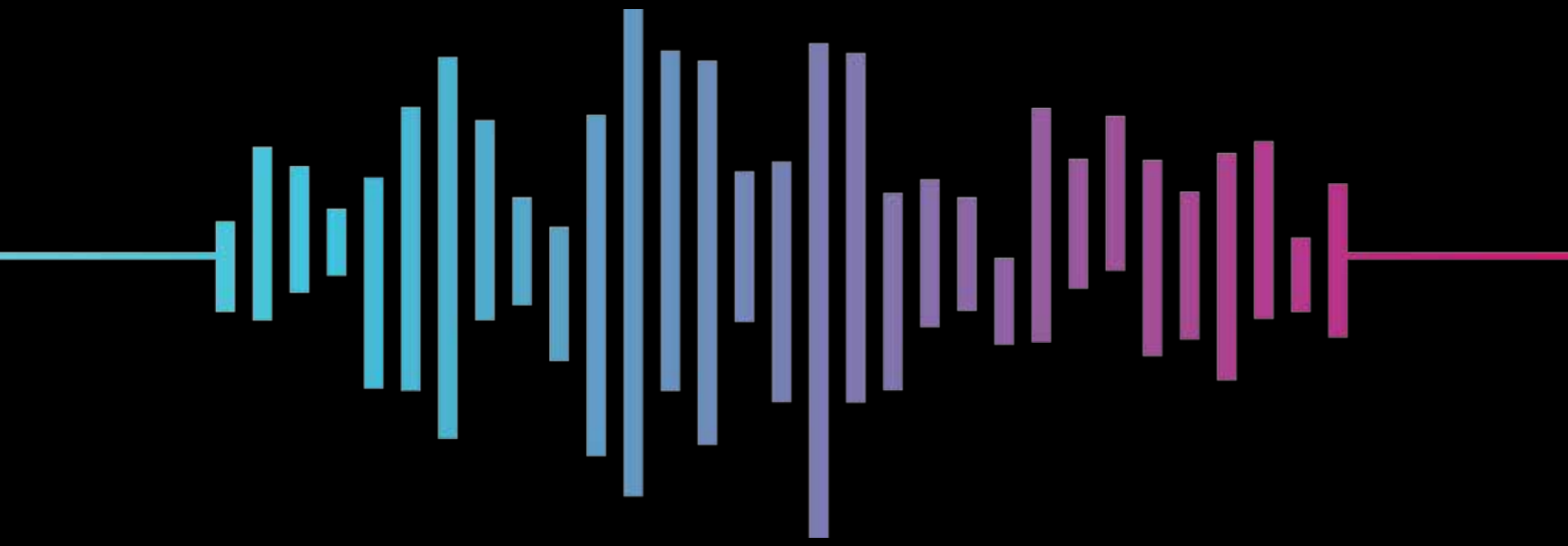
THE Physiologist MAGAZINE

JANUARY 2023

BANKING ON GENETICS

After launching Sweden's first COVID-19 biobank, Michael Hultström, MD, PhD, sets his sights on a nationwide intensive care biobank to improve ICU treatment.



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physiology.org/advocacy

american physiological society®

APS ACTION ALERTS

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Cover photo by Elis Hoffman

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american physiological society®

CALL FOR NOMINATIONS
EDITOR-IN-CHIEF

American Journal of Physiology-Lung Cellular and Molecular Physiology®

Nominations are invited for the position of editor-in-chief of the *American Journal of Physiology-Lung Cellular and Molecular Physiology* (**ajplung.org**) to succeed Rory E. Morty, PhD, who will complete his term as editor on December 31, 2023. The American Physiological Society (APS) Publications Committee plans to interview candidates in the spring of 2023.

Nominations due: January 1, 2023

Applications due: January 15, 2023

How to Nominate

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

Meet the Team

journals.physiology.org/ajplung/edboard

Submit Your Best Work

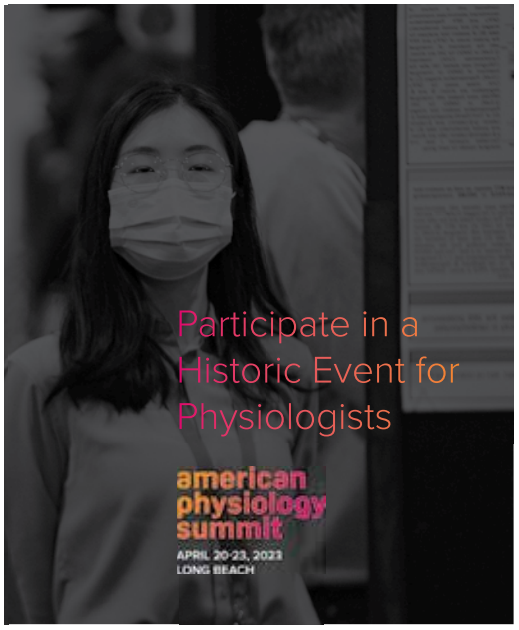
ajplung.msubmit.com

Counting Down to the American Physiology Summit

BY STACY BROOKS

Dear reader:

Happy 2023! If you are a resolution setter like me, you may be thinking about how you'll use the days, weeks and months ahead to get healthier, stronger or smarter. Or, you might be plotting ways to get more time out of your days or more life out of your years. However you're getting started, I hope that this is a year full of promise that holds lots for you to look forward to.



One thing APS and physiologists everywhere are looking forward to is the American Physiology Summit (April 20–23, 2023)! We had a great abstract submission season and are thrilled that so many of you are planning to join us in sunny Long Beach, California, to present your research. Whether you've submitted an abstract or not, there's still time to register and experience the great science, top-tier professional development, and many learning and network opportunities we've got in store. Visit **www.physiology.org/APS2023** for the latest program and schedule updates and to plan your trip!

OUR FEATURES

Our cover article this month features Michael Hultström, MD, PhD, a physician and associate professor of physiology at Uppsala University in Sweden. After COVID-19 hit Europe in 2020, Hultström and his intensive care colleagues began collecting data and launched Sweden's first COVID-19 biobank. Learn how they did it and what he's working on next on page 18. Also, Hultström will be presenting on long COVID as part of a game-changer session at the Summit. Yet another reason to attend!

Last summer and fall, APS staff started hearing rumblings about lab leaders having a hard time finding and hiring postdocs for open positions. We've covered the struggles of being a postdoc in this magazine before, but we wanted to explore if there was more to it than that. Why had it seemed to get worse in 2022? In our feature on page 24, we dive into this issue, looking at it from several angles.

Finally, as we start the new year—a time when so many of us make vows to eat healthier and exercise more—we wondered what the optimal grocery list looks like. With the endless news stories, new studies and sometimes contradictory information out there, what foods are the healthiest for us to focus on? We spoke with several physiology researchers to see what the research tells us about what and how to eat today. It all starts on page 30.

WE WANT TO HEAR FROM YOU

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

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

CAREER RESOURCES

american physiological society®

CAREER NAVIGATOR

Some physiologists move up the academic research ladder, while others explore career opportunities in the government, nonprofit organizations or careers outside the lab, such as science communication, teaching or administration. Learn about career opportunities in all these areas with our new Career Navigator.

CAREER GATEWAY

A successful scientific career requires more than just scientific expertise. To maximize a career in science, investigators, clinicians and educators need a well-rounded professional skill set. The APS Career Gateway provides physiologists the tools for every step of their career journey.

JOB BOARD

Looking for the next step in your career in science? Visit APS' new tech-enabled job board connecting members of our scientific community with career opportunities across academia, government, industry and nonprofits. Find the ideal match for your experience and expertise.

Learn more at physiology.org/careerresources.

THE Physiologist MAGAZINE

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Your personalized My APS Dashboard contains new APS section and interest group Hubs. Stay up to date on award deadlines, upcoming events, topics related to your field at the American Physiology Summit and so much more!

Check out your Hubs today at **physiology.org/MyHubs**.

Taking the Military Path

To better understand the experience of researchers conducting science in a military context, APS Executive Director Scott Steen, CAE, FASAE, spoke to three esteemed civilian scientists and APS members working in the armed forces: Nisha Charkoudian, PhD, chief of the Thermal and Mountain Medicine Division at the U.S. Army Research Institute of Environmental Medicine (USARIEM); Victor A. Convertino, PhD, FAPS, senior scientist in U.S. Army Combat Casualty Care Research at the U.S. Army Institute of Surgical Research (ISR); and Carmen Hinojosa-Laborde, PhD, FAPS, a research physiologist also at ISR. In their wide-ranging conversation, they discussed the career opportunities and the areas of similarities and differences in being a researcher in academia versus the military. Here's an excerpt of their conversation:


Scott Steen, CAE, FASAE

Steen: How do you think the daily work of what you do now is different from what you did in academia?

Charkoudian: I speak with folks a lot who are interested in applying to a position in our division, either as a postdoctoral fellow; as a staff scientist, which would be the equivalent of a faculty position; or as a junior scientist, which would be the equivalent of a technician position, because everyone has the same question: What is it that you're doing here and how is it similar or different from academia?

What I always tell people is our division, Thermal and Mountain Medicine Division at USARIEM, is similar to a hybrid. I see it as a hybrid of an academic department and a military base. A lot of people don't know what a military base looks like. We work with soldiers every day, and we can't really go off and be in some kind of ivory tower mentality. Something that we're doing—this sounds dramatic, but I feel that it's true—in the lab this week or tomorrow could affect someone that's right there in the lab with us next month when they go on deployment.

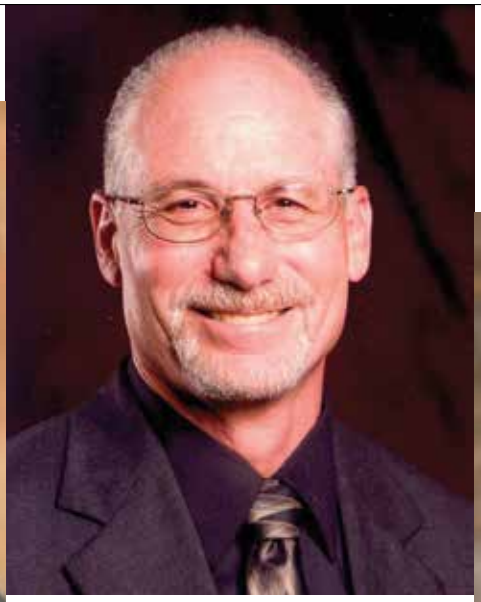
But as far as how the day-to-day is different, I would say some of the day-to-day is similar. In terms of the way that I would evaluate my team, the research physiologist would be evaluated very much like faculty would be evaluated in an academic department in terms of publications, getting research funding.

The way we actually get research funding is a little bit different, but things like developing an independent research program, getting research done, getting it published, those kinds of things are very similar.

Some of the military aspects are different, but as far as some of the requirements that we have to do to interact with the military or to work with military research volunteers, they're considered a vulnerable population in certain ways. So the IRB requirements are a little bit different because they're in a hierarchy. We have to be careful about how we brief them on the studies, how we consent them for studies.

They're very similar to how you consent any human subject, but we have a little extra care in terms of making sure that they don't feel coerced. For example, if it's a bunch of privates and there are sergeants in the room, they're going to feel like they have to do it whether you tell them they have to do it or not. So, we have to just be careful that, for example, no one from their chain of command is present at all, whether they're saying anything or not.

Convertino: I have quite a different experience, only because I started my career probably a good generation before at least Nisha. The first thing that struck me that was quite different: I was working in graduate school in academia and had the opportunity to work in a NASA lab, and the resources that are available in government laboratories easily overrun those that are in academia, at least at the time that I started.



From left: Nisha Charkoudian, PhD; Victor A. Convertino, PhD, FAPS; Carmen Hinojosa-Laborde, PhD, FAPS

NASA actually had, at that time, departments where if you needed a glass tube blown in a certain way, you took your design to them and they did it—no cost. That's what they were there for. And so I grew up in a government where the government was truly supporting their investigators and the work that was being done for operational application.

Over time, it has evolved somewhat to what Nisha was describing, but in my experience we still have access to funding that the outside scientific community does not. And so that allows us to be funded in a relatively less complex manner than you would find in academia when you're trying to compete for NIH funds. I've talked to colleagues that I went to school with and they expressed that they didn't know that they were going to be bogged down as much as they are in writing grants and having to worry about that.

I'm in the laboratory routinely. [Those colleagues] left the laboratory a long time ago because they expressed how they were spending all their time trying to keep their grant funding coming in so that they could keep a research program going and fund graduate students. So, it was really the graduate students that were running the day-to-day operations in the laboratory. Now that's not bad, but my colleagues, former classmates, really began to lose interest in science because they were bogged down with these daily activities of going higher into management and administration and trying to keep their grant funding going.

Hinojosa-Laborde: I think really it depends. What Vic is saying and Nisha is saying is absolutely true. But if you come in as a postdoc into a military lab, you're going to be doing essentially very similar things that you would be doing in an academic lab. And I think the differences start to appear as you move higher in the responsibilities.

I've been at the ISR for 13 years, and I do have a research team. I have a grant or a proposal, and we run experiments every day. But I am not in the lab. I have my own team. They come and talk to me. So, I think that's very similar to what you have in academia.

The type of administrative work I do—that's not the same as what academics do. I mean, again, I think Vic is correct; in academia, the senior scientists or the later career scientists are spending their time on committees and writing grants. We're doing paperwork that's government related that we as civilian government employees are really the only people allowed to do these kind of activities. So, it kind of falls on a few people.

View the conversation in full at **www.physiology.org/evolution**.

Comparative physiologists met in San Diego for the APS Intersociety Meeting in Comparative Physiology conference in October. The conference featured new science, a keynote lecture by NASA astronaut and APS member Jessica Meir, PhD, and even costumes for Halloween.

Share your story with us and it may appear in the next issue of *The Physiologist Magazine*. Email your thoughts—and links to your tweets and posts—to tphysmag@physiology.org.

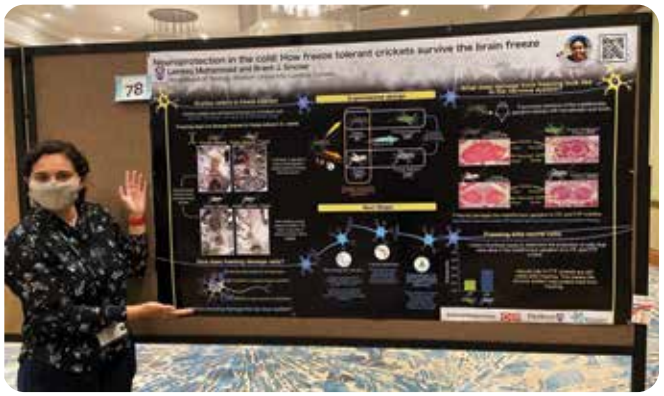
Julie the Bugologist, Ph.D.
@JulieReynolds42

Heading to the @APSPhysiology #Comparative2022 meeting! This is my first in person meeting since 2020. Can someone remind me how to do this?

9:17 AM · Oct 28, 2022

Lamees Mohammad
@cricketbrain1

If you want to learn about frozen cricket brains today @APSPhysiology check out my poster this afternoon! 🦗🧠 #Comparative2022



7:00 PM · Oct 30, 2022

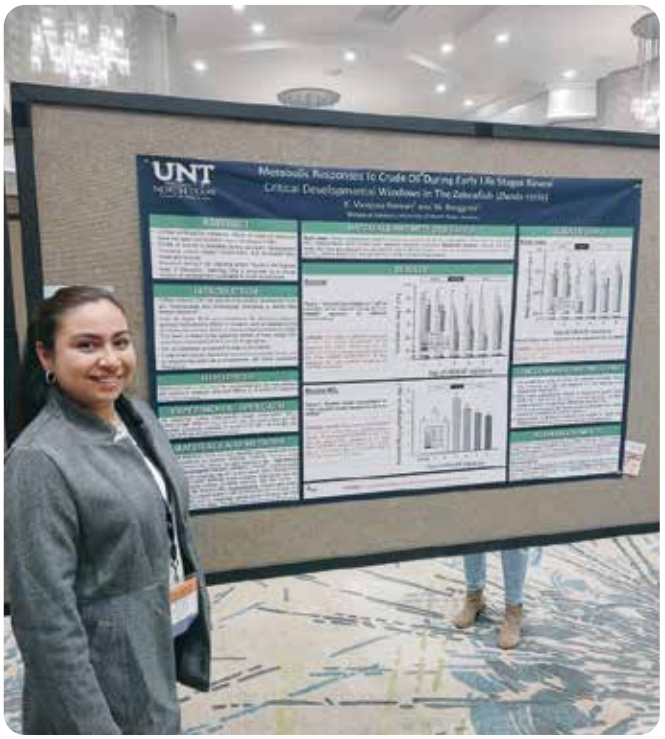
Tobias Wang
@Tobias_Wang_AU

Huge thanks to Dan Warren @SLUCompPhys for arranging a wonderful APS Intersociety meeting #Comparative2022 — zoophysiology rocks!

8:42 AM · Nov 1, 2022

Karem Vazquez
@KaremVazquezR

Comparative Physiology: From Organisms to Omics in an Uncertain World #Comparative2022 San Diego, California. Thanks to APS Martin Frank Diversity Travel Award for this opportunity! @APSPhysiology



6:25 PM · Oct 31, 2022

Carla Madelaire
@CarlaMadelaire

Awesome talk by Astronaut @Astro_Jessica about physiology studies in space! Thanks @APSPhysiology for inviting this inspiring person to open the meeting 😍

9:13 PM · Oct 28, 2022

Kerri Lynn Ackerly, PhD
@KerriAck erlyPhD

our session will be in costumes!! we have been planning for weeks 🤣 @LelaSchlenker

9:38 AM · Oct 26, 2022

Dr. Jackie Lebenzon
@JackieLebz

Sinclair Dynasty Assemble! So great to have the fam back together for #Comparative2022 @APS_CEPS @brentjsinclair @ecophyslab1 @ke_marshall @heathmacmillan @lmartins1721 @elladenicola @cricketbrain1

5:28 PM · Oct 31, 2022

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LAB NOTES

STATS & FACTS

-10%

Decrease in number of biological and biomedical science postdocs at federally funded research and development centers between 2012 and 2019 despite a 19% increase in the overall number of postdocs at these institutions during the same time period.

National Center for Science and Engineering Statistics

RESEARCH FIZZ

Sex differences in human running performance: smaller gaps at shorter distances?

Sex differences in sprint running are small at the beginning but widen as the distance increases.

Journal of Applied Physiology, October 2022

https://doi.org/10.1152/japplphysiol.00359.2022

MENTORING Q&A | EARLY CAREER

Post Postdoc

How to be successful as a new faculty member and collaborator.

Each issue, we ask a trainee or early-career member to pose their career questions to an established investigator and mentor. Here, Justin Sprick, PhD, an assistant professor at the University of North Texas, asks Frank T. Spradley, PhD, an associate professor and the director of basic research in the Department of Surgery at the University of Mississippi Medical Center, for advice on being a new faculty member.

Q: What are some of the common pitfalls that you see junior faculty make when starting their first tenure-track position, and how do you avoid them?

A: It is very easy to get overwhelmed with the ever-increasing volume of administrative tasks asked of you.

Left: iStockphoto; right: Illustrations by Kagan McLeod

It is important to understand when to say no and focus on those tasks that are most important. For example, if your gut is telling you to write a grant, then that's your answer. Form a mentoring team that will help you focus on achieving career checkpoints, making sure to include sponsors that can nominate or advise on optional tasks that will help, not hinder, you.

Q: "Team science" and multiple-principal investigator (PI) grant submissions are becoming more common as the problems we face often require a multidisciplinary approach to solve. What tips do you have for successfully initiating new collaborations to ensure that expectations are clearly established and both parties benefit?
A: This is a very important point. Most departments and centers should have work-in-progress meetings that bring together basic and clinical researchers. This is the case for our Cardiovascular-Renal Research Center and is the reason I am now involved with several co-PI grants. Attending these meetings, as well as national/international conferences, is the best way to initiate such collaborations—more specifically, get up, state your name and ask a question!

Once the team is established, meet often (the beauty of virtual meetings) to set deadlines. The best way to flesh out an outline of expectations is by writing grants because you plan experiments for years in the future. Once funded (fingers crossed!), you will most likely be expected to submit progress reports to the granting agency that effectively reinforce that everyone is meeting goals. Most of the data generated will likely be submitted for publication or used as preliminary data for future grants, so it is vital at the get-go to talk about authorship.

Q: With technological advances, many of the experimental techniques we have spent years mastering will eventually become less common or potentially even obsolete. As a trainee, we spend much of our time in the laboratory developing our technical skills. As faculty, however, this is often not possible due to competing demands on our time. How do you determine where to draw the line regarding taking the time to learn a new experimental technique versus seeking collaborations with others who already have the technique established?
A: I gather you understand what I meant about the "ever-increasing volume" of requests on our time mentioned in answer one above. Sure, the research tool belt that is developed during one's training will need to be realigned as science advances, which could involve using your knowledge base in a manner to teach your lab how to use a new piece of equipment (by understanding what final outputs should be) or range to the development of experimental animal models mimicking human disease (by reinforcing that every observational change in physiology and keeping good notes are critical).

I don't think that anything learned—even basic lab skills such as note-taking and critical thinking and review—are never not useful. However, they should be modified for instructional purposes to train your research staff and students. Then, the expectation is that they will free your time by becoming the teachers themselves. Of course, you can provide guidance, but grants and manuscripts must be written and reviewed to staff said research team.

Such computer work will lessen your time to learn new hands-on techniques, but assembling a group of researchers that want to learn and work well with others, including your intramural and extramural collaborators, is key to allow time for all aspects of scientific discipline. Learning to interview for these positions is a topic for an entire conversation in itself!

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.

Far right: iStockphoto

RESEARCH FIZZ

A multi-trial, retrospective analysis of the antihypertensive effects of high-resistance, low-volume inspiratory muscle strength training

Six weeks of inspiratory muscle strength training has been shown to lower blood pressure in adults.

***Journal of Applied Physiology*, October 2022**

https://doi.org/10.1152/japplphysiol.00425.2022

STATS & FACTS

<10%

The World Health Organization recommends keeping consumption of free sugars to under 10% of total caloric intake.

World Health Organization

RESEARCH FIZZ

Circadian clocks of the kidney: function, mechanism and regulation

This review summarizes current knowledge about the function, mechanism and regulation of kidney clocks.

***Physiological Reviews*, October 2022**

https://doi.org/10.1152/physrev.00045.2021

STATS & FACTS

1915

Year of the first known use of the term "superfood."

Merriam-Webster Dictionary

STATS & FACTS

$1 Trillion

The projected value of the superfoods market by 2026.

Statista

RESEARCH FIZZ

Altered lung physiology in two cohorts post COVID-19 infection as assessed using computed cardiopulmonography

A new laser technique called computed cardiopulmonography may assess post-COVID-19 lung function more fully than standard clinical lung function tests.

Journal of Applied Physiology, September 2022

https://doi.org/10.1152/japplphysiol.00436.2022

POLICY IQ | NIH RESOURCES

How to Navigate New Data-Sharing Requirements

Grant applicants submitting proposals to the National Institutes of Health (NIH) starting in January 2023 are now required to include a data management and sharing (DMS) plan. The newly implemented DMS policy calls on investigators to maximize the sharing of scientific data with the goal of accelerating discovery by enabling validation of research funding, encouraging data reuse for new studies and making high-value data sets available to the scientific community and the public.

To help investigators get started, NIH has generated a suite of resources that are available online at **https://sharing.nih.gov**.

An optional DMS plan format outlines the six required elements, including a description of the types and amounts of scientific data that will be generated; a plan and timeline for data preservation and access; consideration of factors affecting data access, distribution and reuse; and a plan for monitoring adherence to the DMS plan. Once submitted, plans are reviewed by NIH program staff but are not considered during peer review.

Information on how to budget for data management and sharing includes a list of allowable costs that may be included in the grant budget. Examples include costs associated with curating, formatting and de-identifying data, as well as preparing metadata necessary to allow interpretation and reuse. Proposed costs for data management and sharing are assessed by reviewers but do not contribute to the application's score.

A set of frequently asked questions sheds light on the details of the new policy,

Photos at left and on facing page: istockphoto

including the timeline for sharing of scientific data. The DMS policy requires that data be shared either at the time of publication or the end of the award period, whichever comes first. If a no-cost extension is granted for an award, the sharing of data may be delayed until the end of the extension.

In preparation for the new policy, the NIH Office of Science Policy and Office of Extramural Research worked together to produce two webinars that provide an overview of the policy and a deeper dive into the details of compliance. They are available at **https://sharing.nih.gov/about/learning**.

Authors who publish in APS journals are already encouraged to make data that underlie reported conclusions freely available through deposition in public repositories. In addition, supplemental data must be deposited in a publicly accessible data repository. Additional information about APS journal policies is available on the Information for Authors webpage at **https://journals.physiology.org/author-info**.

Access all of these resources on the APS website at **https://physiology.org/datamanagement**.

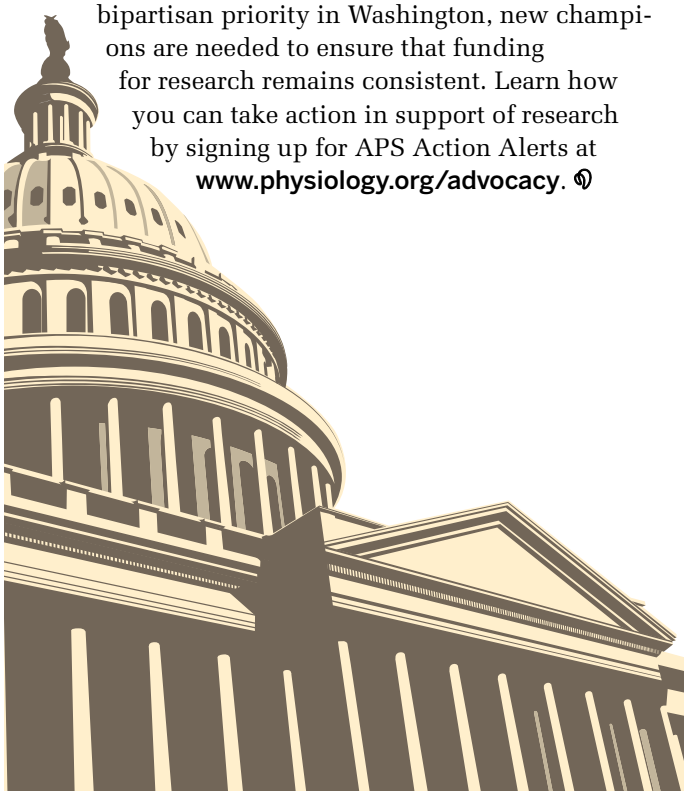
POLICY IQ | NEW CONGRESS

118th Congress Comes to Washington

On January 3, 2023, the 118th Congress convenes in Washington, DC. After a contentious mid-term election, control of the House of Representatives shifted from Democrats to Republicans, who hold a slim 221–213 majority. The Senate remains under the control of Democrats following a December runoff election in Georgia.

The change in party control of the House of Representatives means a shift in both the membership and leadership of all committees, including those that fund and oversee federal research agencies and programs. The end of the 117th Congress brought the retirement of House Science Committee Chair Eddie Bernice Johnson (D-TX 30th), a longtime champion for scientific research. Rep. Frank Lucas (R-OK 3rd) is expected to become chair, having served as ranking member of the committee alongside Johnson. While the Senate remains under the control of Democrats, several retirements, including that of Sen. Roy Blunt (R-MO 7th), mean that there will be new players in key roles for research.

While support for biomedical research has long been a bipartisan priority in Washington, new champions are needed to ensure that funding for research remains consistent. Learn how you can take action in support of research by signing up for APS Action Alerts at **www.physiology.org/advocacy**.



STATS & FACTS

<1 in 10

The number of adolescents and adults in the U.S. who eat enough fruits and vegetables.

Centers for Disease Control and Prevention

RESEARCH FIZZ

Role of macrophages during skeletal muscle regeneration and hypertrophy—Implications for immunomodulatory strategies

This review summarizes the role of macrophages in post-injury muscle regeneration response, including exercise-induced muscle damage.

***Physiological Reports*, October 2022**

https://doi.org/10.14814/phy2.15480

STATS & FACTS

18

The number of states with about one-quarter of their workforce made up of STEM occupations.

"Science and Engineering Indicators" report, National Science Foundation

STATS & FACTS

38.1%

The portion of science or engineering doctoral degree holders employed at four-year institutions.

"Science and Engineering Indicators" report, National Science Foundation

STATS & FACTS

36.9%

The portion of science and engineering doctoral degree holders employed at for-profit businesses.

"Science and Engineering Indicators" report, National Science Foundation

RESEARCH FIZZ

Differential airway remodeling changes were observed in patients with asthma COPD overlap compared to patients with asthma and COPD alone

This study found that people with asthma and chronic obstructive pulmonary disease (COPD) have airway remodeling that differs from that in people with either condition alone.

***American Journal of Physiology-Lung Cellular and Molecular Physiology*, October 2022**

https://doi.org/10.1152/ajplung.00137.2022

UNDER THE MICROSCOPE

Rapid Fire Q&A

Shawn Bender, PhD, thanks an important mentor and shares what he loves about his job and what he wishes the public understood about science.

Q: What inspired you to become a scientist?
A: I actually told a friend in college that I thought being a scientist would be a terrible job. Once I got involved in research, however, I was hooked and am thankful to have found an area I love.

Q: Most challenging laboratory technique you've learned to use?
A: Chronically instrumented swine (and running them on a treadmill).

Q: Items on your lab bench that you are most possessive of?
A: My microdissection tools—spring scissors and forceps (hands off!).

Q: Favorite lab mishap story that you can share without incriminating the innocent?
A: Looking for experiment details in a former undergraduate student's lab notebook and finding a lab "cheat sheet" with details and personal preferences of lab staff and even a map of the floor plan so they wouldn't get lost.

Q: If you could meet any scientist (living or dead) who would it be and why?
A: Blaise Pascal, scientist and philosopher—lots to learn there!

Q: If you could do a sabbatical with any scientist (living or dead) who would it be and why?
A: My collaborator and friend Alex Pinto because he does amazing science and he's in Australia.

Q: If you were a model organism, which model organism would you be?
A: Axolotl because who doesn't want to be able to regenerate?

Q: What do you wish the general public understood about science or research?
A: That it's a human endeavor and not the place to look for an answer to every question.

Q: Favorite book about science (fiction or non-fiction)?
A: "The Immortal Life of Henrietta Lacks" by Rebecca Skloot.

Q: How would you describe your job to a child?
A: I'm a teacher and I study how the heart works.

Bender with a Northern pike he caught during nonconference time at the 2022 Reindeer Lake Bench-to-Bedside Conference on the Microcirculation in Saskatchewan, Canada.

Photos, left and facing page, courtesy of Shawn Bender, PhD

Bender and his wife, Jessica, with their five daughters on vacation at Mount Rushmore in South Dakota.

Q: No. 1 guilty pleasure?
A: French fries and not sharing with the kids.

Q: Most influential scientist on your career?
A: There have been many and I'm so thankful, but I wouldn't be doing this without the influence of my graduate mentor, Richard Klabunde, PhD.

Q: Favorite science-related TV show (fictional or factual)?
A: BBC's "Planet Earth" series.

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

Q: Tell us a surprising fact about you.
A: My wife and I have five wonderful daughters.

Q: Favorite part of your job?
A: Telling the stories of science, whether it's in teaching or presenting our data.

Q: Least favorite part of your job?
A: Regulatory and compliance paperwork.

Q: Title you'd use on your autobiography?
A: "Chasing the Heart of It." Cheesy, but that's all I've got.

Q: Favorite charities you support?
A: Samaritan's Purse, True North (a local shelter) and a hospital in Papua New Guinea where my wife has done medical missions.

Q: Next book on your reading list?
A: "Unbroken" by Laura Hillebrand.

Q: Favorite TV show, movie series or podcast to binge-watch/listen?
A: Competitive reality shows like "Nailed It!" and "Blown Away" or Penguins hockey!

Bender with Scott Brown, PhD, a doctoral student from his lab, just before Brown's hooding at graduation.

Shawn Bender, PhD, is an associate professor at the University of Missouri and a research health scientist at Truman VA Hospital in Columbia, Missouri. He received his PhD from Ohio University with a focus on cardiovascular physiology and was a postdoctoral fellow at the University of Missouri. Bender's research focuses on mechanisms of vascular and cardiac dysfunction in co-morbid conditions, particularly obesity.

PUBLISH WITH POLISH | PEER REVIEW

Learn How to Be a Peer Reviewer with New APS Course

APS Publications has created a new training course on peer review called the "APS Review Certificate Program," for release in early 2023. The new training program gives clear and practical advice to reviewers with different experience levels. It is an excellent resource for existing reviewers who wish to refine their skills, along with early-career researchers wanting to learn about the peer review process.

APS staff worked closely with many of its active editors and top-performing reviewers in developing the content for the course. The program consists of four modules, beginning with the fundamentals of peer review, including its history, importance and models. The second module focuses on how to assess and review each section (e.g., Introduction, Methods & Materials, and so forth) of an original research manuscript. In the third module, trainees are provided tips on how to effectively write a peer review report. The final module focuses on ethics in peer review, including topics such as the detection of biases and figure manipulation.

It is an excellent resource for existing reviewers who wish to refine their skills, along with early-career researchers wanting to learn about the peer review process.

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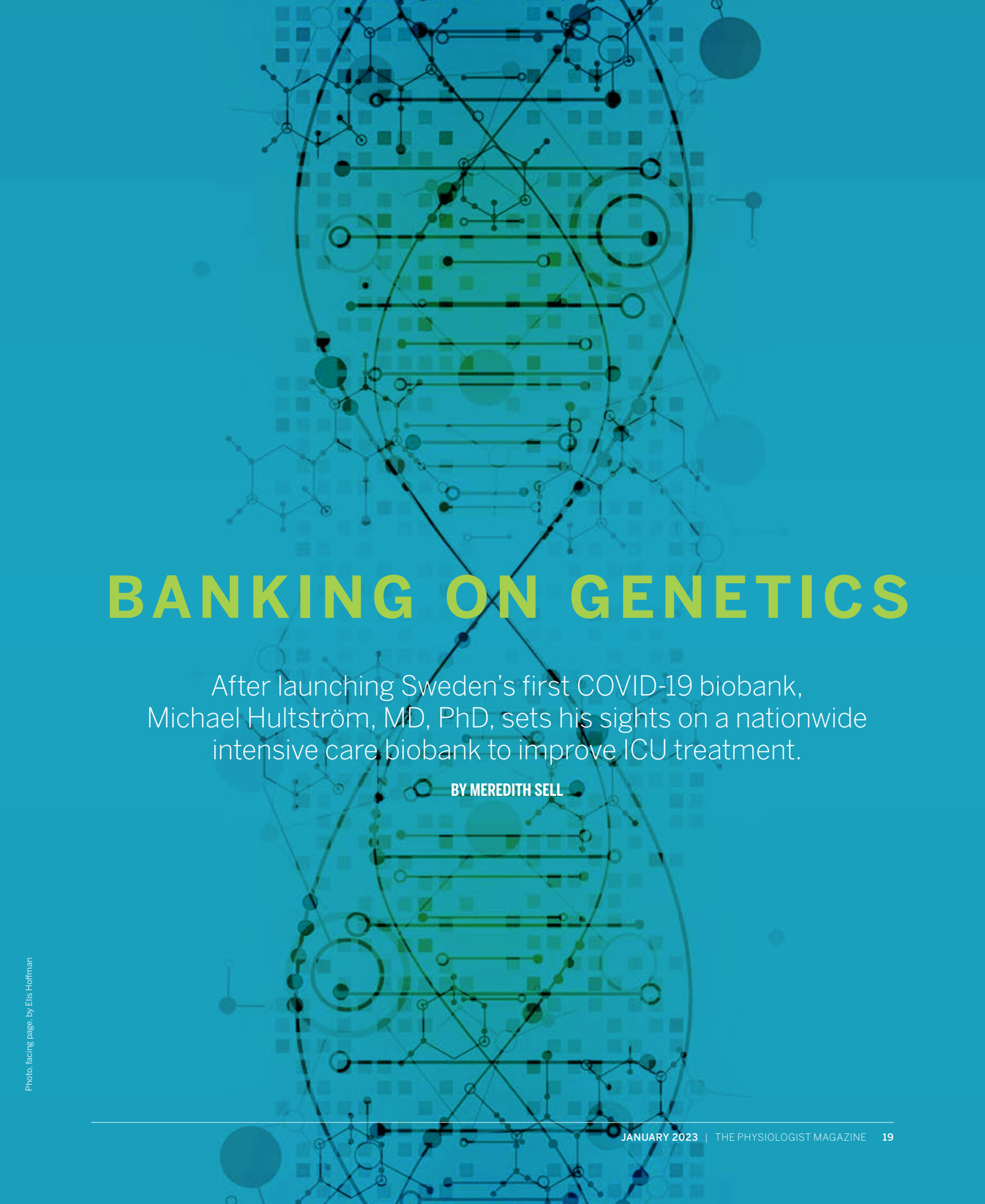
Access the training program at **https://learning.physiology.org**.



BANKING ON GENETICS

After launching Sweden's first COVID-19 biobank, Michael Hultström, MD, PhD, sets his sights on a nationwide intensive care biobank to improve ICU treatment.

BY MEREDITH SELL

Photo, facing page, by Elis Hoffman

Left: Hultström at the bedside of the newly opened ICU at Uppsala University Hospital before the arrival of the first patient.

In early 2020, Sweden's leading research hospital closed down all research labs in anticipation of the oncoming pandemic. While COVID-19 spread through China and Italy and countries worldwide braced for its impact, lab experiments and clinical trials at Uppsala University Hospital screeched to a halt.

Almost immediately, Michael Hultström, MD, PhD—a physician and associate professor of physiology—and his colleagues in intensive care sprang into action. No COVID-19 patients had been admitted; Sweden had yet to see significant spread of the virus. But surely, the hospital could do more than just wait for the sick to arrive. Hultström recalls how the intensivists challenged department heads and administrators with a reference to the hospital's vision: "So you mean that the 'leading international research hospital producing the most value for patients' should not study a completely new disease?"

Over the course of four days in early March 2020, Uppsala changed course: Labs and trials could run as long as they focused on COVID-19. With fellow intensivists Robert Frithiof, MD, PhD, and Miklos Lipcsey, MD, PhD, Hultström got to work setting up a COVID-19 intensive care biobank. On March 13, Uppsala admitted its first COVID-19 patient to the intensive care unit (ICU) and the biobank received its first samples, kicking off a long first wave of the pandemic.

PLANS PIVOT TO COVID-19

An ICU biobank had been in the works for almost a decade. Almost as long as Hultström had been at Uppsala, he'd wanted to study genetic causes of critical illness—those genes that make people more or less vulnerable to life-threatening syndromes, such as sepsis, acute respiratory distress syndrome or acute kidney injury.

His interests were always twofold: physiological research and clinical work. That's how he landed in a parallel PhD/MD program that led him to anesthesiology and intensive care—the medical specialty, he says, is "the closest thing to physiology you ever get in clinical medicine" because it's so hands-on.

"You give drugs that have immediate effects … and you monitor them," he says. "You measure blood pressures and blood flows all the time. If you give a drug, you see what happens—just like in the physiology lab."

In 2013, Hultström finished his MD and started his physiology research lab at Uppsala. With his lab's focus on cardio-renal failure in rats and mice, he was still steps away from researching human genetics, but the idea was there. And his work

Left: Elis Hoffman

"We have nothing specific for treating you once you're in intensive care that would improve your survival or treat your disease. We [only] know how to maintain physiological stability."

in the ICU showed him how valuable such research could be.

"We have nothing specific for treating you once you're in intensive care that would improve your survival or treat your disease," he says. "We know how to maintain physiological stability … but we don't have, like, 'Oh no, his kidneys are failing. Let's give this treatment and then his kidneys will be fine.'"

Conversations with Frithiof and Lipcsey showed they had similar ideas. They all saw a biobank as a way to improve intensive care.

In February 2020, after years of talking about the project, the trio needed just a few more signatures to start a biobank in Uppsala's ICU. The goal was to study sepsis, a condition often seen in intensive care. The biobank would store biological samples, such as blood and urine, associated with physiological information in a database that, over the long term, could be drawn from to explore research questions.

The pandemic retrained the project's focus. After tracking down administrators and interrupting meetings for signatures to authorize the new COVID-focused effort, Hultström and the others started a biobank collecting samples and physiological information from COVID-19 patients in the ICU.

The three-man team found a rhythm for their work as they cycled through ICU shifts. If they weren't in the ICU, they were working on COVID-19 research or at home sleeping. If two of them were busy, the third could handle emailed questions from collaborators.

"Most questions we didn't even need to discuss," Hultström says. "One of us answered and the other two were like, 'Yes, we were going to write that.' … We had a very fruitful way of working where we could keep the activity high even though we had big commitments in the clinic."

And the clinic filled up. Before the pandemic, Uppsala typically operated near its limit of ICU beds, just 10 maximum. (Sweden has fewer than five ICU beds per 100,000 inhabitants, lower than most Western countries.) Just a few weeks into the pandemic, the ICU was taking over other wards within the hospital, ultimately expanding to more than 30 beds.

Hultström has been sailing since about age eight. Here, he is sailing outside the island Arholma on the Swedish East Coast.

Right: courtesy of Michael Hultström, MD, PhD

Hultström and his colleagues kept busy, stabilizing patients and doing their best to treat the poorly understood disease. When lulls came between pandemic waves, Hultström devoted more energy and attention to research, combing through the growing biobank for insights. A better understanding of human genetics, he thought, might help ICUs develop new treatments that could stop the ribonucleic acid (RNA) virus in its tracks.

UNLOCKING INSIGHTS TO IMPROVE COVID-19 CARE

RNA is used by human bodies to translate DNA and trigger the production of various proteins. When a virus, such as coronavirus, uses RNA to hold genetic information, the cells it encounters respond by making the virus-demanded proteins—which multiplies the virus through the body. But some people have a gene that plays good defense: OAS1.

"It was known that this OAS1 gene was an important antiviral gene," Hultström says. Put simply: The OAS1 gene triggers production of the OAS1 protein. That protein then senses the presence of viral RNA and activates an enzyme that breaks down the acid, protecting human hosts from worsened infection.

Because COVID-19 is an RNA virus, OAS1 is a key protein that protects people from critical illness. It was also one of the most significant findings that Hultström's team helped uncover through collaboration with other groups. "It quickly went to the pharmaceutical industry and was taken up by some companies to see if they could do something with it," Hultström says.

Many other genes that turned out to be significant for severe COVID-19 infection had to do with the lungs, mucus production, inflammation and fibrosis-related proteins (which could impact lung scarring). Hultström's team also found that hyper-coagulation, or aggressive blood clotting, was common among the critically ill.

These findings led to changed clinical practices at Uppsala and, in some cases, even went international with entities such as the United Kingdom's National Institute for Health and Care Excellence referencing Hultström and his colleagues' studies in updated guidelines for COVID-19 care.

Meanwhile, the Uppsala team participated internationally with the COVID-19 Host Genetics Initiative, which combined efforts from countries around the world to uncover the genetics behind susceptibility to the virus. That work continues today, with Hultström currently focused on long COVID. At the time of this writing, there's one genetic hit for the extended illness—and it's also a risk factor for severe COVID-19. (Hultström will be sharing more of this work at the 2023 American Physiology Summit. See sidebar below.)

With Uppsala operations mostly back to normal, Hultström and his fellow intensivists are now working to extend the ICU biobank nationally in Sweden. Hultström says all of the country's major hospitals and ICUs are on board, as are the medical registries and Biobank Sweden, which serves as an umbrella organization for nationwide Swedish biobanks. They aim to launch the patient enrollment process in early 2023, and Hultström hopes the biobank's first data release will take place in 2024. Already, at Uppsala, the ICU is collecting samples from patients that have a whole range of illnesses other than COVID-19.

"We need to be able to identify new ways of interacting with critical illness and helping these patients," Hultström says. In time, with Sweden's major ICUs contributing, Hultström hopes they'll have enough information to understand the underlying mechanisms of critical illness—and find treatments that can turn patients around.

Long-COVID Experts Meet at the Summit

Learn more about what we know—and still need to understand—about long COVID at the 2023 American Physiology Summit, which will be held April 20–23 in Long Beach, California.

american physiology summit
APRIL 20-23, 2023
LONG BEACH

Michael Hultström, MD, PhD, will be a part of the game-changer session "The Race to Understand Long-term Covid-19" with Stanley Perlman, MD, PhD, of University of Iowa, and Patricia Silveyra, PhD, of Indiana University.

The moderated panel discussion will look at the current research on post-acute sequelae of COVID-19 from animal models and translational research. It's one of several game-changer sessions, which will feature some of the biggest topics impacting life and health today.

Learn more and register for the Summit at **www.physiology.org/APS2023**.

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January **2**

APS-sponsored AAAS Mass Media Fellowship

$8,000 stipend. 10-week summer program places students at media organizations nationwide. Fellows research, write and report today's headlines, sharpening their abilities to communicate complex scientific issues to the public.

January **9**

ADInstruments Macknight Innovative Educator Award

$1,500 honorarium. Honors a member who demonstrates the ability to incorporate teaching techniques and utilize technology in engaging students in physiology.

January **15**

Porter Physiology Development Fellowship

$28,300 stipend. Honors graduate student members from underrepresented racial and ethnic minority backgrounds pursuing a PhD.

January **15**

Arthur C. Guyton Distinguished Educator Award

$1,000 and travel/registration reimbursement. Honors an educator who has demonstrated excellence in the classroom and improvements in physiology education.

January **24**

Dale J. Benos Early Career Professional Service Award

$1,000 honorarium. Honors a member who has made outstanding contributions to and demonstrated commitment to furthering the goals of the physiology community.

WHERE THE PO

Photo: Wavebreakmedia

ARE ALL STDOCS?

Academic labs struggle to fill open postdoctoral positions, as more researchers choose different paths.

BY MELANIE PADGETT POWERS

Kamal Rahmouni, PhD, has been trying for several months to fill two open postdoctoral positions in his physiology lab at the University of Iowa. He has received zero competitive applications.

"We used to put out ads and then we would get a couple of applications … and select a handful of applicants to invite for an interview. But, it turns out these days when we put out a call for applications, we don't get any viable applications, even from outside the United States," says Rahmouni, a professor of neuroscience and pharmacology whose lab researches the molecular and cellular processes that regulate autonomic, metabolic and cardiovascular functions.

Two-thousand miles west, the story is very similar: At his lab at University of California, Berkeley, assistant professor José Pablo Vázquez-Medina, PhD, has also been trying to fill two postdoctoral positions. He has an international candidate who would be a great fit, he says, but she has been waiting for her work visa for almost a year. She has told Vázquez-Medina that there's a visa backlog post-COVID at her country's U.S. consulate.

A few months ago, Vázquez-Medina began advertising for the second position, for his new National Institutes of Health (NIH) grant, but there have been no suitable candidates.

"Something we tell people who are interested is that this is an R35 grant, not an R01," he says. "So, there's some freedom for people to pursue their own interests." But that extra flexibility hasn't enticed anyone.

Vázquez-Medina recognizes that his research focus is very specific—his lab studies physiological adaptations to natural and anthropogenic stressors in marine vertebrates and the role of oxidative stress and redox signaling in pre-clinical models of disease. However, that niche hasn't been a hiring barrier in the past.

So, why are physiologists suddenly finding it more difficult to recruit and hire postdocs? Principal investigators (PIs) and postdocs alike point to several obstacles—issues that are not new to labs, but that might have been exacerbated by larger societal factors such as the COVID-19 pandemic, inflation, a housing and rental crisis, and more awareness and acknowledgment of burnout and mental health.

Such factors have contributed to a "great resignation" across the U.S. In March 2022, a record 4.5 million employees quit their jobs, and there were 11.55 million job openings—the highest on record, according to the U.S. Bureau of Labor Statistics. The steep numbers continued throughout the year, with another 4.1 million quitting in September. And while researchers might not be quitting in droves like retail and hospitality workers, everywhere you look people are reevaluating their priorities and career needs. It's an employee's market right now.

"I think we all have had some time to reflect," says Josef Brandauer, PhD, associate professor at Gettysburg College in Pennsylvania and chair of the APS Career Opportunities in Physiology Committee. "Most people will have reconsidered their options and their choices during some inevitable downtime during COVID. I don't necessarily think that's a bad thing. I just hope that we can motivate qualified folks to stay scientists or become scientists."

Traditionally in academic science, PhD graduates are expected to do a postdoc for two to five years to gain more research experience, before then expecting to become a PI of their own lab. The problem with that trajectory in the 21st century is that there aren't enough academic positions for all those postdocs, leading some physiologists scrambling to find any open academic jobs, let alone a tenure-track spot. Studies estimate that only about 10% of postdocs will eventually land a tenured faculty position.

Instead, more postdocs are choosing industry and other options over tenure-track roles. In 2015, 49% of postdocs chose academic positions, compared to 40% in 2020, across all genders and race/ethnicities, according to the National Center for Science and Engineering Statistics (NCSES) at the National Science Foundation. On the flip side, postdocs choosing industry grew from 32% in 2015 to 40% in 2020. (And those numbers don't take into account any pandemic consequences.)

Some scientists are skipping the postdoc phase entirely, heading

"Money is one of the main criteria, of course, but there are many other things like the constant demand and the challenges and the competition that make this field harder to survive."

—Rashi Singhal, PhD

straight into industry instead. "They can get positions even without a postdoc. … I know people who got offers even six months before they defended their thesis; they had a job already lined up in industry," Rahmouni says. Other PhD graduates are choosing to work for nonprofits and government.

MONEY MATTERS

Universities are not keeping up with industry when it comes to salary and benefits. While many factors contribute to the postdoc workforce struggles, most agree money is at the top of the list.

The average salary for PhD recipients in life sciences is $85,000 overall. But for those who are postdocs, that drops to $50,004, according to NCSES. And because postdocs are not university employees, there are few benefits beyond health insurance. Postdocs may see their peers in industry—and their friends in other careers—receiving retirement benefits, life insurance, disability insurance, child care subsidies and gym memberships.

"There's no doubt that the postdoc population overall is undercompensated for the work they do," says Thomas P. Kimbis, JD, executive director and CEO of the National Postdoctoral Association. "The average salary across the country is right around $50K, and this is for the highest educated workforce there is."

When Rashi Singhal, PhD, started her postdoc position, she was happy with her salary. She and her husband moved to the U.S. from India, and both were able to land postdocs at the University of Michigan. But Singhal, an APS 2021–2022 Postdoctoral Fellow who is now in the fourth year of her Michigan postdoc, soon realized their postdoc stipends didn't go far in Ann Arbor.

Eight months ago, Singhal gave birth to their daughter. "Half of my postdoc salary is just going to the child care," she says. "And for my colleagues who are postdocs who have two kids, their whole salary is just going to the daycare. It's disappointing."

Singhal was able to take 12 weeks of paid maternity leave, but her friend in industry received a six-month paid maternity leave. "This is one of the disadvantages of being in an academic setting," Singhal says. After 12 weeks, she says her body had not fully recovered and she was struggling to keep up with breastfeeding her daughter. "I was of course happy to return to the lab because I love my work," she says. "But with what was going on with my body and with the baby, [my return] felt very rushed."

NIH sets postdoc stipends, and most universities follow these amounts, not bumping up the stipends from other funding sources. Based on NIH's pay scale for fiscal year 2022, a fellow with zero years of postdoctoral experience would receive a stipend of $54,835; a fellow with seven or more years of postdoctoral experience would receive a stipend of $65,598.

The NIH stipends don't take into account where a fellowship is located, meaning the struggle to pay the bills may be harder in more expensive cities such as San Francisco, Boston, New York City and Washington, DC. Rents soared across the U.S. in 2022, as demand outpaced supply with fewer people able to afford to buy a house. The average rent is now more than $2,000 a month in the U.S. for the first time ever, according to Bloomberg.

Postdoc salaries are not keeping up with the cost of living, which Brandauer worries will mean postdoc fellowships will be filled by those who don't have to worry as much about their income from a postdoc stipend. "I think this ends up being exclusionary—you exclude groups who are more affected by economic factors than others, and that is a problem that we are actively trying to countermand," he says.

There has been a growing movement across the country among graduate students to unionize, demanding higher pay and better benefits. But postdocs are often left out of the fight because they are not university employees.

Princeton University announced in 2022 that it would increase graduate fellowship and stipend rates by an average of 25% to about $40,000 for doctoral candidates during the 10-month academic year. At Dartmouth University in October 2022, graduate students staged a walkout

“For a long time, the only path that we sort of guided our trainees into was academia, and that’s of course not sustainable because there’s just not enough jobs. For us to be able to recruit top students, we have to offer them a living wage and then a clear path.”

—José Pablo Vázquez-Medina, PhD

and says they plan to form a union to demand a guaranteed living wage.

PASSION OVER PAY?

To recruit more postdoc candidates, many are trying to cast a wider net—reaching out to more colleagues and their larger networks, posting open spots on social media. But those interviewed agree the entire postdoctoral structure needs to change.

“I mean, we have to do something,” Rahmouni says. NIH and universities need to offer competitive salaries and benefits or postdocs will continue to leave academia, he says.

“But I think we need to offer them more than that,” he continued. Departments need to develop better programs that will help PhD students decide on career opportunities, he says, teaching them how to target a specific career area and be competitive in the market.

“We need to offer them some paths after the postdoc: OK, they do a postdoc; what’s next? We have to do a better job in mentoring the postdocs, not only in the lab, but give them something that allows them to see some light at the end of the tunnel—that the postdoc will get them somewhere,” Rahmouni says.

Postdocs can experience isolation, underappreciation and burnout from working long hours at a lower pay. “Money is one of the main criteria, of course, but there are many other things like the constant demand and the challenges and the competition that make this field harder to survive,” Singhal says. She has found the work-life balance difficult, and now as a parent, tries not to go into the lab on weekends.

“People put in 10 to 12 hours of work a day Monday to Friday … and then go in on Saturday and Sunday to continue their research,” she says. “We’re doing cell culture—you have to continuously see them and do work, and that doesn’t [matter] whether it is a Saturday or Sunday. Compare that to the industrial sector, where you have projects which are very confined and very streamlined.”

Singhal believes morale decreased during the pandemic when labs were forced to shut down and some professors couldn’t support their postdocs due to lack of funds. “Some of my colleagues or friends who were highly motivated to do academic research shifted their job to another sector, and now they are very satisfied and better paid,” she says.

The National Postdoctoral Association’s Institutional Policy Report recommends institutions increase the staff and budget for postdoc offices, provide higher compensation and equality in postdoc benefits, implement a uniform postdoc onboarding process, offer an intentional training program, build a diverse postdoc population, and implement better career tracking of postdocs after they leave their training institutions.

Supporting postdocs is important, but physiology needs to continue to also recognize that there are not enough academic jobs for postdocs to head into, says Dennis Brown, PhD, APS chief science officer and professor of medicine at Harvard Medical School and director of the Massachusetts General Hospital Program in Membrane Biology. “It’s been well-known for years and years that there are not enough faculty positions for all of the postdocs,” Brown says.

Science needs to stop calling non-academic careers—such as those in industry—the “alternate career path,” Brandauer says. “That wasn’t productive, and we are moving away from that. I am personally glad that we are framing this discussion differently because you can be a scientist and not be in an academic lab and still have a very, very productive, meaningful and impactful career.”

Vázquez-Medina says: “For a long time, the only path that we sort of guided our trainees into was academia, and that’s of course not sustainable because there’s just not enough jobs. For us to be able to recruit top students, we have to offer them a living wage and then a clear path.”

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The MENU Mystery

Physiology research sheds light on what and how to eat today.

BY CHRISTINE YU

"You are what you eat."

We've heard endless iterations of this phrase, often as an admonishment to eat well. But when French politician and lawyer Jean Anthelme Brillat-Savarin first wrote, "Tell me what you eat and I will tell you what you are," it's doubtful he would have anticipated that his words would become a guiding tenet in how we think about food, diet and nutrition.

Facing page: wildpixel

"For almost 100 years, calorie restriction has been the gold standard for interventions that regulate healthy aging in a wide range of species, from yeast to mice and non-human primates."

—Dudley Lamming, PhD

The idea that good food, good health and good character are inextricably linked has persisted since Brillat-Savarin first inked those words in 1826. In the 1930s, American nutritionist Victor Lindlahr was quoted as saying, "Ninety percent of the diseases known to man are caused by cheap foodstuffs. You are what you eat," the first appearance of the phrase in the English language. Since then, it has spawned countless food rules—a series of do's and don'ts that are supposed to illuminate a path toward optimal health.

Yet, when it comes to making everyday food choices, it's not always simple. The landscape of nutrition science is constantly changing. It's hard to parse through the often conflicting and confusing headlines in the news and on social media or even doctor recommendations. Should you eat eggs or strike them from your diet? Is breakfast the most important meal of the day or should you skip it for better metabolic health?

Beneath the hype, what does physiology research tell us about the best ways to eat and foods to consume for optimal health? Are there certain foods that reduce the underlying contributors to disease? Let's take a look.

HOW WE EAT

Most of us hope to age gracefully and live out our years to the fullest. Nutrition is a critical facet of this equation. Not only do we need to eat to survive, Brillat-Savarin and Lindlahr were right—diet is intricately tied to health and longevity. Certain nutrients and patterns of eating are associated with lower rates of age-related disease.

The reality is that for most Americans, there's room for improvement. According to the Food and Drug Administration (FDA), 75% of people don't eat enough fruits, vegetables or dairy. Sixty-three percent exceed the recommended limit for added sugar. Seventy-seven percent consume too much saturated fat. Ninety percent have too much sodium in their diet.

"Most diseases that affect people today are largely due to improper nutrition and, to some extent, lack of physical activity," says Joseph Brozinick, PhD, senior research adviser at Eli Lilly. "It's not just obesity and diabetes. To some extent, perhaps kidney disease, heart failure and some cancers do seem to be affected by nutrition."

Scientists have long been interested in understanding the connection between nutrition and physiology. "Trying to understand what dietary components regulate these effects and the molecular mechanisms that are engaged may give us insight not only

Left: wildpixel

to think about how to eat healthy, but also to develop small molecules that we can use to treat age-related diseases," says Dudley Lamming, PhD, associate professor of medicine at the University of Wisconsin-Madison.

One main area of study is calorie restriction. "For almost 100 years, calorie restriction has been the gold standard for interventions that regulate healthy aging in a wide range of species, from yeast to mice and non-human primates," Lamming says. "When you calorie restrict, limiting the number of calories that an animal consumes, typically 20 to 40%, they live longer and healthier lives."

Recently, scientists have found that there may need to be a period of fasting to evoke the beneficial metabolic, molecular and anti-aging adaptations of calorie-restricted diets. Heidi Pak, PhD, a former student in Lamming's lab, teased apart the effects of calorie restriction and fasting together and alone. In her study, mice that ate only one small meal a day not only had better blood sugar control but were also found to be less frail, have better memories and live longer compared to mice that didn't fast while also eating fewer calories.

"What Heidi discovered was that a lot of the metabolic effects of calorie restriction, particularly those related to insulin sensitivity, require a fasting period," Lamming says.

THE PROTEIN CONUNDRUM

Fasting and calorie restriction aren't the only ways to induce advantageous metabolic changes. Lamming also noticed that the amount of protein in our diets may also influence health and longevity. And most Americans may be consuming too much protein.

"Human epidemiological data suggest that people who eat lower protein diets are healthier and have reduced rates of a number of different diseases, particularly diabetes," he says. "Short-term protein restriction in people tends to make them leaner, have lower fasting blood glucose and increase insulin sensitivity." Lamming believes these changes may be due to decreased consumption of specific amino acids. He and his colleagues have identified potential culprits.

One is isoleucine, a branched chain amino acid. In humans, isoleucine levels correlate with body mass index and mortality risk. By restricting only dietary isoleucine in mice, Lamming and his colleagues—including former graduate students Nicole Richardson and Deyang Yu and current graduate student Michaela Trautman—duplicated many of the metabolic effects of protein restriction. The restriction promoted fat loss and improved glucose tolerance and insulin sensitivity, and mice got leaner. What's more, there was a "beiging" of white adipose tissue.

"It's burning off a lot of fuel in the form of heat. The animals aren't hotter; they don't move more. But their metabolic rate has essentially increased," Lamming says. Conversely, when isoleucine

Is There a Best Way to Eat?

There's no shortage of popular diets. Of the options, Jamie Baum, PhD, director for the Center of Human Nutrition and associate professor at the University of Arkansas, highlights three promising ones:

Mediterranean Diet

The original "healthy" diet emphasizes high fruit and vegetable intake, healthy fats and limited meat consumption. "They're finding people who follow this pattern have less heart disease, less cancer, less decline in cognitive function," Baum says. But she says that it may have to do more with lifestyle than just a way of eating—physical activity, close-knit communities and family, a sense of life purpose and low stress. "It's a complete package."

Seventh-Day Adventist

Created by the Seventh-day Adventist Church, this diet is focused on plant-based whole foods such as legumes, fruits, vegetables, nuts and grains. It discourages eating animal products and consuming alcohol and caffeinated drinks. It's been associated with a lower risk of obesity, high blood pressure and high blood sugar, which can all contribute to metabolic disease. The Adventist community in Loma Linda, California, designated a "blue zone," has been found to live longer than the average American by 10 years. (A blue zone is a place where people consistently live over 100 years old.)

MIND Diet

The MIND diet—or Mediterranean-DASH Intervention for Neurodegenerative Delay—focuses on brain health and preventing dementia. (DASH stands for dietary approaches to stop hypertension.) The MIND diet combines aspects of the Mediterranean and DASH diets, which have both been shown to reduce the risk of heart disease, diabetes and other conditions. It highlights 10 different foods that correlate with improved cognitive function, such as berries, leafy green vegetables, fatty fish like salmon or sardines, whole grains and poultry.

> **"We've cured diabetes and obesity a lot in animals but never in humans. It's hard to translate some of the findings in preclinical models to clinical models or to people. That's where a lot of things fall apart."**
>
> **—Joseph Brozinick, PhD**

was added back to a protein-restricted diet, the positive effects of the diet were mitigated.

The other potential culprit is the amino acid histidine. In humans, there's a correlation with histidine levels in the diet and body mass index, an effect that Lamming says is twice as big as what has been found for isoleucine. When another of Lamming's former graduate students, Victoria Flores, PhD, restricted histidine in mice, mice similarly got leaner. Metabolic rates increased, and insulin sensitivity improved.

However, protein restriction seems to extend lifespan only in males, not females. While researchers don't completely understand why, they believe it might have to do with the mTOR signaling pathway, an amino acid- and insulin-responsive protein kinase that's a key regulator of metabolism and aging. "What we see in our branched chain amino acid-restricted animals is that mTOR signaling goes down, but it only goes down in males, and that correlates with the lifespan extension," Lamming says.

While some researchers are bullish on low-protein diets, others believe muscle mass and function are critical for health and well-being. "Muscle mass has a significant impact on energy balance, which impacts energy metabolism, and improved muscle function reduces risk for chronic disease. There is also a relationship between skeletal muscle mass and outcomes of well-being such as depression and sleep quality," says Jamie Baum, PhD, director for the Center of Human Nutrition and associate professor at the University of Arkansas, who got her start studying higher protein diets during the heyday of the South Beach and Atkins diets.

"Muscle is also essential for disposing of nutrients," Baum says. But to preserve muscle mass, you need dietary protein. Baum recommends a higher intake of lean protein, roughly 30% of daily calorie intake.

"Muscle is a protein storage organ in the body, and losing a lot of protein is detrimental to your health," Brozinick says. "The biggest predictor of survival from profound injury and disease—like cancer, chronic kidney disease, sepsis and traumatic injury—is your ability to hang on to lean muscle mass." And that extends to people who are obese or have type 2 diabetes. It's particularly true for older adults who are at risk of sarcopenia—an age-related involuntary loss of skeletal muscle mass and strength that is associated with a higher risk of mortality.

Brozinick thinks muscle's role in overall health, aside from exercise and physical activity, may have to do with mitochondria. Because mitochondria are symbionts, they have their own DNA. When mitochondria in the muscle become unhealthy and break apart, their DNA is released into the cell and is considered a toxic substance.

"[Mitochondrial DNA] can communicate with other cells in the body and induce inflammation among other things," Brozinick says. This can have adverse effects on other organ systems. He says there's some indication that the ability of muscle to oxidize fat and other substrates may be an important factor in health, aside from just quantity of muscle.

FROM BENCH TO KITCHEN COUNTER

Every scientist knows that translating laboratory findings into real-world, practical applications isn't seamless. "We've cured diabetes and obesity a lot in animals but never in humans. It's hard to translate some of the findings in preclinical models to clinical models or to people. That's where a lot of things fall apart," Brozinick says.

"One thing I always note is that our mice are sedentary and probably not good models for athletes or people who are very physically active. They may well benefit from a higher protein diet," Lamming says. "Our results also may not apply in the same way to people who are over the

age of 65 and suffer from age-related muscle loss. These people are often prescribed to eat more protein."

Instead, Lamming says his mice may be better models for the general population, which tends to be sedentary and overweight or obese. Even still, differences between individuals may also influence expected results.

The debate between low-protein versus higher-protein diets also illustrates that science is often anything but black and white. "That's the beauty of science; it can contradict itself," Baum says. "There are people that would argue with me that high levels of branched chain amino acids are bad for chronic disease. But why is that? Is it because your muscles aren't functioning and can't clear them? Is it because, just like with diabetes and you become unresponsive to insulin, you become unresponsive to branched chain amino acids? I don't know."

In some cases, researchers may need to pull back the lens and consider the larger context. For Baum, her frustration lies with the overemphasis on specific molecules. "Our bodies don't work like that, but I feel like a lot of this research is geared toward a pharmacological approach," she says. "But is that the right approach for aging, nutrition and chronic disease?"

Even working within industry, Brozinick tries to maintain a holistic perspective, one he's had since he first became interested in physiology as a collegiate student-athlete and wanted to understand how the body's different systems worked together. "All these organ systems talk to one another. They communicate with other tissue beds. If all you care about is liver metabolism or adipose, you lose touch with that," he says.

While research may point to the benefits of intermittent fasting or diets with a specific amount of protein, the reality of people's lives and systemic barriers can make dietary advice difficult to implement. Most people have a hard time sticking with a traditional diet or other restrictive way of eating over the long term. Plus, healthy foods such as fresh produce and lean protein may not be available in every neighborhood or fit into every household's budget or food culture. They may also require more time to prep. With long work hours and caretaking responsibilities, not everyone has the available resources. Over 10% of households in the U.S. were food insecure at some point in 2021.

IS PERSONALIZED NUTRITION THE ANSWER?

The answer to the question "What should I eat?" isn't clear-cut. It can vary depending on age, genetics, activity level, body type, food environment, socioeconomic status and even the microbiome environment. Increasingly, scientists are looking into these individualized patterns.

"We're very interested in trying to explore how your genetics might influence your response to different diets," Lamming says. "There is definitely variation, and it would be really nice to be able to prescribe a specific diet to a specific person."

The current research on the molecular and mechanistic level could pave the way toward more personalized diet and nutrition advice. In its Strategic Plan for National Institutes of Health (NIH) Nutrition Research, NIH has targeted precision nutrition as a key strategy. It's a way to customize what's traditionally been a one-size-fits-all approach to eating and to drive the field forward. But there's more work to do.

Until then, rather than trying a specific diet such as Keto or Paleo, Brozinick says to focus on common sense recommendations: Eat a mix of fruits and vegetables for their antioxidant capacity. Include healthy fats such as mono- and polyunsaturated fats found in nuts and olive oil. Consume a moderate amount of protein. Meet your fiber intake. Don't go overboard on any one thing. And exercise.

The debate between low-protein versus higher-protein diets also illustrates that science is often anything but black and white. "That's the beauty of science; it can contradict itself."

—Jamie Baum, PhD

APS ELECTIONS

Get to Know APS Leadership Candidates and Vote!

Voting for the next slate of APS leaders—president-elect and councilors—begins soon. Want to meet the candidates and gain a better sense of what they could bring to these roles? Join the all-member virtual town hall meeting on **January 10, 2023**. (Ballots, along with a recording of the town hall, will arrive in your email shortly thereafter.) Voting closes on **February 7, 2023**. More details: **http://physiology.org/elections.**

PRESIDENT-ELECT CANDIDATES


Musch

Timothy Musch, PhD, FAPS, FACSM
University Distinguished Professor & Director, Cardiorespiratory Exercise Lab, Kansas State University


Ortiz

Rudy Ortiz, PhD, FAPS
Professor of Physiology and Endocrinology, University of California, Merced

COUNCILOR CANDIDATES


Caplan

Michael Caplan, MD, PhD, FAPS
C.H.H. Long Professor of Cellular and Molecular Physiology & Chair, Cellular and Molecular Physiology, Yale School of Medicine


Haack

Karla Haack, PhD
Associate Medical Writer, Merck


Helms

My Helms, PhD
Associate Professor, Internal Medicine, University of Utah School of Medicine


Hodges

Matthew Hodges, PhD, FAPS
Professor of Physiology, Medical College of Wisconsin

(continued in next column)


McCormick

Beth McCormick, PhD
Professor & Vice Chair, Department of Microbiology and Physiological Systems, University of Massachusetts Medical School


Yosten

Gina Yosten, PhD
Associate Professor of Pharmacological and Physiological Sciences, Saint Louis University

APS AWARDS

Sigmund, Yosten Win Prestigious APS Research Awards


Sigmund


Yosten

Each year, APS recognizes two outstanding member-researchers with the Physiology in Perspective: The Walter B. Cannon Award Lecture and the Henry Pickering Bowditch Award Lecture. These awards recognize the lifetime achievement of an established researcher and the physiological research excellence of an early-career researcher, respectively.

The Society's Executive Cabinet has announced that **Curt D. Sigmund, PhD, FAPS**, of the Medical College of Wisconsin, has received the 2023 Walter B. Cannon Award, and **Gina L.C. Yosten, PhD**, of Saint Louis University, has received the 2023 Henry Pickering Bowditch Award Lecture.

This year's awardees will each present a virtual award lecture in early 2023, host a curated poster session at the American Physiology Summit in April and present a virtual symposium related to their research after the Summit.

Sigmund is the James J. Smith and Catherine Welsch Smith Chair of Physiology, chair of the Department of Physiology and associate director of the Cardiovascular Center at the Medical College of Wisconsin. He will present the virtual award lecture "A Multigenerational Exploration of the PPARγCullin-3-RhoBTB1 Pathway" on February 23, 2023.

Yosten is a tenured associate professor in the Department of Pharmacological and Physiological Science at Saint Louis University. She will give the the virtual lecture "Orphan GPCRs as Novel Therapeutic Targets in Human Disease" on March 7, 2023.

DEI RECOGNITION

APS Porter Fellowship Receives Association DEI Award

APS' Porter Physiology Development Fellowship, the Society's flagship diversity program, has been honored with an inaugural Impact Award from the Software & Information Industry Association and its Associations, Media and Publishing Network division.

The new awards program honors outstanding leadership in the publishing industry, specifically recognizing diversity, equity and inclusion (DEI) champions and emerging talent.

Over the past 55 years, the Porter Fellowship has supported scientists


APS Director of Member Communities Brooke Bruthers, on the right, accepts the DEI award.

from underrepresented racial and ethnic backgrounds pursuing education and training in the physiological sciences, as well as retention in physiology careers. The mentorship and the sizeable stipend ($28,300) that the Fellowship provides make the program unique in the STEM field.

The Impact Award win specifically recognizes the reporting and content-related initiatives the Society has undertaken since 2021 to raise the profile of both the Fellowship and the up-and-coming researchers selected as Fellows. These include a comprehensive program analysis of recent Fellow cohorts (2016–2020) and promotion of individual Fellows from each cohort on social media and the APS website and in *The Physiologist Magazine*.

NEW FAPS INDUCTEES

Congratulations to the APS 2023 Class of Fellows

The Fellow of the American Physiological Society (FAPS), the highest honor APS bestows upon a member, recognizes distinguished leaders who have made significant contributions to the physiological sciences and who have served the Society.

Please join us in congratulating the 2023 FAPS inductees:

Dane Crossley, PhD, FAPS
Jessica Dominguez Rieg, PhD, FAPS
David Fuller, PhD, FAPS
Scott Kirkton, PhD, FAPS
Mark Knuepfer, PhD, FAPS
Ralph Lydic, PhD, FAPS
William Milsom, PhD, FAPS
T. Richard Nichols, PhD, FAPS
Gary Pierce, PhD, FAPS
David Poole, DSc, PhD, FAPS
Caroline Rickards, PhD, FAPS
Michael Romero, PhD, FAPS
Kathryn Sandberg, PhD, FAPS
Ernest Wright, Dsc, FAPS

TRANSPORT

Brooks Becomes Physiology Chair at Tulane School of Medicine

Heddwen Brooks, PhD, has been named the new chair of the Department of Physiology at Tulane University School of Medicine in New Orleans. She was previously a professor of physiology, biomedical engineering and nephrology and a past chair of the graduate interdisciplinary program in physiological sciences at the University of Arizona College of Medicine. Brooks is editor-in-chief of the *American Journal of Physiology-Renal Physiology* and is an APS Councilor. She has been an APS member since 1999.

Farquhar Appointed University of Delaware College of Health Sciences Dean

William Farquhar, PhD, professor and past chair of the Department of Kinesiology and Applied Physiology at the University of Delaware, has been named dean of the University of Delaware College of Health Sciences. Farquhar's research focuses on blood pressure and the intersection between hypertension, high-salt diet and exercise. He has been an APS member since 1995.

Lynch Receives Distinguished Service Medal

Gordon Lynch, PhD, professor of physiology and director of the Centre for Muscle Research in the Department of Anatomy and Physiology at the University of Melbourne in Australia, received the institution's Distinguished Service Medal. The honor recognizes Lynch for his contributions to research excellence in skeletal muscle physiology, as well as mentoring, learning and teaching, media engagement, and academic and administrative leadership. He has been an APS member since 1996.

APS COMMITTEES

APS Committee Applications Now Open

It's an exciting time at APS, and it's a great time to get involved. Apply before the February 6, 2023, deadline for APS committee service.

Terms will begin in spring 2024. Members serve a three-year term that will begin and end at the Society's annual meeting.

Committee members are appointed by the APS Council at the recommendation of the Committee on Committees. Review the list of committee vacancies at **https://bit.ly/JoinAnAPSCommittee**.

DATES & DEADLINES

AWARDS

William Galey Professional Skills Training Scholarship Award (January 2)

ADInstruments Macknight Innovative Educator Award (January 9)

Dependent Support Travel Award (January 13)

Barbara A. Horwitz and John M. Horowitz Outstanding Undergraduate Abstract Awards (January 13)

Porter Physiology Development Fellowship (January 15)

Teaching of Physiology Section Labfront Mid-career Educator Award (January 15)

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

Graduate Student Ambassador (January 24)

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

Summer Undergraduate Research Fellowships (February 1)

Carl J. Wiggers Award (February 8)

Gabor Kaley Memorial Lectureship (February 8)

Robert M. Berne Distinguished Lectureship of the APS Cardiovascular Section (February 8)

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

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

Renal Section Young Investigator Award (February 28)

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

Environmental & Exercise Physiology Section Honor Award (March 1)

Environmental & Exercise Physiology Section Impact Award (March 1)

Hugh Davson Distinguished Lectureship of the APS Cell & Molecular Physiology Section (March 15)

Carl Ludwig Distinguished Lecture of the APS Neural Control & Autonomic Regulation Section (March 19)

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

More details: www.physiology.org/awards

CALLS FOR PAPERS

American Journal of Physiology-Cell Physiology (April 1, 2023)
- The Extracellular Matrix and its Derived Effector Molecules in Aging: Regulators and Therapeutic Targets

American Journal of Physiology-Heart and Circulatory Physiology (February 1, 2023)
- Cardiovascular Consequences of COVID

Journal of Applied Physiology (March 1, 2023)
- Physical Activity, Mitochondria and Disease

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

MEETINGS & EVENTS

American Physiology Summit 2023
Conference dates: April 20–23, 2023
Long Beach, California
- Late-breaking abstract submission deadline: January 31, 2023
- Early-bird registration deadline: January 17, 2023
- Housing deadline: mid-March 2023
- Regular registration deadline: March 31, 2023

More details: www.physiology.org/APS2023

WEBINARS

APS-EvermedTV Physiology in Disease Modeling and Drug Development Roundtable
January 24, 2023

The Physiology in Perspective Walter B. Cannon Award Lectureship (Curt D. Sigmund, PhD, FAPS)
February 23, 2023

Henry Pickering Bowditch Award Lecture (Gina L.C. Yosten, PhD) March 7, 2023

More details: www.physiology.org/webinars

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Happy Donut Friday! A Culinary Case for Comradery in the Lab

BY BRANT ISAKSON, PHD, FAPS

The academic lab is a screwball cross-section of personalities. There is everyone from the omnipotent lab manager and the timorous undergraduate to the idealistic graduate student and the grizzled post-doc or any other combination thereof.

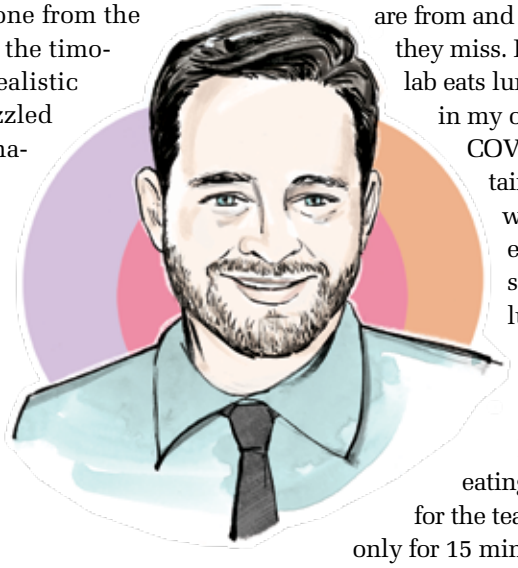
With each personality comes a different level of lab experience in terms of time spent in the lab. Because people don't enter the lab as a unit, the time together for most people is short. And during their short time together, everyone is looking to move forward in their career stage.

The singular constant in this cabal is the principal investigator (PI) who will be there for everyone's time in the lab, from start to finish. The PI sets the culture for the lab—how people interact and how people become scientists. How then does a PI build comradery among this rag-tag group? How can the team work together to advance the lab but at the same time advance everyone's perspective career goals?

Lab members like to share culinary favorites, and it often starts a conversation about where they are from and the traditions or flavors they miss.

In my case, the best answer usually starts and ends with food. The American Heart Association noted in 2022 that people (e.g., families) who have frequent meals together enjoy better social and emotional mental health. The lab is by no means a family and should never be treated as such, but the lab is not a sterile environment either. Because food is such a personal and cultural concoction of our psyche, simply asking lab members what they fixed for lunch allows people to relax and talk about themselves. Eating a lunch or enjoying a donut with the members of your lab creates low barriers for discussion.

Our lab practices this in a few ways. Each week a different person is chosen to bring breakfast to our lab meeting. Though not required, most of the time homemade breakfast treats are brought in. Lab members like to share culinary favorites, and it often starts a conversation about where they are from and the traditions or flavors they miss. In addition, most days our lab eats lunch together by gathering in my office. During the height of COVID-19, we wanted to maintain this time together and would wheel chairs into one end of the hallway, socially spaced, and still enjoy our lunch and time together. And we always end the week with donut Fridays (my personal favorite). Food is for the body, but eating together is for the soul and for the team. It brings us together if only for 15 minutes so we can talk about a commonality and connect.



Because of this low barrier for conversation, a huge number of science discussions take place while we're eating, educational and experiential differences fade away, and we become one group of people with similar interests and similar hunger. We leave with our stomachs full, our aspirations connected and our scientific interests peaked.

Thus, I maintain that breaking bread together among the people in your lab is one of the best cost-to-benefits that a PI can do to create team comradery and move the lab forward together scientifically and personally. Bon appétit!

Brant Isakson, PhD, FAPS, is a professor of molecular physiology and biological physics and resident faculty of the Robert M Berne Cardiovascular Research Center at the University of Virginia in Charlottesville. He's also a member of the APS Program Working Group.

Illustration by Brett Affrunti

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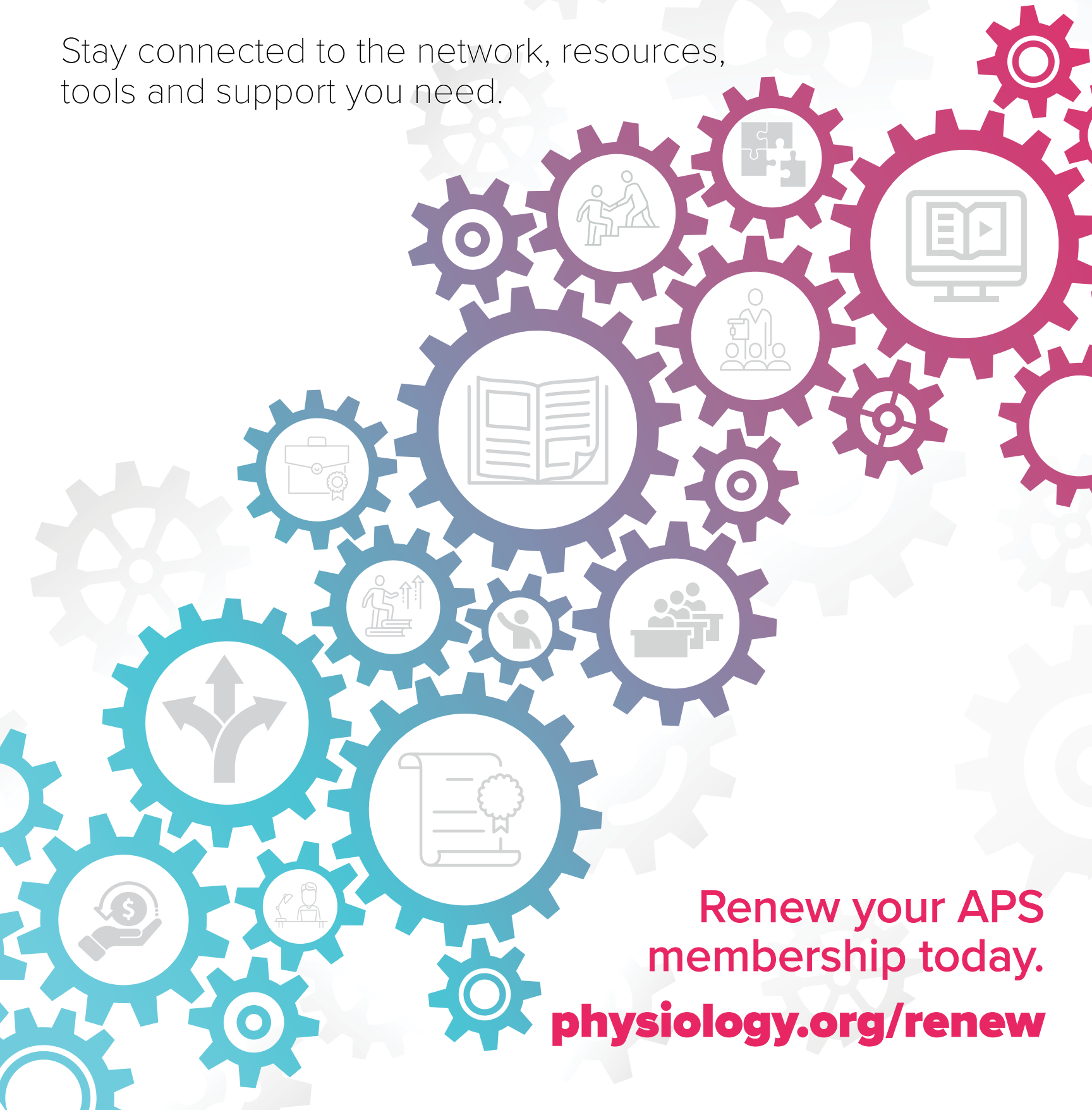
Stay connected to the network, resources, tools and support you need.



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physiology.org/renew

Participate in a Historic Event for Physiologists

Participate in the inaugural American Physiology Summit, April 20–23, 2023, in Long Beach, California. Designed by American Physiological Society (APS) members, the Summit will be a stimulating, innovative event for scientific exchange and networking. Come together with your colleagues and leaders in your field to share the most recent advances and breakthroughs impacting the research community and the world around us.

Registration rates will increase by up to 35% after January 17. Register today for the best rate at physiology.org/APS2023.

american physiology summit

APRIL 20-23, 2023
LONG BEACH