

# BIOLOGY

UPDATE FALL 2015



## Chair's Message

**WELCOME TO THE SECOND ISSUE OF *BIOLOGY UPDATE*.** Since our 2014 issue, we have experienced a tremendous amount of growth and have accomplished much.

Six distinguished new faculty members have joined us: Laura H. Carnell Professor Sudhir Kumar, Laura H. Carnell Professor S. Blair Hedges, Professor Ananias Escalante, Associate Professor Susan Patterson, Associate Professor David Liberles and Assistant Professor Brent Sewall—all of whom are profiled in this issue.

Our undergraduate program continues to grow, the number of biology students in the Honors Program is increasing and the diversity and strength of our graduate program is attracting exceptional students.

We also have introduced two new graduate programs: the Professional Science Masters (PSM) program in BioInnovation and the PSM program in Bioinformatics. These programs leverage the instructional and research depth of our faculty and, along with the PSM program in Biotechnology, are expected to have a strong, positive impact on workforce training and development. In addition, they are enabling collaborative research and educational ties with private industry as well as governmental and academic sectors.

Visit our department—either online or in person—to witness the exciting research and teaching that is occurring. And please join the increasing number of alumni and friends who are providing much-appreciated financial support to the Department of Biology.

Sincerely,

Allen Nicholson,  
Professor and Chair, Department of Biology

[bio.cst.temple.edu](http://bio.cst.temple.edu)

## Department of Biology welcomes 6 new distinguished faculty members

### Ananias Escalante PROFESSOR, BIOLOGY



Ananias Escalante studies ecology and the evolution of infectious diseases by focusing on the genetic patterns of pathogens across anthropological, epidemiological, ecological and biological perspectives. Of particular interest is the study of the evolution and drug resistance of malaria-causing parasites, for which Escalante has received numerous grants from the National Institutes of Health and various educational institutes across the United States and Latin America. The founder and president of the CoEvolution Society, Escalante came to Temple from Arizona State University.

### S. Blair Hedges LAURA H. CARNELL PROFESSOR OF BIODIVERSITY



S. Blair Hedges came to Temple from Penn State, where he had taught since earning a PhD in zoology from the University of Maryland. Hedges' research explores the evolution of biodiversity by studying evolutionary genetics and genomics, with particular interest in how the planetary environment affects life. He has named 112 species in the Caribbean and received more than a dozen grants from NASA and the National Science Foundation to study early life on Earth and the implications for life on other planets. He is the director of CST's Center for Biodiversity.

## ENDOWED PROFESSORSHIP CHALLENGE

**This past year, two faculty members—S. Blair Hedges and Sudhir Kumar—joined the Biology Department as Laura H. Carnell Professors. Established in 1985, Carnell professorships recognize Temple faculty who have distinguished themselves in research and scholarship. Endowed professorships bring top researchers to the college. To support outstanding faculty, CST has launched a \$1 million campaign to fund two endowed term professorships.**

**Learn how you can support CST faculty at [cst.temple.edu/giving/professorship-challenge](http://cst.temple.edu/giving/professorship-challenge)**

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## Amish Patel: Research helps pave undergrad's way to medical school



A rising senior, I am majoring in biology with a minor in healthcare management and hope to attend medical school following my graduation next May.

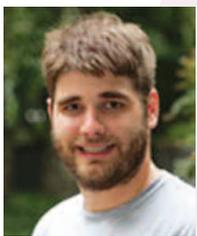
As the current student ambassador and ombuds-person for the Department of

Biology and vice president of Alpha Epsilon Delta, a health pre-professional honor society, I have cultivated a wide variety of interests at Temple. Through Temple's Office of Pre-Professional Health Studies, these have included working with Gregory Smutzer, associate professor (teaching/instructional), through the Undergraduate Research Program to study an alternative pathway for inositol 1, 4, 5-triphosphate signaling for calcium flux during enamel formation in mammalian tooth cells.

I have also participated in a clinical research program in the Emergency Department of Thomas Jefferson University Hospital and served as a teaching aide for a freshman seminar.

These opportunities have all enabled me to build a strong foundation to continue to pursue my passion for healthcare.

## Erick Recktenwald PhD '15: PhD graduate to teach at Alvernia University



After five years as a graduate student in biology, this year I earned my PhD and achieved one of my goals: attaining a tenure-track teaching position that will allow me to continue my research on the frog's visual system at Alvernia University in Reading, Pennsylvania.

I am very grateful to CST, the Department of Biology and particularly Professor Edward Gruberg for the opportunities I enjoyed at Temple to teach and conduct advanced research. When I began, little was known about how frogs see stationary objects. My work focused on understanding what stationary objects frogs can and cannot see, and where in the brain this information is processed.

That work culminated last summer in a paper on which I was the lead author, "Light and Shadow: Visual Recognition of the Stationary Environment by Leopard Frogs," which was published in the journal *Behavioral Processes*.

## New faculty *continued from page 1*

### Sudhir Kumar

LAURA H. CARNELL PROFESSOR OF GENOMIC MEDICINE



Sudhir Kumar's research focuses on analyzing the evolution of species, genomes and mutations using integrative and comparative approaches, particularly through technology. Kumar has received numerous grants from the National Institutes of Health to develop computational analysis of genetic evolution; his web applications have been cited more than 50,000 times. He came from Arizona State University and now directs CST's Institute for Genomic and Evolutionary Medicine.

### David Liberles

ASSOCIATE PROFESSOR, BIOLOGY



David Liberles studies bioinformatics, comparative genomics and molecular evolution. A recipient of numerous grants from the National Institutes of Health, the National Science Foundation and the European Science Foundation, Liberles has also presented his work and taught at locations around the world, including Oslo, Norway; Christchurch, New Zealand; and Bellville, South Africa. A recipient of a PhD in chemistry from the California Institute of Technology,

Liberles came to Temple from the University of Wyoming.

### Susan Patterson

ASSOCIATE PROFESSOR, BIOLOGY



Susan Patterson studies the mechanisms underlying learning and memory, which depend on the functional strength and structure of the synapses that connect nerve cells and the brain—and the effects the immune system can have on such synaptic plasticity. After earning a PhD in neurobiology and behavior at the University of Washington, she was a postdoctoral fellow and then a research associate in the Center for Neurobiology and Behavior at Columbia University.

She then was an assistant professor of psychology and neuroscience at the University of Colorado before coming to Temple in the spring of 2014.

### Brent Sewall

ASSISTANT PROFESSOR, BIOLOGY

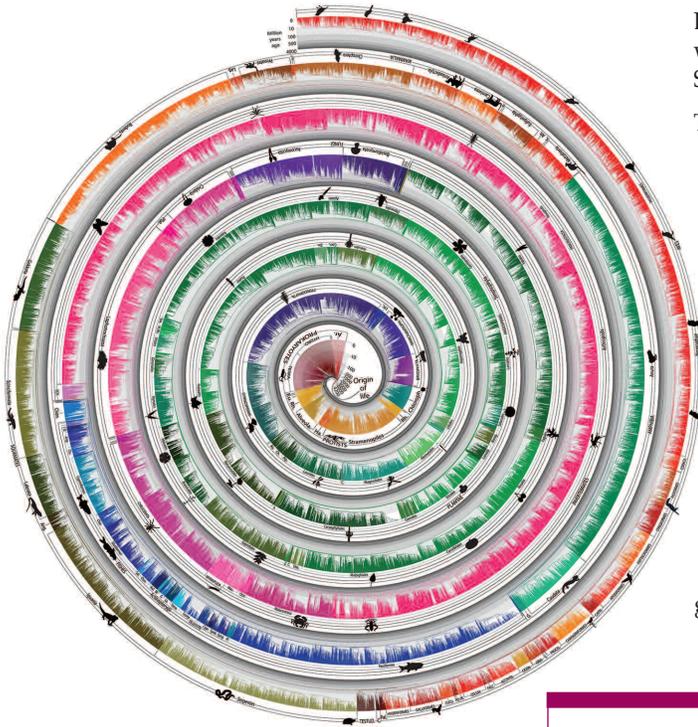


Brent Sewall's research focuses on understanding critical and emerging threats to biodiversity and developing effective strategies for conservation. He joined the Biology Department as a non-tenure track faculty member in 2009. He has received several awards, including the American Society of Mammalogists William T. Hornaday Award for outstanding contributions to mammal conservation and CST's William Caldwell Memorial Distinguished

Mentoring Award. Prior to arriving at Temple, Sewall was a visiting assistant professor of conservation biology at the College of William and Mary. Sewall received his PhD in ecology from the University of California, Davis.

# HEDGES HEADS NEW CENTER FOR BIODIVERSITY

Temple's new Center for Biodiversity facilitates research, education and conservation of species by faculty and associates, especially those in the areas of ecology and evolution.



## Largest tree of life shows new species develop like clockwork

The largest and most accurate tree of life calibrated to time ever assembled shows that the diversification of life forms has been expanding at a constant rate, not slowing down—and it is being driven more by random genetic effects and geographic isolation than by the adaption widely assumed to be responsible.

So say department researchers in a March article published in the online edition of *Molecular Biology and Evolution*. Built with new computer algorithms and tools to synthesizing data from 2,274 molecular studies, the new Temple tree of life contains more than 50,000 species spiraling out from the origin of life.

"This finding shows that speciation is more clocklike than people have thought," said Laura H. Carnell Professor of Biodiversity S. Blair Hedges, who for the past decade has been leading the construction of the timetree of life ([timetree.org](http://timetree.org)) with Sudhir Kumar, Laura H. Carnell Professor of Genomic Medicine.

Located in the Science Education and Research Center (SERC), the center was established by its director, Laura H. Carnell Professor of Biodiversity S. Blair Hedges, upon his arrival at Temple in July 2014.

The center includes Department of Biology faculty members Erik Cordes, Amy Freestone, Tonia Hsieh, Sudhir Kumar, Robert Sanders, Brent Sewall and Rachel Spigler, as well as research assistant professors Matthew Helmus and Julie Marin.

In spring 2015, the center hosted the "Phylogenetics and Biodiversity" meeting, which brought together 35 scientists from nine countries to discuss the latest research in this field, which researchers use to understand the general principles for the evolution and distribution of species globally, in the past and future.

Funded by both the Society for Molecular Biology and Evolution and Temple University, the meeting also highlighted Temple's new SERC facility. Said one distinguished researcher: "This may go down as the best meeting ever."

For more information about the center and Hedges' research, go to [biodiversitycenter.org](http://biodiversitycenter.org).

## iGEM institute plumbs genetic causes of diseases and traits

The Institute for Genomics and Evolutionary Medicine (iGEM) brings genomic data and evolutionary biology together to reveal the genetic causes of diseases and traits.

Housed in the new Science Education and Research Center, iGEM was founded by its director, Laura H. Cornell Professor Sudhir Kumar, upon his arrival in July 2014 following a highly distinguished career at Arizona State University.

iGEM research programs pursue a Pattern-Process-Prediction-Product (P4) paradigm, where scientists first conduct fundamental research to discover biological *patterns* and then elucidate *processes* that have generated these patterns over evolutionary time. It is iGEM's mission to harness the knowledge of these patterns and processes to make *predictions* about genomes, diseases and biodiversity. Ultimately, iGEM researchers are developing *products*, including research tools and resources, which enable scientists to accelerate biological discovery and make better predictions.

The core laboratories in iGEM integrate concepts and methods from diverse disciplines. Working at the interface of evolution, genomics, analytics and medicine, they focus on making discoveries in the genomics of health, disease dynamics and biological complexity. The process of establishing the core laboratories has already begun with the hiring of several world-renowned scientists, and with plans to recruit more. These faculty searches are being conducted jointly with the Center for Computational Genetics and Genomics (CCGG) led by Professor Jody Hey. The integration of CCGG and iGEM faculty and initiatives now makes Temple an elite institution in the fields of molecular evolution and population genomics.

"iGEM is heralding a new era of genomics research where the computational and big-data science will be an integrative force across new research programs that apply evolutionary knowledge to better the human condition and to understand the nature around us," said Professor Kumar.

For more information about the institute and Professor Kumar's research, please go to [igem.temple.edu](http://igem.temple.edu).

For more news, go to [bio.cst.temple.edu](http://bio.cst.temple.edu)

## NIH-funded program enhances diversity of biomedical researchers

Temple University has been awarded a second-five year grant from the National Institutes of Health for an undergraduate training program designed to help diversify the national pool of biomedical researchers.

Awarded in 2014, the five-year, \$3.3 million grant—the fifth-highest grant among nearly 60 participating colleges and universities—continues the Maximizing Access to Research Careers (MARC) U-STAR (Undergraduate Student Training in Academic Research) at Temple. Its purpose: to diversify biomedical research by including more students from under-represented groups including racial minorities, low-income and first generation college students.

The 24-month program provides tuition support and a research stipend for eight juniors and eight seniors. During the academic year students spend about 15 hours a week in a research laboratory and during summers work fulltime in a lab. To expose students to potential graduate programs, the NIH requires students to spend one of their summers in a high-caliber research laboratory outside of Temple.

During the program's first five years, 25 of the 30 graduating students entered competitive graduate programs and two students are currently in competitive programs at the National Institutes of Health before applying to PhD or MD/PhD programs. TU MARC alums attend Harvard, Columbia, Yale, Cornell, Penn, Penn State, University of Maryland, University of Chicago, University of Wisconsin, Johns Hopkins, Albert Einstein, Thomas Jefferson, SUNY and CUNY. One student is an MD/PhD student at NYU.

Jacqueline Tanaka, an associate professor of biology who directs the program, credits the students' faculty mentors throughout the university. "I'm rarely turned down when I approach a faculty member about mentoring a MARC student," she says, "because by now our faculty all know or have heard about how motivated and hardworking our MARC students are."

## Support undergraduate research

**CST's Undergraduate Research Program (URP) offers top students the opportunity to work with world-class researchers on real-world research. More than 700 students have participated, gaining a valuable advantage in the job market and in graduate school.**

Learn how you can support URP at [cst.temple.edu/giving/where-give](http://cst.temple.edu/giving/where-give)

## Biology expands its Professional Science Master's degree programs

**Two new degrees join the successful PSM in Biotechnology, offering both high-tech training and professional development**

### PSM in Bioinformatics

This two-year degree program—first available in fall 2015—combines genomics, evolutionary medicine and structural bioinformatics. The rapidly growing field has become an essential part of healthcare research and the biotechnology and pharmaceutical industries—including the high-volume genomic and proteomic data analyses that form the foundation for personalized medicine.

For more information, go to [bio.cst.temple.edu/bioinformaticsPSM](http://bio.cst.temple.edu/bioinformaticsPSM).

### PSM in Bioinnovation

A collaboration of CST and the Fox School of Business, this full-time two-year or part-time three-year PSM offers cross-disciplinary knowledge and training essential to enter or advance in rapidly growing sectors, including: biotechnology startups; pharmaceutical companies; contract-research organizations; public health and environmental agencies; scientific and technical writing; research grant administration; intellectual property law; and business administration/capital investment.

For more information, go to [cst.temple.edu/bioinnovation](http://cst.temple.edu/bioinnovation).