

THE **Physiologist** MAGAZINE

MAY 2020

**PHYSIOLOGISTS
SHARE HOW
CORONAVIRUS
HAS CHANGED
THEIR LIVES**

8

THE UNDERGRADUATE PHYSIOLOGY BOOM

Faculty leaders share their formulas for building successful physiology undergraduate programs.



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AUG. 31
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BY MELANIE PADGETT POWERS AND WENDY LYONS SUNSHINE

On the Cover: clockwise from bottom left, Lisa Carney Anderson, PhD; Terrence Sweeney, PhD; Claudia Stanescu, PhD; Vincent Barnett, PhD; Erica Wehrwein, PhD; and Christopher Banek, PhD.

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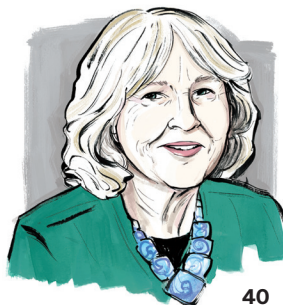
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Barbara Morgan

The Importance of Undergrad Education

BY SCOTT STEEN, CAE, FASAE



At a time when all of our lives have been impacted by the COVID-19 pandemic, our educator community is facing a unique challenge: to quickly change teaching plans, class schedules and lab work to accommodate remote learning amidst prolonged campus closures.

During my tenure at APS, I have observed how passionate undergraduate and graduate teachers of physiology are in their efforts to educate and inspire the next generation. These scholars are some of the Society’s most engaged members as evidenced by the work of the APS Teaching Section and Physiology Educators Committee. This community has created a vibrant network of other important resources to further the discipline, most notably the Physiology Educators Community of Practice.

Undergraduate education is becoming increasingly important for the discipline. With the consolidation of physiology into broader programs and courses in graduate schools and medical programs, physiologists have long been concerned that the discipline is losing its identity. This is in sharp contrast to the reality at the undergraduate

level where many physiology programs at major research universities and liberal arts colleges are growing rapidly. Increasingly, undergraduate programs will become the “keeper of the flame”—the primary place where the discipline is defined in the minds of young health professionals and the general public alike.

During a recent visit to the University of Arizona (UA), I met with physiology students and educators (see photo below). Of the nearly 50 students I spoke to, few of them were considering a career in academic physiological research. Instead, they were working toward becoming doctors, nurses, physical therapists and professionals in other health and biomedical careers. This sentiment is not unique to UA, where its physiology undergraduate major is the second most popular on campus with nearly 1,800 students enrolled. It’s representative of a move toward clinical and health careers among physiology students nationwide.

Given all this, undergraduate educators are an increasingly critical part of the APS member community, and we are undertaking some significant changes in how we develop and support them. One example is the renaming and refocusing of our Physiology Educators Committee, whose core mission is now “to ensure that the interests of physiology educators are represented throughout the Society and to provide resources, training and recognition to undergraduate, graduate and medical school educators in physiology and related disciplines.” Along with this realignment of priorities, we are focusing more time and energy on creating valuable professional development, resources and community-building opportunities for educators.

We are also taking major steps to ensure that the voices of physiology educators are included as we make major decisions about the Society’s future. We have created an Educator Advisory Committee and conducted educator focus groups as part of our next strategic planning process. And we have made sure that educators are well-represented in the design process for our new annual meeting. Our goal is to both continue to increase the ways in which we serve physiology educators and expand their role in helping to set the Society’s direction. ☞

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





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Deadlines

The American Physiological Society (APS) Publications Committee plans to interview candidates in the fall of 2020.

Nominations due:

August 1, 2020

Applications due:

August 15, 2020

How to Nominate

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

CALL FOR NOMINATIONS EDITOR-IN-CHIEF

American Journal of Physiology—Cell Physiology[®]

Nominations are invited for the position of editor-in-chief of *American Journal of Physiology—Cell Physiology* (journals.physiology.org/journal/ajpcell) to succeed Josephine C. Adams, PhD, who will complete her term as editor on June 30, 2021.

American Journal of Physiology—Gastrointestinal and Liver Physiology[®]

Nominations are invited for the position of editor-in-chief of *American Journal of Physiology—Gastrointestinal and Liver Physiology* (journals.physiology.org/journal/ajpgi) to succeed Nigel Bunnett, PhD, who will complete his term as editor on June 30, 2021.

Physiological Genomics[®]

Nominations are invited for the position of editor-in-chief of *Physiological Genomics* (journals.physiology.org/physiolgenomics) to succeed Bina Joe, PhD, who will complete her term as editor on June 30, 2021.

Physiology[®]

Nominations are invited for the position of editor-in-chief of *Physiology* (journals.physiology.org/journal/physiologyonline) to succeed Gary Sieck, PhD, FAPS, who will complete his term as editor on June 30, 2021.

COMMITTEE CHAIR

APS Book Committee

Nominations are invited for the chair of the APS Book Committee (physiology.org/publications/news/books) to succeed Dee Silverthorn, PhD, FAPS, who will complete her term as chair on June 30, 2021.

THE Physiologist MAGAZINE

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WHAT is physiology?

WHERE is physiology?

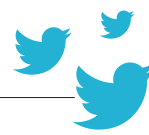
WHY does it matter to you?

Join us as we follow the path from the lab all the way to the healthy lifestyle recommendations that you receive from your doctor.

Explore how the body works by reading the blog at [ISpyPhysiology.com](https://www.ispyphysiology.com).

Interested in contributing?
Email communications@physiology.org.

#ISpyPhysiology



The coronavirus pandemic has upended routines and detoured everyone's plans. Physiologists and other scientists have been sharing through Twitter how they are coping and how their lives have changed.

How are you dealing with the coronavirus quarantine? 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.



Anna Stanhewicz
@AnnaStanhewicz

As we head into week 3 of working from home here's a reminder to mute when you aren't talking during conference calls and zoom meetings.



8:27 PM • Mar 29, 2020



Stella Gouloupoulou
@SGouloupoulou

Some days: focused, productive, upbeat, optimistic 😊

Other days: defeated, lonely, with no purpose 😞

#StayingHome and learning to manage this emotional rollercoaster 📈

8:31 AM • Apr 3, 2020



Andrew T Del Pozzi
@ATDelPozzi

First online Thesis defense a success. Way to go Carley Shannon. You Rocked it.

12:13 PM • Mar 27, 2020



Jill Barnes
@Barnes_Lab

Day 10. Worked up a sweat running around the lab, assessing inventory, and collecting items to get picked up and sent to the hospital. I'm glad our small lab can contribute but looking at empty shelves has filled me with a deep sense of fear. **#COVID19**



6:00 PM • Mar 24, 2020



Ryan T. Scott
@RyanTScott

When your Anatomy class is virtually presented on ZOOM #scicomm #scicetwitter #SciArt @AnatomyOrg @JoyBalta @AnatomyOSU @AACAnatomy @APSPHysiology @ThePhySoc



6:27 PM • Mar 31, 2020



Josef Brandauer
@BrandauerJ

I'm doing this tomorrow (immune bio unit), and hope it goes well. lots of thought going into this. trigger warnings, voluntary participation, etc.

Janita @janita_vandyk • Mar 29

Dear Academics: please check with your students if you want to "teach the virus." Students are grieving, locked away from their families, disconnected from their support groups. They are homeless and in debt. They don't need more lessons on how the virus is ruining their lives.

10:10 AM • Mar 31, 2020



Dr Hannah Brown
@DrScienceLover

Despite endless 🌧️, we visited Malaysia and Vietnam with food, we baked a 🍰, ate 🍷, went nuts with the label maker, did something creative & most importantly, didn't work! I'd say that's a win!

Special thanks for all your amazing suggestions! Hope you all had great weekends!

Dr Hannah Brown @DrScienceLover • Apr 2

HELP: SERIOUS QUESTION: what are people gonna do on the weekend to make it feel different to the weekdays? Asking for the whole world.

6:13 AM • Apr 5, 2020



Anne R Crecelius
@DaytonDrC

Would rather be meeting Future Flyers on campus @UDaytonSEHS Open House today, but we are talking about our programs via webinar instead! @DaytonAdmission still working hard to welcome the future class of '24 from @univofdayton !



11:21 AM • Apr 3, 2020

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LABNOTES

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

STATS & FACTS

63

The number of days between the sequencing of the COVID-19 genome to the beginning of the first clinical trial for a vaccine in the U.S.

Nature

RESEARCH FIZZ



Effects of aging and lifelong aerobic exercise on basal and exercise-induced inflammation

This study of lifelong exercise in men found that their long history of physical activity had an anti-inflammatory effect on the muscles and circulation.

Journal of Applied Physiology, January 2020
<https://doi.org/10.1152/jap.2019.00495>



MENTORING Q&A | POSTDOCTORAL DECISIONS

Location, Location, Location?

What to consider when choosing a postdoc.

Each issue, we'll ask a trainee to pose their career questions to an established investigator and mentor. Here, Maria Jones-Muhammad, a PhD student in the neuroscience program at the University of Mississippi Medical Center, asks Rudy M. Ortiz, PhD, a professor and chair in the School of Natural Sciences, University of California, Merced, how important location is when choosing a postdoctoral position.

Q: My question pertains to advice about choosing a postdoc once we graduate. I had been told by other professors that the postdoc itself is more important than where it is located. Is it true that location should not be a high priority when choosing a postdoc?

A: This is a great question that doesn't have a clear black or white answer because everyone is different and everyone has different priorities. Personally, I think that the person I'll be working with is more important than the geographic location,

I weighed who my postdoc mentor was, his history of training individuals and their histories, and the reputation of the department and institution before considering the geographic location. However, the location did weigh into my decision.


With the understanding that the tenure of the postdoc was only for two to three years and not permanent, I knew that my family and I could be happy in that location, allowing me to be successful and productive.

overcome a challenge. And this lesson will very likely be an important one later in your academic career and in your personal life as well.

Selecting a postdoc position in a seemingly less-than-ideal location at first may be a bit challenging, but at the end of your tenure, it may actually end up having been the best decision.

Thus, while location may not be the highest priority for selecting why you go to a particular institution to work with a specific mentor, it should be considered for various reasons. Ultimately, the weight applied to it as a contributing factor will vary from person to person based on their priorities and personal well-being.

But keep in mind that a postdoc is intended to be a temporary position, so selecting to work in a less-than-ideal geographic location could be viewed as a challenge that may lead to life-changing experiences and lessons that will last a lifetime.

For more information and suggestions, check out the National Postdoctoral Association's career page at www.nationalpostdoc.org/page/Career_Resources. 

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

RESEARCH FIZZ



66 Bilateral differences in hamstring coordination in previously injured elite athletes

Research found that athletes with previous hamstring injuries had differences in coordination in their legs, even after completing rehabilitation for their injury.

Journal of Applied Physiology, February 2020
<https://doi.org/10.1152/jappphysiol.00411.2019>

STATS & FACTS

188

The number of countries to have announced nationwide school closures in response to COVID-19 as of April 3, 2020

United Nations Educational, Scientific and Cultural Organization

STATS & FACTS

89.5%

Total learners, pre-K through university-level, out of school because of COVID-19 school closures

United Nations Educational, Scientific and Cultural Organization

“Being out of one’s comfort level sometimes allows oneself to grow and develop confidence by demonstrating an ability to overcome a challenge. And this lesson will very likely be an important one later in your academic career and potentially in your personal life as well.”

but location should be considered and will be weighed differently. For example, if you can't tolerate extreme cold, taking a postdoc position in a geographic location where there is extremely cold weather may not suit you well. And the contributing factor to a successful postdoc is your personal well-being, so if you are not happy, it makes focusing on your work that much more difficult and potentially leads to less-than-ideal performance.

Ideally, you find a great mentor in a location you love and you get to experience a win-win situation, but I'm not sure how common that is.

But a less-than-ideal location can be viewed from another perspective: This limited-time experience can be an opportunity to be adventurous and expand your horizons. Being out of one's comfort level sometimes allows a person to grow and develop confidence by demonstrating an ability to

How Working Scientists Help Set the Agenda at NSF

The National Science Foundation (NSF) funds cutting-edge basic research, provides critical research infrastructure and supports STEM education and workforce development across the country. At the agency's headquarters in Alexandria, Virginia, the career workforce is joined by some 200 rotating scientists and engineers who bring their expertise to help the agency make decisions about what research to fund and how to shape research within their fields. NSF also brings in science and technology policy fellows who wish to gain experience in the administrative side of federal science agencies.

Physiologists Kim E. Barrett, PhD, FAPS, and Vincent Tedjasaputra, PhD, are currently taking advantage of these opportunities and agreed to share their experiences. Their responses have been edited for length and clarity. (This interview took place before the coronavirus pandemic.)

What drew you to the National Science Foundation?

K.B.: I spent more than 10 years as dean of the Graduate Division at the University of California, San Diego, where I was responsible for the academic progress and well-being of more than 5,000 graduate students. In that role, as well as in prior roles in my own graduate program, I became interested in how graduate students gain competencies in the skills that equip them to undertake the full range of career paths that are open

to them, including in the private sector, and how to encourage cultural change that makes individual faculty supportive of students who wish to explore a variety of career paths. I have also been dedicated throughout my career to efforts that accelerate progress toward a more inclusive STEM workforce, including increased representation of women and members of underrepresented minority groups.

V.T.: I wanted to be part of the public-facing apparatus

of a large science agency. As a biomedical scientist, most of my funding came from the National Institutes of Health, but I liked the challenge of applying my communication skills in a broader sense.

Describe your day-to-day activities.

K.B.: A lot of my time thus far has been devoted to mandatory training, such as learning about the specifics of NSF's merit review process. But I already know that quite a bit of my time will be devoted to reviewing specific proposals submitted to our various programs in the Division of Graduate Education (DGE) and concurring with the recommendations of our program officers as to whether projects should be funded or declined. I've also already had the opportunity to hear from [principal investigators] of our Innovations in Graduate Education program at their first national meeting; review specific legislative language; meet with representatives from stakeholders in the graduate education community; and discuss with DGE staff how we can fulfill our mission more effectively and efficiently, including by updating program solicitations and considering new initiatives.

V.T.: I am absolutely loving my time as an AAAS Fellow at NSF because I get to flex my creative muscles. My "audience" is the scientific community, that is, researchers and staff across all career levels at institutions across the country.

Day to day, I'm acting as a public speaking coach, helping our team coach scientists to become better storytellers in their public appearances, interactions with reporters and policymakers, speeches and on-camera work. I'm working closely with my mentor to create a Scientific Communication and Media Training Course for the

"I am absolutely loving my time as an AAAS Fellow at NSF because I get to flex my creative muscles."

NSF Academy, which will be available to all NSF employees and leadership.

I also have the pleasure of working closely with our visual media team, developing an informational series called NSF 101. They've animated my doodles into pilot explainer videos, which address frequently asked questions and provide tips about early-career researcher funding, broader impacts and how to amplify research news. I teamed up with another American Association for the Advancement of Science (AAAS) Fellow to record


some fun ukulele and whistling music for these videos. The goal of these outreach strategies is to create two-way engagement with the science community.

Finally, perhaps my favorite bit of the job is the public outreach. Our external affairs team is top-notch and busy! We completed a Women in STEM event at a local high school in December, brought science to Capitol Hill for a disaster preparedness event in January and started the celebration of NSF's 70th anniversary with a great symposium in February.

What else would you like readers to know?

K.B.: I would certainly encourage any APS members who are interested in exploring how federal agencies develop and direct the scientific agenda of the U.S. to consider applying for a position at NSF as a program officer or in a leadership role such as division director or higher. It has been a wholly positive experience for me thus far.

V.T.: My experience with AAAS and NSF exemplifies two important points for me: One is that earning a PhD or completing a postdoc should not limit you to pursuing an academic research position. Leaving academia for a career in science policy should

not be considered an alternate or backup career path; it's simply a career path. And second is that effective communication of science is just as important as creating scientific knowledge. As scientists we need to encourage ourselves and colleagues to take the time to declutter and organize our messages so we can actively contribute to each other's work. 



Kim E. Barrett, PhD, FAPS, is a distinguished professor of medicine at the University of

California, San Diego, where she conducts a research program related to the physiology and pathophysiology of the gastrointestinal epithelium. A long-time APS member, she has served in many roles and was president of the society from 2013 to 2014. In January 2020, she took up a rotating position as division director of DGE in the Education and Human Resources Directorate at the NSF.



Vincent Tedjasaputra, PhD, joined NSF as a 2019–2020 AAAS Science and Technology

Policy Fellow in the Office of the Director, Office of Legislative and Public Affairs, as a scientific communications specialist and public speaking coach. Prior to NSF, Tedjasaputra studied healthy lung aging as a postdoctoral fellow at the University of California, San Diego, School of Medicine. A former collegiate track athlete-turned exercise physiologist, he earned his PhD in physical education and recreation at the University of Alberta, in Canada, where he studied the pulmonary vascular response to exercise in health and chronic obstructive pulmonary disease. Tedjasaputra was also a 2014 APS Caroline Tum Suden/Frances Hellebrandt awardee.

PUBLISH WITH POLISH | BUILD A BETTER RESEARCH PAPER

Referencing Genes and Proteins in Your Manuscript

Maintaining a clear distinction between genes and proteins enhances the clarity of a manuscript. So, as an author, how can you best present this information in your submitted research?

It all comes down to italics: Genes are italicized, whereas proteins are not.

However, there are additional adjustments that need to be made, particularly to distinguish between human and animal genes. This distinction is made with capitalization: All letters are generally capitalized when referencing human genes (e.g., A2ML1), but only the first letter is capitalized in animal genes (e.g., A2ml1).

By upholding these rules, you can ensure that your published research will be clear in its presentation of proteins, human genes and animal genes.

The resources below provide additional information on genes and proteins:

NOMENCLATURE	WEBSITE
Human genes	HUGO Gene Nomenclature Committee: www.genenames.org
Human proteins	Uniprot: www.uniprot.org
Mouse genes	Mouse Genomic Informatics: www.informatics.jax.org
Rat genes	Rat Genome Database: https://rgd.mcw.edu

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

RESEARCH FIZZ



Glucose alters the symbiotic relationships between gut microbiota and host physiology

This study explores the symbiotic relationship between gut microbiota and blood sugar levels in the body.

American Journal of Physiology-Endocrinology and Metabolism, February 2020

<https://doi.org/10.1152/ajpendo.00485.2019>

STATS & FACTS

27%

The portion of researchers surveyed who attribute their pursuit of a career in science to mentoring and encouragement from a teacher or professor

Pew Research Center

RESEARCH FIZZ



Antenatal sildenafil citrate treatment increases offspring blood pressure in the placental-specific Igf2 knockout mouse model of FGR

A potential treatment for fetal growth restriction may cause high blood pressure and raise blood sugar levels in offspring. This study urges practitioners to consider both short- and long-term effects when treating people with this pregnancy complication.

American Journal of Physiology-Heart and Circulatory Physiology, February 2020

<https://doi.org/10.1152/ajpheart.00568.2019>



Gopalan enjoying the sunflowers at Eckert's Farm in Bellville, Illinois.

UNDER THE MICROSCOPE

Rapid Fire Q&A

Chaya Gopalan, PhD, FAPS, shares a lab 'mishap,' how she mastered lecturing and a surprising fact about her that involves writing.

Q: What inspired you to become a scientist?

A: It was love at first sight—I fell in love with the intricacies of biology when I was first exposed to this subject in high school. Since that time, I have become most fascinated and enamored by neuroendocrine physiology.

Q: "Old school" technique you're most proud of mastering?

A: Lecturing! What started off as a traditional lecture is now a vibrant student-centered flipped classroom filled with engaging activities.

Q: Most challenging laboratory technique you've learned to use?

A: Implantation of cannula into a lateral ventricle using stereotaxy technique.

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

A: Micropipettors.

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

A: I had planned on wrapping up a high-fat-induced intermittent fasting experiment in the lab before Christmas break and my out-of-town trip. But due to an unexpected turn of events, I had to postpone the experiment until after Christmas. As a result, I had to FaceTime instructions to my husband and my son, who took turns to drive twice a day to feed rats in my absence over the holiday.

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

A: Claude Bernard because he was one of the founders of experimental physiology, conducting experiments on the fundamental aspects such as the nature of digestion, the production of heat, etc. He coined the term "milieu intérieur" (internal environment) and the concept of homeostasis, which applies to interactions among all body systems to maintain normalcy.

Q: If you could do a sabbatical with any scientist (living or dead) who would it be and why?

A: I would spend my sabbatical with Dr. Arthur Guyton discussing the latest trends in teaching physiology to students in health science careers. [Editor's note: Gopalan was named the APS 2020 Arthur C. Guyton Educator of the Year in March.]

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

A: I wouldn't mind being a planaria because if it is cut into pieces, each piece has the ability to regenerate into a fully formed

individual. By having clones of myself, I would never have to worry about getting things done.

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

A: Science, specifically research, is how we test, understand and improve knowledge. It is often tedious and uses a methodical approach in understanding the question at hand and is based on statistical evidence prior to sharing with the public.

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

A: "The Immortal Life of Henrietta Lacks" by Rebecca Skloot.

Q: No. 1 guilty pleasure?

A: I love to throw dinner parties for my friends at our home.

Q: Most influential scientist on your career?

A: Dr. Radha Sharma, a professor during my master's degree in Bangalore, India, inspired me to pursue my PhD in the field of neuroendocrinology.



Gopalan shares a laugh with her granddaughters, Armiya and Siyona.

Q: Tell us a surprising fact about you.

A: I published a cookbook called "Bengaluru Brunch." I even got to share my cooking on local TV.

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

A: I wish I could reveal the mystery of insulin resistance and protect individuals from developing diabetes.

Q: Favorite way to spend a free hour?

A: Walking in the woods.

Q: Most valuable quality in a colleague?

A: Trust.

Q: Favorite part of your job?

A: Sharing my knowledge with students and igniting their inner quest for knowledge.

Q: Title you'd use on your autobiography?

A: "The Gritty Gowda."

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

A: I am a teacher. I teach grown-ups about how the body works. I also like to ask questions and try to figure out the answers in my lab.

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

A: Patience! It takes time, resilience, hard work and some luck, whether it is an experiment, a grant application or a publication.

Q: Next book on your reading list?

A: "Educated: A Memoir" by Tara Westover

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

A: "The Office" and "Wait Wait ... Don't Tell Me!"

Q: Favorite musician/musical artist/band?

A: M.S. Subbalakshmi, a legend in Carnatic music, is one of my favorite singers.

Q: Go-to snacks to get you through long days in the lab or classroom?

A: Fruits, mostly apples.

Q: All-time favorite city in the world?

A: Barcelona.

Q: Crunchy or creamy?

A: Both, but crunchy more than creamy.

Q: City, suburb, country? (Favorite place to live)

A: Suburb (so far).

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

A: My favorite sport, which is American football. 🏈

Chaya Gopalan, PhD, FAPS, earned her bachelor's and master's degrees from Bangalore University in India and her PhD in medical physiology from the University of Glasgow in Scotland. She currently teaches anatomy, physiology and pathophysiology to undergraduate and graduate students in the Department of Applied Health and the Department of Primary Care and Health Systems at Southern Illinois University Edwardsville. Gopalan practices evidence-based teaching using team-based learning, case-based learning and flipped classroom techniques.

STATS & FACTS

202

The number of doctorates granted in physiology nationwide in 2018

National Center for Science and Engineering Statistics

STATS & FACTS

8,087

The number of doctoral-level degrees conferred in biological or biomedical sciences in the 2016–2017 academic year in the U.S. (includes PhDs, EdDs, MDs, DVMs and DDSs)

The National Center for Education Statistics

RESEARCH FIZZ



Perinatal maternal antibiotic exposure augments lung injury in offspring in experimental bronchopulmonary dysplasia

This mouse study explores the gut-lung axis in prematurity and suggests that exposure to antibiotics before birth may impair lung development in premature infants.

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

<https://doi.org/10.1152/ajplung.00561.2018>



BOOM

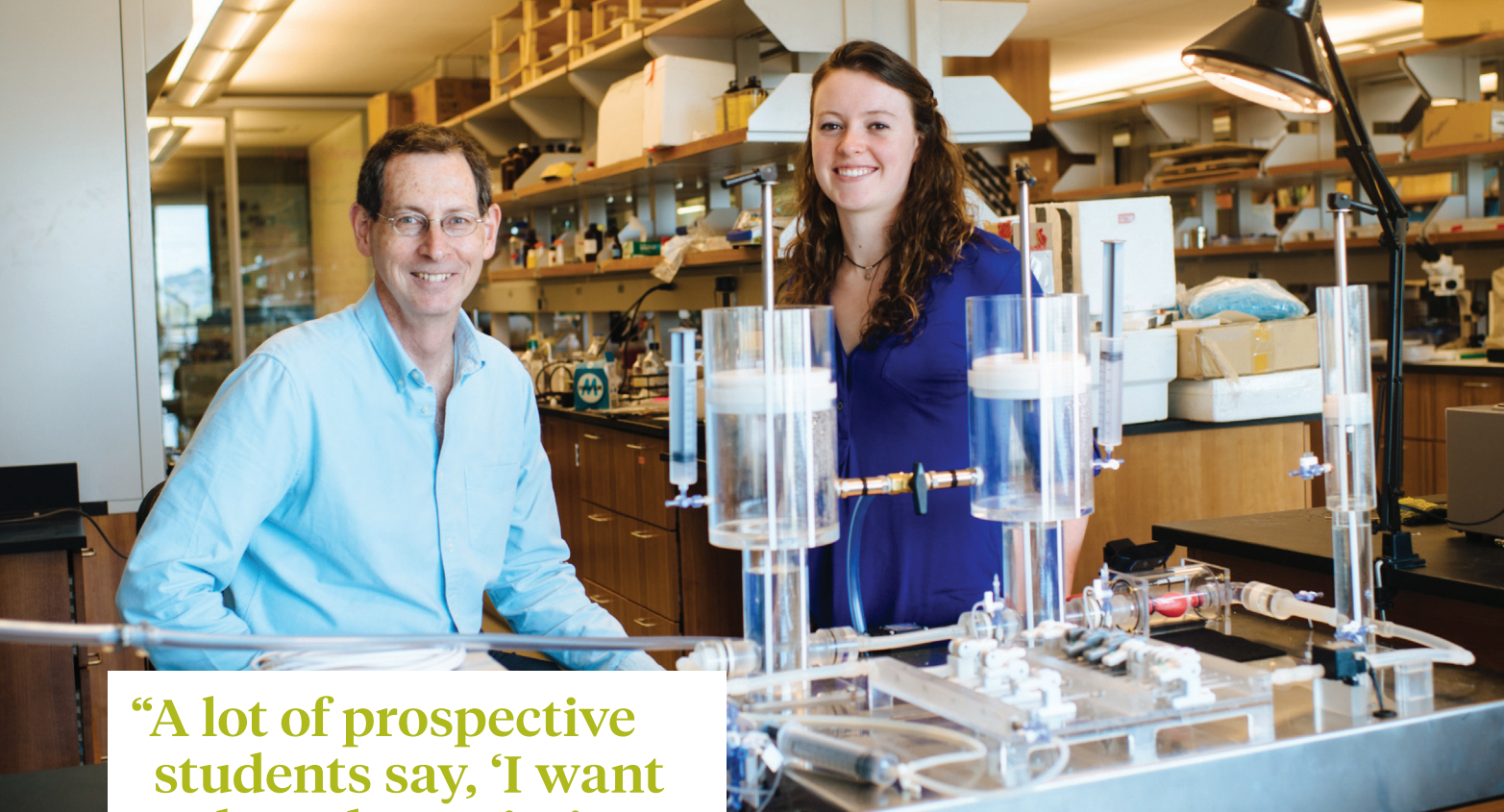
THE UNDERGRADUATE PHYSIOLOGY

Faculty leaders share their formulas for building successful physiology undergraduate programs.

BY DARA CHADWICK

Physiology is alive and well—particularly at the undergraduate level. But quantifying how well can be challenging because, increasingly, physiology has been rolled into other major programs with names like human biology.

“Physiology is becoming less visible at the graduate level,” says Terrence Sweeney, PhD, professor and physiology program director at the University of Scranton in Pennsylvania. “As graduate physiology programs fold into larger umbrella programs, the clarity of what physiology is has become lost. It’s become a little less obvious that it’s physiology students are learning.”



“A lot of prospective students say, ‘I want to be a doctor.’ It’s my responsibility to show them what they can do with a physiology major.”

—Terrence Sweeney, PhD

Erica Wehrwein, PhD, is an associate professor at Michigan State University (MSU) in East Lansing and director of the Physiology Majors Interest Group (P-MIG), an organization facilitating communication among undergraduate physiology programs throughout the country. She points to a 2017 online survey of P-MIG members that showed that only about a quarter of respondents said their institutions had a degree titled “physiology.” Other program names ranged from human physiology, biology and biological sciences to exercise physiology, kinesiology and integrative physiology, among others.

Yet physiology is flourishing at the undergraduate level as students see

how it intersects with other fields, Sweeney says. “This has the potential to raise the level of physiology, as well as how it relates to biomedical careers and careers in health and disease,” he says. “A lot of prospective students say, ‘I want to be a doctor.’ It’s my responsibility to show them what they can do with a physiology major.”

WHAT’S IN A NAME?

Naming a major program of study is a critical component of bringing in students—both to the program and to the institution.

Take the University of Arizona (UA) in Tucson, for example. Its undergraduate physiology program, housed in the College of Medicine, is one of the largest in the U.S. About 1,800 students are enrolled, and physiology has been the university’s second most popular major (after pre-business) selected by freshmen for several years. It’s also the third largest major in terms of degrees awarded; in 2019, 296 students earned a bachelor’s degree, up from 287 students in 2018.

Claudia Stanescu, PhD, assistant professor and director of the undergraduate physiology program at UA, says several program changes were made in 2019—including a name change. Students now earn a degree in “physiology and medical sciences,” helping to make the major more recognizable to students interested in medicine, she says.

“It was a good marketing strategy,” she says, noting about 58% of enrolled students say they’re interested in going to medical school. “Prospective students might not search for physiology, but they might search for medicine.”

According to Wehrwein, 90% of students enrolled in undergraduate physiology programs want to go into health care. “Students in these programs are thinking about the human body as a whole system,” she says. “They’re looking to study big integrative questions and applied research, rather than bench science. We’re not at all capturing the audience if we just use ‘physiology’ as the degree title.”

The University of Minnesota (UMN) in Minneapolis offers two degrees

UA students now earn a degree in “physiology and medical sciences.” “It was a good marketing strategy. Prospective students might not search for physiology, but they might search for medicine.”

—Claudia Stanescu, PhD

with a physiology focus—a bachelor of science (BS) in cellular and organismal physiology from the College of Biological Sciences and a bachelor of arts (BA) in human physiology, housed in the College of Liberal Arts.

“We would like to offer a bachelor of science degree in human physiology,” says Vincent Barnett, PhD, director of undergraduate studies and physiology program adviser at UMN. While the university wouldn’t abandon the human physiology BA, adding a BS would remove language requirements and require upper-division physiology courses that are now electives, he says.

“For those on a research track, this change would give them a leg up,” Barnett says. “It would let them drill down into physiological function and mechanism, focusing more on the science and less on the liberal arts.

We know that one-size-fits-all is not necessarily the best model.”

EVOLVING PROGRAMS

Making such a change would take time and require tough decisions about the allocation of both tuition funds and faculty, acknowledges Lisa Carney Anderson, PhD, associate professor and director of education for the Department of Integrative Biology and Physiology at UMN. Still, physiology is in a time of transition, and undergraduate programs must reflect that, she says. UMN has seen consistent interest and growth in physiology, according to Barnett, who says people often come to his office to ask about the major and say it’s exactly what they’re looking for.

Other recent UMN physiology program changes have included shifting the math requirement from two semesters of calculus to one semester of calculus and a semester of a quantitative course such as statistics or computer science.



“We want our students to have a broader understanding of data analytics,” Barnett says, noting the university has also added intercultural competency electives that focus on human interactions in the sciences. “These provide students with cultural context. When we looked at the landscape of evolving admissions requirements for professional schools such as medical, dental and pharmacy schools, one of the questions is ‘can they treat a diverse population?’”

Setting students up for success is a moral obligation, Anderson adds. “A large majority of our students are interested in health care



“[Students are] looking to study big integrative questions and applied research, rather than bench science. We’re not at all capturing the audience if we just use ‘physiology’ as the degree title.”

—Erica Wehrwein, PhD

careers.” Knowing this, UMN has added anatomy as an elective for its physiology students. “We have a fine human anatomy program with human cadavers,” she says. “It’s rare for undergraduates to get that experience.”

The UA physiology program’s location in the medical school means students can take a broad range of medical electives, Stanesco says. Although the program previously required only 30 physiology units, that figure was low compared to other science majors, she says. “In 2019, we bumped that requirement to 36 units, which allowed us to add electives from the College of Medicine,” she says. “We don’t yet have data, but word of mouth from students is they’re excited about this.”

At the University of Scranton, physiology majors take a 120-credit curriculum that includes required courses in biology, chemistry, physics and mathematics; 18 credits in physiology that are unique to the major; and an additional 12 upper-level elective physiology credits. The new program took in its first majors in fall 2017, with current enrollment at 75 majors. “The program is growing quite rapidly,” Sweeney says.

MSU has 380 undergraduates enrolled in its physiology program, with another 1,600 enrolled in human biology, the university’s physiology-related pre-health major, according to Wehrwein. “Students see physiology as something that can get them to the health care sector,” she says. “We have a small subset who are interested in cells and molecules. That’s the research piece.”

THE CLASSROOM AND BEYOND

Providing opportunities for research can be challenging for many undergraduate programs, Wehrwein says. “Typically, a very small percentage of students get to have a traditional research lab opportunity because of limited lab space, limited faculty and limited funding.”

To help address this, MSU requires a capstone laboratory in physiology, where students complete a human physiology research project of their own design. MSU also offers independent study and a senior thesis research project, she says.

Research can be a major draw for undergraduates. Christopher Banek, PhD, assistant professor in the Department of Physiology at UA, says he gets emails weekly from students looking to get involved with research in his lab—particularly those hoping to get into medical school.

“Biomedical research is extremely advantageous to any applicant,” he says. “It’s a great opportunity to learn, gives them experience in critical thinking, statistical analysis and data interpretation, in addition to benchtop experience.”

Banek gained research experience as an undergraduate physiology student at UMN at Duluth. “It was much smaller than the main campus, but I was able to land in a lab I liked,” he says. “That launched my research career, but my focus was going to graduate school to pursue a PhD and career in academic research—increasingly the non-traditional track for trainees.”

His academic path included graduate study at the University of Oregon, another institution known for its strong undergraduate physiology program, followed by postdoctoral work at UMN before he joined the faculty at UA. A major difference between the programs was that Oregon’s wasn’t housed in a medical school, he says.

“Oregon’s physiology program had a stronger emphasis on athletic performance, with an excellent athletic training program and a heavy focus on environmental and exercise physiology,” he says. “Minnesota and Arizona have homes in medical schools and naturally a primary focus on more translational biomedical research.



“When we looked at the landscape of evolving admissions requirements for professional schools such as medical, dental and pharmacy schools, one of the questions is ‘can they treat a diverse population?’”

—Vincent Barnett, PhD



“Biomedical research is extremely advantageous to any [medical school] applicant. It’s a great opportunity to learn, gives them experience in critical thinking, statistical analysis and data interpretation, in addition to benchtop experience.”

—Christopher Banek, PhD

Paired with a robust class schedule, these programs are quite attractive to pre-medical, pre-dental and pre-pharmacy students.”

Larger schools can offer more resources, including funding, equipment and connections, both within the school and nationally, Banek adds. “Larger research institutions will likely have more opportunities for students to participate in exciting, fast-paced, high-impact research projects, as well as provide the valuable experience of attending a national science conference,” he says.

The downside? Those opportunities aren’t always available to all undergraduates.

“With over 300 majors, it’s not possible to give everyone a full research experience,” Barnett says. “But students can volunteer, and we sponsor an undergraduate symposium for students who’ve done research. As a requirement of the physiology major, every student is required to research a physiology topic and write a paper,” he says. Other opportunities for UNM undergraduates include a physiology honors program and a physiology club, where students work with a faculty adviser to develop informational programs for their peers, organize tours of research labs and identify philanthropic projects.

At UA, undergraduate students are encouraged to find their own opportunities in research labs, Stanescu says. “We don’t have enough faculty for all students to work one-on-one with a faculty member,” she

says. UA offers several programs to connect students with opportunities, including a matchmaking event that introduces faculty and students for interdisciplinary research opportunities—the research can be in any college as long as it’s physiology based, she adds.

Sweeney says the University of Scranton’s small size is an advantage for students looking for lab experience. “We have the luxury of offering lab classes in the first three years of the program,” he says. But he is cognizant of the pressures that come with program growth. “There are only so many seats for laboratory work,” he says, adding that Scranton is currently undertaking a space utilization study to plan for the infrastructural needs of its growing programs.

Small class size is also an advantage in getting to know faculty, Sweeney says. “Closer interaction with faculty enables students to explore their interests, both from a disciplinary and career point of view,” he says. “This also allows faculty to engage with students and guide them on their journey through the program.”

Wehrwein says P-MIG has not only tracked the evolution of undergraduate physiology programs since the group formed in 2014, it’s also tracked the evolving interests of physiology students. “There are a huge number of students defining themselves as

physiologists but not pursuing a traditional physiology path,” she says.

While there’s no accrediting body for undergraduate physiology programs, P-MIG is in the early stages of drafting curriculum guidelines, Wehrwein adds. She notes there are two physiologies—a pre-health track geared toward students with clinical interests and a more traditional research track whose students are using cell and molecular techniques. Meeting the needs of students in each track is critical to strong undergraduate programs, she says.

“It’s taken a few years to figure out who these students are, where they want to go and where they ultimately end up in their careers,” she says, adding that professional development, such as writing and teamwork skills, along with clinical measurement and lab coursework, has now become an important component of many undergraduate programs.

Also important is effectively managing a program’s growth—something several institutions have faced with increased enrollment.

“We want our program to grow, but we also know we need to maintain staff and lab infrastructure,” Sweeney says. “We’re taking caution from what we’ve seen at other schools and planning for growth. We expect to become a more competitive program as time goes on.”



NURTURE NOW

Mentoring today means tailoring interactions to meet the needs of each student.

BY HEATHER BOERNER AND SARAH WATTS

Since childhood, Damilola Dada has dreamed of becoming a doctor or scientist—any area, so long as it had to do with public health. Now a graduate student in public health at Georgia State University in Atlanta, Dada’s dreams are coming into focus, thanks in part to her mentor, Adrienne King, PhD, a physiologist and clinical assistant professor at the Georgia State University School of Public Health.

“She’s trying to maybe change my mind to switch my major,” Dada says with a laugh. “She’s going to have me work on some of her research projects. With that exposure, I may end up trying to do more environmental epidemiology.”

Mentoring any student, but especially students from marginalized communities, requires the mentor to learn where the student is coming from so they can help provide the resources they need.

Dada has been King's graduate teaching assistant for the past two semesters, with the hopes of continuing until she graduates. Partly this is because King's life reflects Dada's ambitions: public health, parenthood, leadership, all as a black woman.

"It's good for me to see someone who looks like me doing the same thing," Dada says. "Her experiences are going to be a reflection of my experiences as I go further into this field."

Mentoring is a critical component of developing the physiology pipeline and something APS has

long supported. But as labs get more diverse, mentors need to tailor their mentoring to the individual student more broadly than in the past.

King has learned that mentoring any student, but especially students from marginalized communities, requires the mentor to learn where the student is coming from so they can help provide the resources they need. "We make assumptions, and we could be offering the student the very wrong thing," she says. "It helps you be able to mentor other people better when you know their story."

As a profession, physiology has tended toward the academic, and past demographics were typically white and male. "Forty or fifty years ago, you go to a scientific meeting and there were no underrepresented students; the female population was extremely small," says Jeff Osborn, PhD, chair of the APS Physiology Educators Committee and professor of biology, physiology and neuroscience at the University of Kentucky. "That's not the case today."

Indeed, a growing number of graduate students in the sciences today are women, and the ranks of people of color are growing. Plus, rather than going into academic research, nearly 70% end up elsewhere—in education, industry or clinical care, according to research published in 2018.

And that means, Osborn says, "We have to prepare students to move in every direction."



King with her students at a water treatment facility.

Physiology is changing with this demand. APS recently shifted its focus from sparking a love of science in K–12 students to supporting graduate students like Dada, who are finding their ways to careers that require physiological training.

“Unless we meet the needs of the trainees who are coming out of graduate school or postdoctoral fellowships, 25 years from now, there will be no APS. People will go about their own business, in their own direction, in their own way,” Osborn says.

MENTORING IN AND OUT OF THE CLASSROOM

Greg Brower, DVM, PhD, has been a mentor through APS for more than a decade. Brower is associate professor of medical education at the Texas Tech University Health Sciences Center and a member of the APS Teaching Section Steering Committee. As a regular attendee of the Society’s annual meeting at Experimental Biology, he has served as a mentor for science students selected for the Society’s Martin Frank Diversity Travel Awards. These awards—open to graduate students, postdocs and early-career faculty—support underrepresented scientists’ attendance at the annual meeting and include formal mentorship.



Appleyard, second from right, with her students at a past Experimental Biology meeting.

Over the years, he’s noticed increased diversity in both students’ backgrounds and their intentions for how they will use their physiology degrees. This has affected the way he teaches and mentors.

Today, Brower spends his days teaching medical students enough physiology to help them make clinical decisions quickly and accurately. That’s changed his curriculum vastly. Now, he’s no longer teaching physiology as an end to itself. Instead, physiology needs to be functional for the student.

“We’re teaching the students to [solve problems] in a clinical

setting—how you sequentially work through a problem, organize your thoughts and come to a conclusion,” he says. “We still have classes and lectures and take a traditional approach to teaching physiology, but we accomplish that with team-based learning and high-tech medical simulation.”

For instance, students practice listening to a “patient’s” breath and taking a pulse through the use of lifelike patient simulators. Since most of his students and mentees are now digital natives—that is, they grew up in the era of cellphones and the internet and are adept with modern

“I’ve come to a slow realization over the years that there’s a big difference between everyone being treated the same and everyone having the same access.”

—Caroline Appleyard, PhD, FAPS

“With the advent of email and Skype, there are so many more opportunities to be involved without having to go across country to mentor students.”

—Greg Brower, DVM, PhD

technology—reaching them and teaching them this way is critical. That’s not just for his classroom.

Brower is increasingly charged with helping mentees connect to people working in industry, including startups, and the clinical world, which increasingly needs them, too. He also takes pains to introduce his mentees to researchers who could help them along their career paths. And he’s stayed in touch with many of them. “Most scientists are busy,” he says, “but we’re also very interested in helping to train the next generation.”

Happily, technology helps. “With the advent of email and Skype, there are so many more opportunities to be involved without having to go across country to mentor students,” he says. “They used to bring individuals into a class for a week, and now they’ve transitioned into more of an online approach, going into a chat room and discussing concepts. We can disseminate [information] much more widely than we could before.”

STANDARDIZING SCIENTIFIC ACHIEVEMENT

More than a decade ago, Caroline Appleyard, PhD, FAPS, a professor at Ponce Health Sciences in Puerto Rico, noticed a big discrepancy in

how her institution’s physiology and biomedical sciences students were performing—not in the classroom or the lab, but at conferences, in networking, in leadership opportunities. Only some were presenting at international and national conferences. Others struggled with the English language and, importantly, confidence. And that translated into fewer presentations and, later, fewer PhDs awarded.

For Appleyard, who is known to be hyper-organized, this was a problem of the academic timeline.

“I like to project and know where things are going,” she says. So she began sitting down with PhD students when they came into her lab and delineating the kinds of milestones they’d need to hit. If they did, she hoped it would ensure they would finish their PhDs and go on to scientific careers.

“Obviously, in higher education and with PhDs there’s a lot of individuality” to what students need, she says. “But we want to try to standardize the process of students attaining their PhDs in a timely manner.”

This idea, in collaboration with colleagues, turned into a model program for how to increase the number of diverse PhD holders. Ponce’s Research Training Initiative for Student Enhancement (RISE) program was born. Funded by the National Institute of General Medical Sciences, Appleyard’s program is one of several around the country that are piloting new ways to improve PhD completion rates for students of diverse backgrounds. Each student selected for the program receives a salary, tuition, lab supply and travel funds, as well as career development and team mentoring.

The program isn’t just Appleyard’s brainchild. Through student surveys,

RISE identified areas where students said the PhD program was lacking. It turned out that students wanted a hands-on course in molecular lab techniques outside their regular lab work—now a mainstay when entering the PhD program. And they wanted help improving their written and spoken English. These exercises help build confidence and give students access to more career-building opportunities in their respective areas of study, she says.

The result is that more students are attaining PhDs in a shorter time frame. What the experience has taught Appleyard, she says, is that to improve outcomes, they couldn't roll out the support equally to all PhD students.

"I've always been very much a believer that everyone should be treated the same," she says. "But I've come to a slow realization over the years that there's a big difference between everyone being treated the same and everyone having the same access, the same background. You have to take individual populations and find out where they need more help to achieve equity."

ADDING THE PERSONAL TOUCH

When King was in graduate school at the University of Alabama at Birmingham, the conventional

wisdom was that she should choose a mentor with a large lab and lots of experience working with grad students.

She should not, for instance, choose someone like Shannon Bailey, PhD, who had never had a PhD student before. "But I looked at her, and I said, 'She's a younger female, she has excellent training and she had funding,'" King says. "I knew this professor was going to be dedicated to me finishing my PhD in a timely fashion."

But it wasn't just that. Bailey was always available and helped talk King through her interests. That would have been enough to make her a good mentor, King says. But then, King's father unexpectedly died. When King returned to the lab, she saw her father's obituary hanging on the wall.

"It's bringing tears to my eyes," she says now. She remembers Bailey pointing to the obituary and asking, "Why didn't you tell me your father was the provost at Tuskegee University? I had no idea."

King looked at Bailey differently after that. Bailey could have "assumed that I was a low-income black person," King says. Instead, she took the time to get to know and honor King's family lineage. "It's not that she treated me any differently,"

King says. "But our relationship changed after that."

King felt safe asking more questions and opening up to Bailey. Even after she rotated out of Bailey's lab, King took Bailey up on her open-door policy. Bailey responded quickly to King's questions, and she nudged King to finish sections of her dissertation.

King now follows in Bailey's footsteps, keeping her grad students to two or three so she can give them the attention they need. And she always tells her own story to minority students.

"They get to see a black female who has a PhD from a top-20 research institution," she says. "I've been the only [minority or woman in a room]. It's OK to be the 'only' in the room. But I have to make sure that our students know they don't have to be the 'only,' and the best way to do that is they must continue their education so they aren't the 'only' in the room."

As APS and the field of physiology become more diverse, mentoring will be more important than ever. Getting to know students and trainees as individuals will be an integral part of successful mentorship. It will require established physiologists to tailor interactions to meet the needs of the next generation of researchers. ☞

"It's good for me to see someone who looks like me doing the same thing. Her experiences are going to be a reflection of my experiences as I go further into this field."

— Damilola Dada

flipped class-room

[flip'd klas-room] **vid-e-o**

[vid-ee-oh] **med-i-cal**

sim-u-la-tion [med-i-kuh

| sim-yuh-ley-shuh n]

ex-per-i-en-tial lear-ning

[ik-speer-ee-en-shuhl lur-ning]


TREND SETTERS

Physiology professors share some of the hottest trends in education—new ideas that became invaluable as the coronavirus forced universities into online-only learning.

BY MELANIE PADGETT POWERS AND WENDY LYONS SUNSHINE

As science advances at breakneck speed, educators have been adopting new teaching methods and developing creative ways to engage 21st century learners. Embracing technology and innovation quickly became more important as the world was struck by the coronavirus pandemic this year.

As universities shuttered and classrooms went online, professors were forced to quickly adjust to this new virtual world. We spoke to several physiology professors about how the latest trends in education have allowed them to adjust their teaching styles and remain connected to their students.



flipped classroom [flip'd klas-room]: Students are introduced to new material at home and come together as a class for discussion and hands-on applications.

Today, students are not considered empty vessels into which facts get poured; they are active participants in the learning process. Barbara Goodman, PhD, FAPS, first noticed this trend when accreditation agencies began reducing lecture requirements for medical training and replacing those hours with problem-based, case-based and team-based teaching. Now these types of active-learning, student-centered approaches have trickled down to

Educators who embrace ingenuity, technology and a new approach, can move the needle, empowering students to master new information, apply problem-solving skills and gain confidence for their future careers.

undergraduate programs as well.

Goodman, a professor at the University of South Dakota Sanford School of Medicine, took the helm as editor-in-chief of *Advances in Physiology Education* in January 2020.

“It bothers me when anybody says, ‘I have to cover that in lecture,’” Goodman says. “There’s no such thing as ‘covering’ anymore. Information is so readily available by the internet today that we don’t cover it anymore.

We just have to help our students figure out what’s most important and how to think through parts of physiology that they haven’t had a chance to think about before.”

Research has found that during flipped classroom activities, students multitask less and instead spend more time in focused, deep learning than during traditional lectures.

“All of the evidence is that active learning and student-centered approaches and doing activities together in class are the best way for people to learn,” says Goodman, who teaches physiology to advanced undergraduates and occupational therapy doctoral students. Apart from briefly reviewing the assigned material, Goodman never lectures. Instead, she makes her way around the classroom to support students who are busy with assigned human physiology experiments or online case studies or developing projects for presentation to classmates.

This type of in-person activity disappeared when the coronavirus hit, however. Anne Crecelius, PhD, says trying to recreate active group work in a virtual environment can be challenging, but it is possible. Crecelius, associate professor and interim chair of the Health and Sport Science Department at the University of Dayton in Ohio, has used breakout rooms in Zoom along with Google Docs that students work on live.

video [vid-ee-oh]: Visual media product featuring moving images that is recorded and can be played over and over.

Beyond laptops and cellphones, digital technology and multimedia are woven throughout today’s learning experience. The increase of video in the past few years made the transition to distance-learning easier this year,

says Thomas Pressley, PhD, FAPS, professor in the Department of Medical Education and the Department of Cell Physiology and Molecular Biophysics at Texas Tech University Health Sciences Center in Lubbock. In-house videos “ensure that the learning experience remains institution specific,” he says. Plus, it helps departments build a content library.

When on campus, Crecelius used Zoom for guest speakers, which had numerous benefits. She too was able to build a content library by recording these “visits.” And it was often easier to schedule the guest speakers because they didn’t have to travel to campus and no audiovisual equipment had to be arranged. Crecelius had her students join the Zoom video calls, which allowed them to practice video conferencing—a skill that came

in handy after classrooms became online only.

“This was many students’ first experience with video conferencing for a professional reason (not a social FaceTime call),” she says. “Now that we are in a distance-learning model and many colleagues are incorporating Zoom into their classes, these students have the advantage of having had this practice.”

In her classrooms, Goodman assigns interactive video segments using the ADInstruments online resource. ADInstruments is an APS partner and is offering its Lt online teaching platform for free through June 30. Students can follow along to perform simple experiments on themselves or watch case studies of real patients. These feature clinical evaluations and interviews with family members,

doctors and caregivers to vividly illustrate a disease’s progress and potential treatments.

medical simulation [med-i-kuhl sim-yuh-ley-shuh n]: Using technology, including mannequins, to enact situations as a way to learn.

High-tech, realistic robotic animals and mannequins are the stars of today’s simulation, or sim, centers and have taken advanced physiology and health training by storm. These lifelike simulation machines can portray animal dissections and sick patients with surprising accuracy. The most sophisticated interactive mannequins even respond to treatment.

“The sim center gives students an opportunity to see that things

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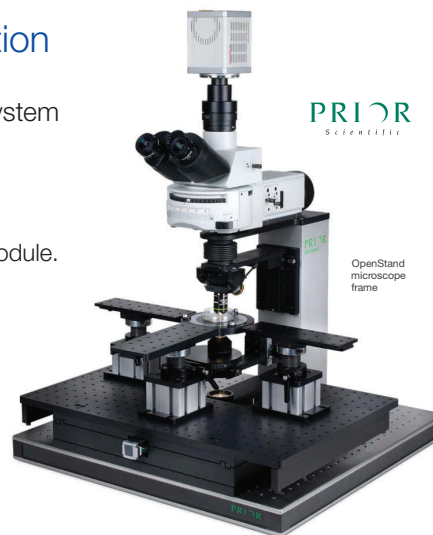
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“Information is so readily available by the internet today that we don’t cover it anymore. We just have to help our students figure out what’s most important and how to think through parts of physiology that they haven’t had a chance to think about before.”

—Barbara Goodman, PhD, FAPS

don’t always work,” Goodman says. “Sometimes even the simulated patient is going to die. Those are the kinds of real situational issues that they’re going to be faced with when they’re a clinician.”

In one study, students showed significantly greater understanding of respiratory physiology after working with simulated patient scenarios. Students also reported feeling more confident about their ability to cope with clinical uncertainty and real patients. Simulation scenarios are also being used effectively with undergraduates.

experiential learning
[ik-speer-ee-en-shuh | lur-ning]:
Gaining knowledge and skills through direct experiences outside a traditional academic setting.

Douglas Curran-Everett, PhD, FAPS, is the former editor-in-chief of *Advances in Physiology Education*. He points to some of his favorite examples of outside-the-box education that have appeared in *Advances* papers. In one example, a group of physiology instructors tasked their students with designing a fictional animal to

help them think about integrated, interdependent body systems. Another instructor illustrated locomotion and rotational inertia by having students construct wooden frames to be held around the waist like a Hula-Hoop and pretending to navigate a slalom ski course in them. One demonstration featured rigged balloons, duct tape and empty water bottles used to show how the lungs are affected by snorkeling and why elephants can snorkel to a greater depth than people can.

To illustrate respiration and hyperventilation, an educator devised a set of bottles full of colored solutions, balloons to be popped and sprays of confetti. Other journal papers described how fictional superheroes can help students think through physiology, for example, reverse engineering the impenetrable skin of Colossus from the X-Men or the vision mechanisms of Hawkeye from the Avengers.

“I was struck by the novelty and creativity of these papers,” Curran-Everett says.

Experiential learning also means increasing the number of opportunities to “do” physiology, says Jennifer Rogers, PhD, through job shadowing and clinical observations,

formal internships, study abroad and research opportunities. Rogers is associate professor of instruction and director of the human physiology curriculum at the University of Iowa in Iowa City.

“This has been a significant point of discussion across our departmental undergraduate curricula and more broadly at the collegiate level at our institution,” Rogers says. “Undergraduate students themselves report a high level of interest in opportunities to develop career skills and garner professional experiences.”

In 2018 and 2019, the Physiology Majors Interest Group surveyed 2,000 students from a variety of physiology programs from across the country about current undergraduate educational practices. Students on average reported their intention to participate in three different experiential learning activities as undergrads, according to Rogers.

FLEXING DIFFERENT ‘COGNITIVE MUSCLES’

Educators who embrace ingenuity, technology and a new approach, can move the needle, empowering students to master new information, apply problem-solving skills and gain confidence for their future careers.

Though challenging, the move to online-only learning during the coronavirus pandemic can be framed as an opportunity to flex a different set of cognitive muscles, Rogers says.

“Going along with this, we provide focused study tips, in manageable pieces, at regular intervals in order to promote adoption of study strategies aligned with self-regulated learning and improving metacognition.

“The goal is for students to be aware that they may be using different learning strategies to adapt to the current circumstances and, furthermore, that these strategies may be helpful to them in the future.”



Read the comparative physiology blog

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by

Dr. Dolittle

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Wandinger-Ness Receives AAAS Lifetime Mentor Award

Angela Wandinger-Ness, PhD, of the University of New Mexico (UNM), is the 2020 recipient of the American Association for the Advancement of Science (AAAS) Lifetime Mentor Award. This



top honor recognizes researchers who, for a minimum of 25 years, have contributed to their department or institution by mentoring students from communities that are underrepresented in STEM fields. Wandinger-Ness, associate director for education, training and mentoring at the UNM Comprehensive Cancer Center and an endowed professor in the UNM School of


Medicine's Pathology Department, has dedicated nearly 30 years to increasing the diversity of students pursuing doctoral studies in pathology. She has been an APS member since 2002.

Function Editor-in-Chief Awarded Academia Europaea's Gold Medal



Academia Europaea has announced that Ole Petersen, CBE, FRS, will receive its Gold Medal Award. "Academia Europaea is proud to award its Gold Medal to Ole Petersen, one of the world's prominent physiologists and founding member of Academia Europaea, for more than 30 years of eminent and unselfish service to our Academy and its role in scientific advice for policy in Europe," says

Academy President Sierd Cloetingh.

Petersen is the founding editor-in-chief of APS' newest journal, *Function*. He is a professor at Cardiff University's School of Biosciences in Wales, an elected Fellow of The Royal Society and a Commander of the Order of the British Empire. 

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

POSTDOCTORAL RESEARCH FELLOW •

THE UNIVERSITY OF VERMONT (UV)

The Department of Neurological Sciences at UV's Larner College of Medicine seeks a postdoctoral research fellow in the lab of Marilyn Cipolla, PhD.

Read more at www.physiology.org/vermont.

ASSISTANT/ASSOCIATE/FULL PROFESSOR FACULTY POSITION • UNIVERSITY OF MISSOURI COLLEGE OF VETERINARY MEDICINE

The Department of Biomedical Sciences is seeking individuals with a strong record of research in neuroscience and/or physiology for a tenure-track faculty position.

Read more at www.physiology.org/umissouri.

PROFESSOR/ASSOCIATE/ASSISTANT PROFESSOR • CHARLESTON SOUTHERN UNIVERSITY (CSU), SOUTH CAROLINA

CSU is seeking candidates for two full-time, 12-month, tenure-track faculty positions in the Department of Physical Therapy.

Read more at www.physiology.org/charleston.

ASSISTANT PROFESSOR POSITION IN EXERCISE PHYSIOLOGY • UNIVERSITY OF LOUISVILLE, KENTUCKY

The Department of Health & Sport Sciences invites applications for a 10-month clinical (term, non-tenure) faculty position at the assistant professor level.

Read more at www.physiology.org/louisville.

POSTDOCTORAL RESEARCH FELLOWSHIP IN PROTEIN METABOLISM • BAYLOR COLLEGE OF MEDICINE, TEXAS

The Children's Nutrition Research Center invites applications for a postdoctoral fellowship in protein metabolism in the laboratory of Teresa A. Davis, PhD.

Read more at www.physiology.org/baylor.

RESEARCH SCIENTIST-RESPIRATORY PHYSIOLOGY • UNIVERSITY OF WISCONSIN-MADISON

Seeking scientists, preferably with previous experience in study field, to work in the James B. Skatrud Pulmonary & Sleep Physiology Laboratory directed by Mihaela Teodorescu, MD.

Read more at www.physiology.org/uwiconsin.

Harvey V. Sparks Jr., MD, in Remembrance (1938–2019)

BY CHARLES L. COX, PHD

Harvey Sparks, MD, an outstanding scholar, great educator and active advocate for physiology, passed away in October 2019. Dr. Sparks received his medical degree from the University of Michigan (UM) and subsequently completed postdoctoral studies in physiology at Harvard Medical School with Dr. A.C. Barger and the University of Gothenburg with Dr. B. Folkow.

Dr. Sparks joined the faculty at University of Michigan in 1967, rising through the academic ranks to professor and serving as the assistant dean at UM Medical School. In 1979, Dr. Sparks moved to Michigan State University (MSU), where he served as chair of the Physiology Department for 10 years, during which time he recruited leading scholars to strengthen the research and teaching of the department. Before that, he also served as the vice provost for human health programs at MSU.



Dr. Sparks was also honored as a Michigan State University Distinguished Professor, someone who taught physiology to two generations of medical students and pioneered the use of remote learning technology. He was the consummate professor who was endeared as an outstanding scholar, educator and citizen. He had an illustrious research career, publishing

over 150 manuscripts and training 15 graduate students and 15 postdoctoral fellows. As an example to his dedication to the field of physiology, Dr. Sparks and his wife lived and worked in Zimbabwe over the course of 10 years, where he helped the University of Zimbabwe strengthen its physiology program, mentored its budding faculty and conducted research on hypertension.

Dr. Sparks was the 60th president of APS. He also played an influential role in the Society by serving on a laundry list of important committees. He was also engaged with many other societies, including the American Heart Association, Federation of American Societies for Experimental Biology, Association of American Medical Colleges and National Academy of Sciences.

Dr. Sparks was a caring mentor to students, trainees and faculty. He had a lasting and powerful influence at Michigan State University and within his field, and he is truly missed by all.

Charles L. Cox, PhD, is professor and chair of the Department of Physiology at Michigan State University.

Vernon S. Bishop, PhD, FAPS, in Remembrance (1935–2020)

BY EILEEN M. HASSER, PHD; CHERYL M. HEESCH, PHD; AND LILA P. LAGRANGE, PHD

Vernon S. Bishop, PhD, the 62nd president of APS, passed away on February 19, 2020, surrounded by his family.

After earning degrees in physics and radiation biophysics, Dr. Bishop earned his PhD in physiology and biophysics from the University of Mississippi Medical Center under the mentorship of Dr. Arthur Guyton. He spent his career at the University of Texas Health Sciences Center at San Antonio, where he rose through the ranks to serve as professor and chair of the Department of Physiology.



Dr. Bishop's research focused on neurohumoral control of the cardiovascular system. He was highly innovative in his

approaches, using in vivo and in vitro techniques to evaluate both the functional significance and cellular mechanisms for adaptations in central nervous system cardiovascular control during physiological and pathophysiological challenges. He received numerous honors for his research, including the APS Cardiovascular Section Wiggers Award and the Neural Control & Autonomic Regulation Section Ludwig Distinguished Lecture Award and the Alexander Von Humboldt-Stiftung Award. During his career, he provided service and leadership to APS and its journals, the American Heart Association, National Institutes of Health and Federation of American Societies for Experimental Biology.

In addition to his many important scientific contributions, perhaps Dr. Bishop's greatest legacy to the scientific community was his dedication to training new scientists. He successfully mentored numerous PhD students and postdoctoral fellows. His trainees describe him as an amazing mentor who had a lasting impact. He held his trainees to the highest standards, yet instilled the importance of loving what they were doing.

His passion for science was infectious. He was always encouraging and supportive, and his combination of scientific rigor and good-natured teasing made his laboratory a wonderful place to be. He also instilled a passion for life—sharing his love of fly-fishing, boating, water skiing and, most importantly, his joyful pride and love for his wife, Shirley, and their children, grandchildren and great-grandchildren.

He inspired his trainees as a superb role model as both scientist and human being. His scientific brilliance, kind and encouraging mentorship, and his love of life, family, friends, colleagues and trainees will be greatly missed. ☹

Eileen M. Hasser, PhD, is professor of biomedical sciences and investigator at the Dalton Cardiovascular Research Center at the University of Missouri. Cheryl M. Heesch, PhD, is also a professor of biomedical sciences and investigator at the Dalton Cardiovascular Research Center at the University of Missouri. Lila P. LaGrange, PhD, is professor in the Department of Pharmaceutical Sciences, Feik School of Pharmacy, at the University of the Incarnate Word in San Antonio.

DATES & DEADLINES

AWARDS

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

Research Career Enhancement Awards (Deadline: May 31)

Teaching Career Enhancement Awards (Deadline: May 31)

International Opportunity Program (Deadline: June 30)

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

More details: www.physiology.org/awards



CALLS FOR PAPERS

American Journal of Physiology-Cell Physiology (June 30, 2020)

- Endo-membrane Systems: Formation and Function
- Making Cell Culture More Physiological

American Journal of Physiology-Renal Physiology (June 30, 2020)

- Circadian Rhythms or Time-of-day Effects in Renal Physiology, the Urinary System, Blood Pressure or Volume and Electrolyte Regulation
- Inflammatory Mediators in Kidney and Bladder Diseases and in Hypertension
- Metabolic Syndrome and the Kidney
- Renal Hemodynamics
- Renal Mechanisms of Tissue Remodeling
- Sex and Gender in Renal Health and Function

Journal of Applied Physiology (July 1, 2020)

- Highlighted Topic: Physiology of Thermal Therapy

Journal of Neurophysiology (JNP) (June 30, 2020)

- Spinal Networks and Spinal Cord Injury: A Tribute to Reggie Edgerton
- The Benefits of Nonhuman Primate Research for Understanding the Brain and Spinal Cord in Health and Disease

More details: www.physiology.org/calls



PHYSIOLOGY IN FOCUS CONFERENCES

APS conference organizers and staff are planning exciting scientific programming and professional development opportunities. They are also monitoring the rapidly evolving situation related to the coronavirus and following guidance from public health authorities. The health and safety of Society members, staff and community remains a top priority. APS will keep members informed of any changes to Society scheduled events due to these concerns.

Institute on Teaching and Learning

June 22–26, 2020, Minneapolis

THIS CONFERENCE HAS BEEN CANCELED DUE TO THE CORONAVIRUS PANDEMIC.

11th International Conference on Heme Oxygenase and Related Enzymes: From Physiology to Therapeutics

June 28–July 1, 2020, Los Angeles

THIS CONFERENCE HAS BEEN CANCELED DUE TO THE CORONAVIRUS PANDEMIC.

Integrative Physiology of Exercise

November 11–13, 2020, Austin

- Abstract submission: August 3, 2020
- Award application: August 3, 2020

More details: www.physiology.org/ipe2020



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Online Webinar
[physiology.org/webinars](https://www.physiology.org/webinars)

Integrative Physiology of Exercise

November 11–13, 2020
Austin
[physiology.org/IPE2020](https://www.physiology.org/IPE2020)

More dates and topics coming soon!

APS PUBLICATIONS

Function Launches in April for Open Access Submission

APS is pleased to announce the launch of its new broad-spectrum open access journal, *Function*. The journal began accepting submissions in April 2020 at <https://academic.oup.com/function> and will publish its inaugural issue later this year.

From organelles to organisms, *Function* seeks papers that contribute to defining the mechanistic basis of living systems in health and disease. *Function* aims to publish major advances that extend physiological understanding of biological function and the changes associated with disease states.

The journal will provide a fully open access platform for researchers to publish their major advances in basic, translational and clinical sciences. The editorial team is excited to work with authors, carefully evaluating high-quality submitted research to be shared with the global community. The journal is committed to providing authors a final decision after the initial review, even if some revisions are requested. While additional experiments may be requested by the reviewers, the final outcome of the experiments will not impact the acceptance of the article.

Function will offer authors several article types, including:

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This new type of short-focus article (up to 3,000 words) reports on a new and important observation. These “quick release” articles allow for solid research to be reported without all the ramifications expected in a full research paper.

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These articles will evaluate the factual evidence in a field and, therefore, only cite original articles and not other reviews.

PERSPECTIVE ARTICLES

For full original research articles, *Function* will include a perspective, opinion or commentary article from a top expert in the field providing an elevated point of view on the scientific impact of the article.



Twenty-eight Renowned Scientists Named to *Function* Inaugural Editorial Board

As part of the launch of *Function*, APS welcomes the journal’s newly named editorial board. “I’m pleased to announce the recruitment of a topically diverse editorial board consisting of world-renowned researchers and clinician scientists from around the globe,” said Editor-in-Chief Ole Petersen, CBE, FRS. “I’m confident that these seasoned researchers will provide exceptional peer review to support our authors and help us achieve our goal of publishing high-quality, impactful science across the full spectrum of physiological research.”

Learn more about the editorial board, including the executive and consulting editors, at <https://journals.physiology.org/function>.

Peter S. Aronson, MD

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University College London, U.K.

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University of Michigan Medical School, Ann Arbor

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University of Ljubljana, Slovenia

MEET THE NEWEST JOURNAL EDITORS

Gina L. C. Yosten, PhD*American Journal of Physiology-Regulatory, Integrative and Comparative Physiology*

Gina L. C. Yosten, PhD, will begin her term as editor-in-chief of the *American Journal of Physiology-Regulatory, Integrative and Comparative Physiology (AJP-Regu)* on July 1, 2020.

"The American Physiological Society has been my home society since I first joined as a graduate student in 2007. *AJP-Regu* quickly became my home journal due to its longstanding history of facilitating rapid and high-quality peer review and publishing primary research articles and reviews that stand the test of time.



Traditionally, the role of society-based journals has been to serve as a platform for disseminating the work of society members. While this is an important aspect of APS journals, our journals also have the opportunity to function as a recruiting tool for the Society—a door through which potential new members could enter, contribute to and benefit from the Society. Likewise, the journal can serve as an important platform for upholding the commitment of APS to diversity and inclusion.

To these ends, my goals include establishment of special issues of the journal dedicated to celebrating the diversity of our membership, including those that coincide with Black History Month and International Women's Day. We will also continue the successful initiative established by past Editor-in-Chief Rick Samson, PhD, FAPS, that recognizes excellent early-career physiologists through a special call for papers. Last, our editorial team will begin utilizing social media to more effectively communicate with our readership. Exciting things are coming—stay tuned!"

Jan-Marino (Nino) Ramirez, PhD*Journal of Neurophysiology*

Jan-Marino (Nino) Ramirez, PhD, will begin his term as editor-in-chief of the *Journal of Neurophysiology (JNP)* on July 1, 2020.

"Since *Journal of Neurophysiology's* first publication in 1938, the field of neuroscience has exploded. We have seen research trends come and go: Vertebrate and invertebrate models had their ups, downs and ups again; as new molecular and genetic tools evolved, systems neuroscience seemed less fashionable. Yet, these same tools brought systems neuroscience back into the spotlight. In the end, all these trends serve one common goal: to accelerate our understanding of the most fascinating organ, the brain. *JNP* will continue to be on the forefront of this quest.



We embrace the newest methodologies as they come and go, but we also hold on to traditional approaches and model systems. We learned that all approaches are critical to cross the different

levels of integration from the molecular and cellular networks to the behavioral level, from the basic to the clinical sciences. We also know that conceptual innovation needs to be balanced with confirmatory studies. *JNP* continues to serve both needs. However, as authors, we often experience that conceptual advances trigger controversies and new ideas generate more questions than they solve. This often makes publishing a frustrating and time-consuming experience.

I believe that authors should be encouraged to voice big ideas, raise open questions and acknowledge caveats as long as the data are solid. With the incoming editorial team, I am working on designing a new publication format that is specifically designed to be provocative, raise open questions and trigger discussions that will advance neuroscience. *JNP* may be an old journal, but in our mind we will always stay young and aim to move neuroscience forward. Come on board with us and join our exciting journey!"

SECTION AND CHAPTER NEWS

Ohio Physiological Society Holds 34th Annual Meeting

Wright State University hosted the 34th Annual Meeting of the Ohio Physiological Society September 20–21, 2019. Robert Dirksen, PhD, of University of Rochester Medical Center in New York, presented the keynote lecture on his research into T-tubule remodeling in skeletal muscle. The Saturday sessions culminated in awards for research excellence, with six students receiving travel awards. Read more about the meeting at <http://ohio-physiological-society.org>



What Makes a Person Qualified to Teach Physiology?

BY DEE U. SILVERTHORN, PHD, FAPS

What makes a person qualified to teach physiology? Seems like a simple answer: being trained as a physiologist. But that's where things get murky. Is someone with a master's degree in veterinary physiology or a PhD in marine science (which is what I have) qualified to teach human physiology? If all we look at is the graduate degree and graduate coursework, the answer is no.

And does having content expertise make a person qualified to teach, especially in today's changing climate focused on interactive, evidence-based teaching?

The question of faculty credentials for teaching physiology or combined anatomy/physiology (A&P) courses has been plaguing our community for the past 20 years, especially

when our institutions are up for accreditation. In its 2012 "Principles of Accreditation," the Southern Association of Colleges and Schools Commission on Colleges (SACSCOC) told institutional credentialing faculty to give "primary consideration to the highest earned degree in the discipline," with a minimum of 18 graduate credit hours.

This stipulation hit people teaching combined A&P classes particularly hard. How many people with degrees in physiology took anatomy courses and vice versa? It also disqualified people with

degrees in biomedical sciences, a graduate program that has replaced physiology degrees at many institutions, as well as people with clinical degrees such as MSN, MD or DVM. And, honestly, if your graduate degree dates from the 1980s or before, how closely does the science you teach today resemble the science you learned in graduate school?

The Human Anatomy & Physiology Society (HAPS) addressed faculty qualifications for teaching A&P in 2005 and 2013 position statements (www.hapsweb.org/page/Accreditation_2020). The 2013 document included three appendices to help instructors document their qualifications, especially those that were acquired outside standard coursework, such as being a teaching assistant in a student laboratory or practicing as a clinician for years. The documents were widely used and sparked enough discussion that in 2018, SACSCOC published an updated "Principles of Accreditation," with revised faculty qualifications that include non-degree-related training and documentation of teaching excellence.

What does this mean for those of us who teach or hope to teach? Here are some ways to convince a visiting accreditation committee that you are qualified to teach:

- Keep a copy of your graduate and undergraduate transcripts to document course titles and credit hours for your degrees.
- While you are still in training, do what you can to get pedagogical expertise and teaching experience and document them in as much detail as possible.
- If possible, take an anatomy course or become a teaching assistant in an anatomy student laboratory to bolster your credentials for teaching A&P. Volunteer if necessary.
- Keep all evidence of teaching effectiveness, including student and peer evaluations and emails from students, starting in graduate school.
- Finally, take advantage of opportunities offered by APS. The Teaching Section welcomes anyone with an interest in physiology education at any level. ♡

Dee U. Silverthorn, PhD, FAPS, is a Distinguished Teaching Professor of Physiology in the Dell Medical School at the University of Texas at Austin. She is the author of the best-selling textbook "Human Physiology: An Integrated Approach."



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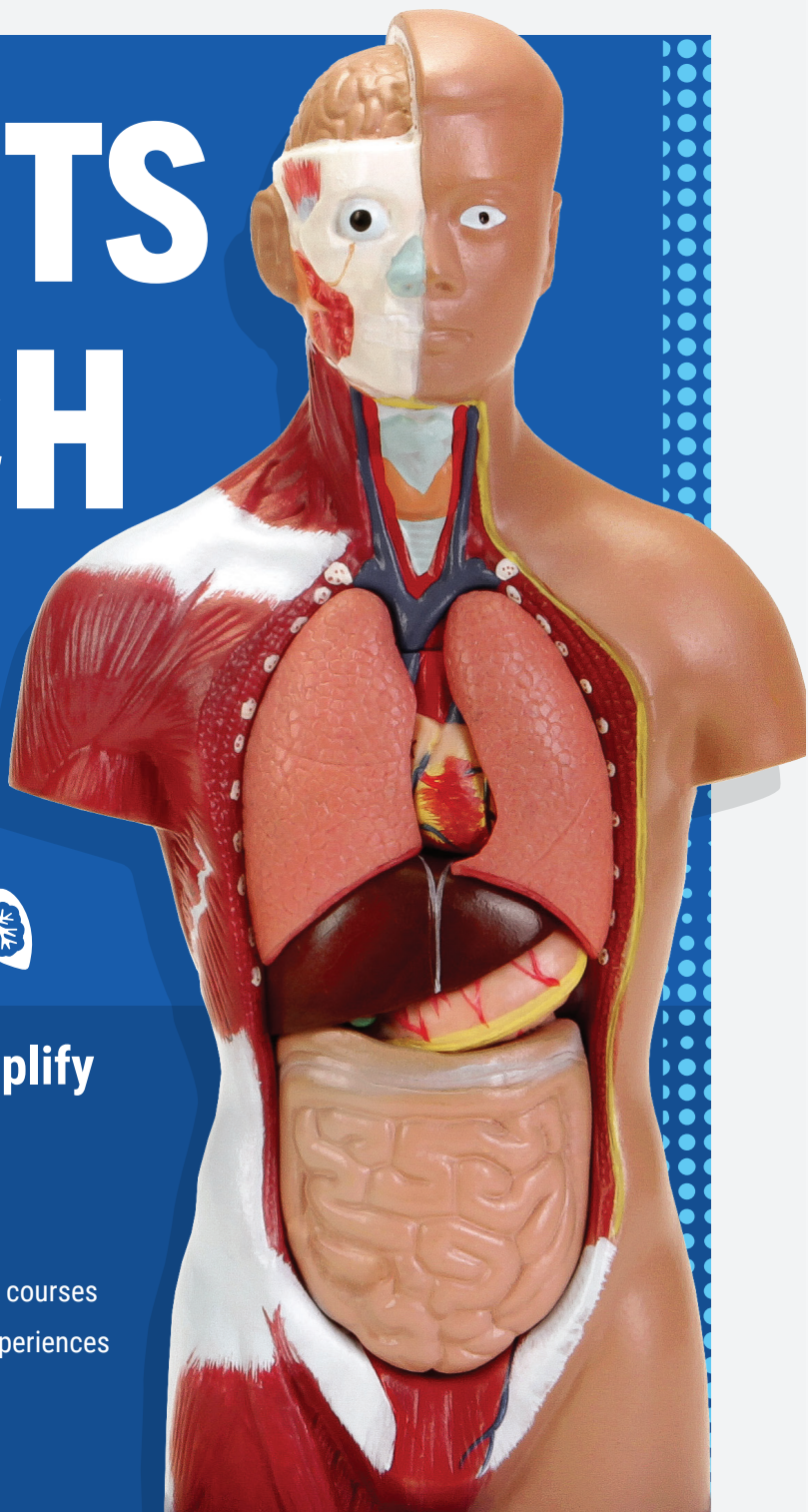


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“APS
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development.”

—Dee Silverthorn, PhD, FAPS, APS Member
University of Texas

WITH MEMBERSHIP COMES PROFESSIONAL GROWTH

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