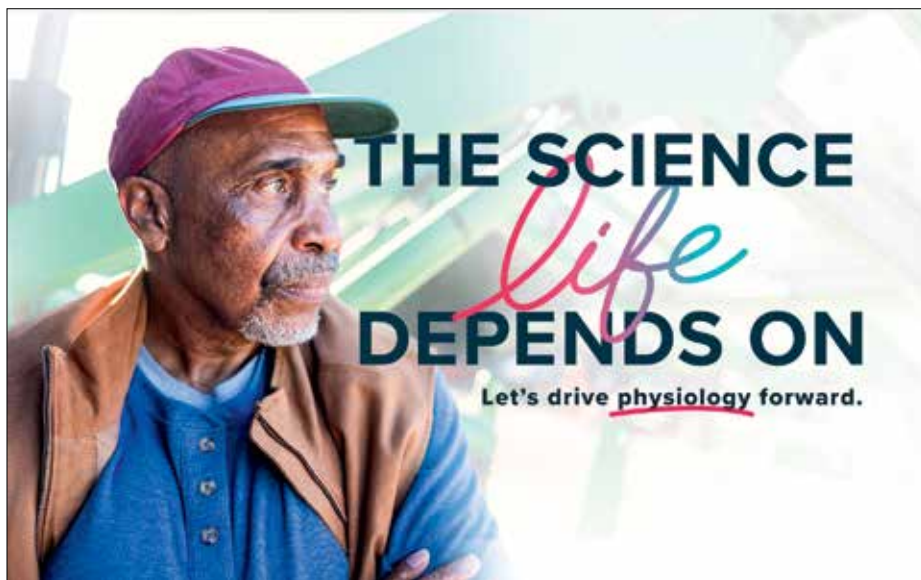
But it was at Penn where Bale learned the importance of engaging communities with humor, empathy and understanding. “We did a bar night with scientists,” she says. “We focused on the microbiome, and each scientist gave an amusing talk on a different microbiome topic, such as the vagina, the armpit and the gut. It was fantastic science done in an engaging way. Oh, and interspersed was burlesque dancing.”

Creative approaches like these can help shatter the perception of scientists as elitist, Bale says. “Go to your synagogue, community center or your child's school,” she says. “Go talk about the science you do. You'll be amazed at how that can grow into understanding and support. How are people going to care about NIH if they don't know what's happening on campus?”

APS CAMPAIGN

Fighting for Physiology—and for You

APS launches a national campaign to elevate the field and its scientists.



Imagery from the campaign that will be featured through 2026.

Physiology is at the heart of every health breakthrough. Yet too often, it operates behind the scenes—underfunded, under-recognized and misunderstood. With increasing funding challenges and declining support for basic scientific research, the need to champion physiology has never been greater. That's why APS has launched a new national initiative: Physiology: The Science Life Depends On. This effort aims to raise awareness of physiology's essential role in biomedical science and ensure policymakers, funders and the public understand that without stronger support for this foundational discipline, the future of innovation is at risk.

At its core, this initiative is about fighting for physiologists. It's about elevating physiology's influence and securing the respect, resources and recognition the discipline—and the people advancing it—deserve. We're telling the story of how physiology drives progress, and that story begins with your work.

The campaign, which launched in November, will continue to roll out in phases through 2026. It will include a public-facing webpage, a downloadable brief outlining the case for physiology, short videos that will spotlight the work of physiologists, advocacy events on Capitol Hill, and outreach to national media—all designed to put physiology on the national radar. "While the campaign targets policymakers, funders and the public, this effort exists to support our members and the science they represent," says Dennis Brown, PhD, FAPS, APS chief science advisor. "This is advocacy in action."

The future we're advocating for:

- Academic institutions recognize physiology as the foundation of integrative research, training and discovery and prioritize it in recruitment, funding and program development.
- Federal agencies prioritize physiology research as essential to advancing biomedical innovation and public health.

- Policymakers understand and can clearly articulate how investment in physiology translates to improved health outcomes and a stronger health economy.
- Biomedical organizations unite in advocating for physiology and the vital role of basic research in driving progress across the life sciences.
- Industry leaders value the expertise and translational insights physiologists bring to solving complex health challenges.
- Physiologists everywhere are empowered to thrive in a supportive, collaborative and well-resourced research environment, and they are recognized as indispensable contributors to global health.

We encourage you to explore the campaign and read the brief. It outlines the case for physiology as foundational science and calls for renewed investment in the field to safeguard the future of health innovation.

Read the campaign brief and learn more at fightforphysiology.org.

GET IN TOUCH

Help Us Tell the Story of Discovery

Whether from your own lab or an inspiring example from history, share how a physiological advancement has improved human health and shaped scientific progress for years to come.

Email ScienceLifeDependsOn@physiology.org.

CONFERENCES

Key Deadlines for the 2026 Summit Approaching

Planning to join us in Minneapolis? January 30 is your last chance to lock in early registration rates for the 2026 American Physiology Summit. It's also the final deadline to submit a late-breaking abstract, so if you've got new data to share, don't wait. Whether you're presenting, networking or diving into cutting-edge research, now's the time to get it on your calendar—and your to-do list. Visit physiology.org/summit to register.



APS HONORS

Announcing the 2026 APS Fellows

APS is proud to recognize the newest members of the Fellow of the American Physiological Society (FAPS) program—the Society's highest honor. This distinction celebrates outstanding contributions to physiology and dedicated service to the Society. Join us in congratulating the class of 2026:

Lourdes Alarcon Fortepiani, PhD
University of the Incarnate Word

Shawn Bender, PhD
University of Missouri

Marco Brotto, PhD
University of Texas at Arlington

Michael Czubryt, PhD
University of Manitoba, Canada

John Durocher, PhD
Purdue University, Northwest

Robert Fenton, PhD
Aarhus University, Denmark

Michael Hultstrom, PhD
Uppsala University, Sweden

Bina Joe, PhD
University of Toledo

Anita Layton, PhD
University of Waterloo, Canada

Analia Loria, PhD
University of Kentucky

Luis Martinez-Lumus, PhD
University of Missouri

Kerry McDonald, PhD
University of Missouri

Paras Kumar Mishra, PhD
University of Nebraska Medical Center

Scott O'Grady, PhD
University of Minnesota

Steven Segal, PhD
University of Missouri

Karen Sweazea, PhD
Arizona State University

Frank Thevenod, PhD
Witten/Herdecke

APS HONORS

Porter Fellows Announced

As one of the largest awards APS gives, the Porter Physiology Development Fellowship supports students from nontraditional backgrounds in pursuing full-time studies toward a PhD in the physiological sciences. The 2026 fellows are:

Eric Albuquerque
University of Miami

Olufunke Falayi
University of Missouri

Jordan Hart
University of Mississippi Medical Center

Mark Hatcher
Howard University

Sidney Strause
Marshall University

Alyssa Tipler
University of Florida

Carlos Zepeda
Marquette University

ELECTIONS

Shape the Future of APS

The 2026 APS election opens in mid-January. Members will vote for a president-elect and new board directors to help guide the Society's direction. Get to know the candidates and their priorities during a virtual town hall later in the month. After the event, you'll receive your ballot and a recording of the discussion by email. Stay tuned for details—your voice matters. Here are the candidates:

PRESIDENT-ELECT CANDIDATES



Lacy Alexander, PhD, FAPS
Pennsylvania State University



Michael Caplan, MD, PhD, FAPS
Yale School of Medicine

BOARD OF DIRECTORS CANDIDATES



Kirtseen Browning, PhD, FAPS
Penn State University College of Medicine



Joseph Brozinick, PhD
Eli Lilly



Julie Freed, MD, PhD
Medical College of Wisconsin



L. Bruce Gladden, PhD, FAPS
Auburn University



Wolfgang Kuebler, PhD, FAPS
Charité—Universitätsmedizin Berlin



Eric Lazartigues, PhD, FAPS
Louisiana State University Health-New Orleans

PUBLICATIONS

New Advances in Physiology Education Editor Named

Bryan Mackenzie, PhD, has been named editor of *Advances in Physiology Education* after more than 15 years of service on the journal's editorial board, including as deputy editor since 2020. A professor of physiology at the University of Cincinnati



(UC), Mackenzie brings a career-long passion for integrating research and education. Originally from Scotland, Mackenzie earned his PhD from the University of Dundee and completed postdoctoral training at UCLA and Harvard Medical School. His research

explores the molecular physiology and structure-function of the iron transporters DMT1, ferroportin and ZIP14 and their roles in iron homeostasis and iron disorders. An APS member for three decades, Mackenzie has served on the Society's International Physiology Committee and the editorial board of *American Journal of Physiology—Gastrointestinal and Liver Physiology*. At UC, he directs both research and master's programs, with teaching interests that include molecular physiology, hematophysiology and experimental design. Read more about the journal at journals.physiology.org/journal/advances.

MEMBER NEWS

Tamara Hew-Butler, DPM, PhD, has been named medical research director for the prestigious Western States Endurance



Run (WSER). The oldest 100-mile footrace in the U.S., held in late June, the WSER runs through the Sierra Nevada Mountains in California. The race serves as a field lab for

researchers studying extreme physiology and ultra-athletes. Hew-Butler, formerly an associate professor at Wayne State University, specializes in hydration and hyponatremia.

DATES & DEADLINES

AWARDS APPLICATION DEADLINES

Award deadlines vary and may be subject to change. For the latest information, including award descriptions, amounts, eligibility requirements and to apply, visit physiology.org/awards.



JAN. 9

CARDIOVASCULAR SECTION

New Investigator Award
Outstanding Graduate Student Trainee Award
Outstanding Postdoctoral Trainee Award
Research Recognition Award
Young Investigator Award

CELL & MOLECULAR PHYSIOLOGY SECTION

New Investigator Award
Research Recognition Award
Robert Gunn Student Award

CENTRAL NERVOUS SYSTEM SECTION

New Investigator Award
Research Recognition Award
Van Harreveld Memorial Award

COMPARATIVE & EVOLUTIONARY PHYSIOLOGY SECTION

Fauna Bio Translational Research Award
New Investigator Award
Research Recognition Award
Travel Award Sponsored by Novo Nordisk Foundation

ENDOCRINOLOGY & METABOLISM SECTION

New Investigator Award
Research Recognition Award
Virendra B. Mahesh Award of Excellence in Endocrinology

ENVIRONMENTAL & EXERCISE PHYSIOLOGY SECTION

CANTROL International New Investigator Research Award
Early-career Research Award
New Investigator Award
Partnership for Clean Competition Anti-doping Predoctoral and Postdoctoral Awards
Postdoctoral Research Awards
Predoctoral Research Awards
Research Recognition Award

GASTROINTESTINAL & LIVER PHYSIOLOGY SECTION

Horace W. Davenport Distinguished Lectureship (for 2027)
John S. Fordtran Distinguished Research Award
New Investigator Award
Raj and Prem Goyal Lectureship in Pathophysiology of Gastrointestinal and Liver Disease
Research Recognition Award
Trainee Poster Award

RENAL SECTION

New Investigator Award
Postdoctoral Excellence in Renal Research Award
Predoctoral Excellence in Renal Research Award
Research Recognition Award

RESPIRATION SECTION

New Investigator Award
Outstanding Trainee Award
Research Recognition Award
The Usha Award
Trainee Poster Presentation Award

TEACHING OF PHYSIOLOGY SECTION

Arthur C. Guyton Distinguished Educator Award
Labfront Mid-career Educator Award
New Investigator Award
Research Recognition Award
Travel Fellowship
William Galey Scholarship Award

TRANSLATIONAL PHYSIOLOGY INTEREST GROUP

David D. Gutterman Trainee Award for Translational Science

WATER & ELECTROLYTE HOMEOSTASIS SECTION

Jane Reckelhoff Mid-career Achievement Award
Juan Carlos Romero Postdoctoral Research Award
Leonard Share Award
Leonard Share Predoctoral Research Award
New Investigator Award
Research Recognition Award

JAN. 16

Charlie Bates Research Award
Dale J. Benos Early Career Professional Service Award
Dependent Support Travel Award

FEB. 3

Summer Undergraduate Research Fellowship

FEB. 15

COMPARATIVE & EVOLUTIONARY PHYSIOLOGY SECTION

August Krogh Distinguished Lectureship

FEB. 28

RENAL SECTION

Carl W. Gottschalk Distinguished Lectureship

MARCH 9

CARDIOVASCULAR SECTION

Carl J. Wiggers Award

Gabor Kaley Lectureship and Symposium

Robert M. Berne Distinguished Lectureship

MARCH 14

RENAL SECTION

Mid-career Achievement Award

MARCH 21

ENVIRONMENTAL & EXERCISE PHYSIOLOGY SECTION

Edward F. Adolph Distinguished Lectureship

Honor and Impact Awards

CALLS FOR PAPERS

CROSS-JOURNAL CALLS FOR PAPERS

Cardiorenal Physiology

Plus: Explore our ongoing cross-journal calls for papers on key women's health research topics:

- Alzheimer's disease
- Autoimmune diseases
- Breast cancer
- Cardiovascular disease
- Hormone replacement therapy and menopause
- Migraines
- Novel perspectives on sex as an investigative variable
- Pregnancy and postnatal conditions:
 - Endometriosis
 - Gestational diabetes
 - Preeclampsia
 - Polycystic ovary syndrome

Join APS in advancing our mission to improve health care outcomes and promote greater scientific understanding of women's health. Learn more about this special call for papers at journals: [physiology.org/womens-health-research-initiative](https://www.physiology.org/womens-health-research-initiative).



American Journal of Physiology-Cell Physiology

Jan. 9

- Revising Platelet Signals, Function and Therapies

American Journal of Physiology-Gastrointestinal and Liver Physiology

Jan. 16

- Cell and Animal Models of Gastrointestinal Disease
- Epithelial Cell Metabolism
- Immunometabolism and Novel Gut-Neural-Cardiorenal Pathophysiological Mechanisms of Disease
- The Microbiota-Gut-Brain Axis

American Journal of Physiology-Heart and Circulatory Physiology

Feb. 2

- Role of Leukocytes in Cardiovascular Disease
- Spotlight on Cardiovascular Health Disparities
- Stress, Exercise and Cardiovascular Disease

American Journal of Physiology-Renal Physiology

Feb. 2

- Mechanism of Renal Ion Transport and Sensing in Health and Disease in Honor of Steven Hebert, MD

Journal of Applied Physiology

Jan. 5

- Context-dependent Mechanisms of Striated Muscle Dysfunction

Anytime

- Cerebrovascular Control in Health and Disease: From Modeling to Translational Research
- Experiments of Nature

Physiological Reports

March 31

- Women's Health Research in Basic and Translational Physiology

MEETINGS & EVENTS

2026 CONFERENCES

American Physiology Summit

April 23–26

Minneapolis

Control of Renal Function in Health and Disease

June

Comparative Physiology Conference

September



Lab Limits Lead to Determination

BY DOUGLAS R. SEALS, PHD

Recently, I found myself reflecting on life and my professional journey. I come from a distinctly non-academic background. My parents had only elementary school educations. No one in my extended family had attended college.

Sans romance paperbacks, there were no books in the house, as there was no emphasis on reading. For males in my neighborhood, the career goal was a blue-collar labor job. (I wanted to be a mailman.)

While I chose to attend college, I did so primarily to play football, not for academic reasons. I went on to graduate school, but only to obtain the required master's degree to teach and coach sports at the small college level. But that's where I became interested in exercise physiology research and continuing my scientific training.

My original faculty appointments were on undergraduate campuses in departments of exercise science/kinesiology with historically weak research cultures. As was the norm in such settings, I was assigned office and laboratory

space in sports arenas or old gyms for the first 35 years of my career.

Working in these environments, I encountered a series of daunting obstacles, including electrical interference from nearby TV satellite trucks (not ideal for neural recordings), regular evictions

by security guards clearing the arena for sports events, the absence of core laboratory facilities, consistent flooding of my research area, electrical outages and loss of irreplaceable frozen samples, lack of temperature control, pest infestations, and young children from local swim teams running and screaming through the building.

Despite these unconventional challenges, I have been able to build and sustain a highly successful, continuously funded research program for the past four decades. My program has provided scientific training for over 300 students, fellows and junior faculty.

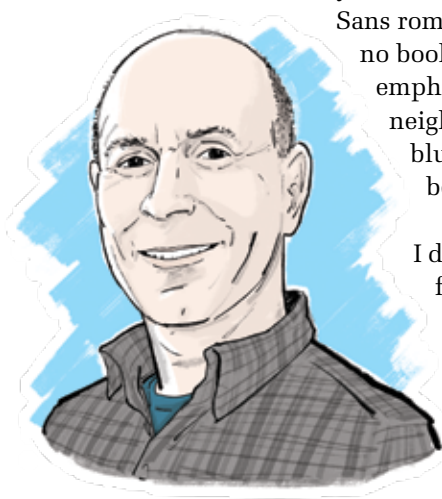
I cannot explain how this was accomplished. Well over a century ago, German philosopher Friedrich Nietzsche coined the well-known expression "what doesn't kill you makes you stronger." Perhaps knowing the limitations of my environment, I worked that much harder.

Lacking contemporary research facilities, I knew I had to be creative. I was not intimidated by the idea of change. Indeed, I felt the need to constantly move forward, ready to pivot as necessary to keep my science competitive and biomedically relevant. I also learned not to expect support from the university. I would obtain what was needed through my own initiative and resourcefulness.

I am not the only physiologist who ever worked out of substandard research facilities in gyms or elsewhere. However, I believe that my story illustrates how an individual can create success from their own intrinsic drive, ideas and inventive spirit. Somewhere along the way, I developed a fierce determination to succeed, coupled with what I'm fond of calling "functional resilience"—overcoming adversity to create sustainable success.

I suppose my experience could be viewed as a sort of "experiment-in-nature," providing evidence that it's the person, not their family background, long-held educational aspirations, nor the quality of their working environment, that determines success. I think that's a valuable point for anyone pursuing big dreams in improbable settings. You, not your environment, are the master of your fate.

Douglas R. Seals, PhD, is a distinguished professor of integrative physiology at the University of Colorado Boulder. His research focuses on cardiovascular aging. He has published a series of professional development articles in APS journals and is the author of a forthcoming memoir, "A Life of Science—in Gyms!"



"I encountered a series of daunting obstacles, including electrical interference from nearby TV satellite trucks (not ideal for neural recordings) and regular evictions by security guards clearing the arena for sports events."



DON'T MISS THESE MOMENTS



Stay connected.
Stay informed. Stay engaged.

Your American Physiological Society (APS) membership profile connects you to the people, knowledge and opportunities that can advance your science and your career. Keeping it up to date ensures you receive news, invitations and updates tailored to you.

Now's the perfect time to make the most of your member benefits—update your APS profile today so you never miss a moment that could move your work forward.

physiology.org/profile





THE SCIENCE *Life* DEPENDS ON



Championing the essential science behind every cure.

From pioneering organ transplantation decades ago to designing tomorrow's regenerative therapies and synthetic organs, every medical advancement begins with physiology. It's the science that makes discovery possible—and the foundation of innovation that improves lives every day.

Physiology: The Science Life Depends On is APS' national campaign to raise the visibility of our field,

defend discovery funding and remind the world that every cure starts here. Together, we're amplifying the voices of physiologists and spotlighting physiology's essential role in biomedical discovery, public health and scientific innovation.



 **Let's drive physiology forward. Learn more at FightForPhysiology.org**