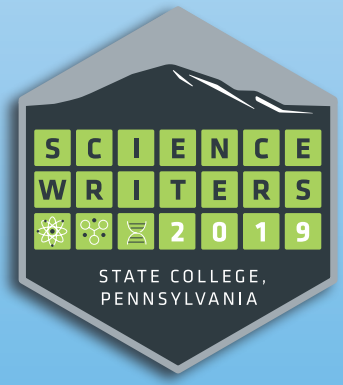
CASW Council for the Advancement of Science Writing

Fifty-Seventh Annual Briefing

New Horizons in Science

PART OF



HOSTED BY

Penn State University

Nittany Lion Inn
October 27–28, 2019

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R Limited seating; advance registration required

FRIDAY, OCTOBER 25

1 – 5 pm	**#SciWriUnited: A regional SciWri groups congress** R Boardroom 1
	Pre-conference workshop: Digital map making for science journalists R Penn State Room
5 – 8 pm	**Welcome Reception** Alumni Ballroom

SATURDAY, OCTOBER 26

7 am	**Meet and greet for newcomers and students** Alumni Ballroom
7:30 am	**National Association of Science Writers annual membership meeting and continental breakfast** Alumni Ballroom
8:30 am – 6:30 pm	**NASW workshops** R Various locations, Nittany Lion Inn
11:45 am	**ScienceWriters awards luncheon** R Alumni Ballroom
8 pm	**Film screening: Human Nature** Thomas Auditorium, Thomas Building, Penn State

New Horizons in Science

AT PENN STATE UNIVERSITY

SUNDAY, OCTOBER 27

7:30 am

Continental breakfast
Atrium

8:45 am
Alumni Ballroom ABC

Welcome
Nick Jones
executive vice president and provost, Penn State

A call for radically new tactics on the evolutionary battlefield of medicine

#EvoDrugs

Do we need more cancer drugs and antibiotics? Andrew Read isn't sure new drug development is the weapon needed for victory on the battlefields of cancer and infectious disease. As an evolutionary biologist, he sees both challenges as arms races where populations of cells raid their storehouses of genetic variation to evolve resistance. The strongest cancer drugs, by rapidly killing weaker tumor cells, are almost certainly accelerating evolution and leaving the most adept, resistant cells behind. Read, who also works on diseases in agricultural animals – the Ground Zero of the resistance wars – says it may be time for a radical strategic rethinking. Imaginative tuning, timing and combining doses of existing drugs may be the best way to win evolutionary battles.

Andrew Read
director, Huck Institutes of the Life Sciences; Evan Pugh University Professor of biology and entomology; Eberly Professor in biotechnology, Penn State

10:00 am

Concurrent sessions

Alumni Ballroom DE

An upside-down "lab rat" for studying coral reef ecology

#CoralCousins
@MedinaLabPSU

Corals are full of complexity, surprise and mystery. And they are threatened. Mónica Medina has found a way to study important questions about corals without disturbing these fragile systems: a model organism. Her "lab rat" is *Cassiopea xamachana*, the upside-down jellyfish, also known for its use in models of computational fluid dynamics and neuromechanics. Like their cnidarian cousins the corals, *Cassiopea* jellies are dependent on symbionts – photosynthetic dinoflagellate algae – for key parts of their life cycle. For example, Medina's recent work suggests that it's the symbionts that dictate when *Cassiopea* polyps metamorphose into baby jellies. She will update science writers on this research and her fieldwork with the coral reefs of the Caribbean.

Mónica Medina
professor of biology, Penn State

Alumni Ballroom ABC

Curing disease with cellular circuits

#CellCircuits
@HanaScientist

From where Hana El-Samad sits, much of human disease looks like a problem of malfunctioning feedback loops. Take traumatic brain injury. The brain needs inflammation to heal, but runaway inflammation causes cognitive impairment. How can a doctor know when to start and stop anti-inflammatory medication? El-Samad and her collaborators have a solution: replace traditional drug delivery with programmable molecular toolkits that deliver a payload inside the diseased organ only when their built-in sensors tell them it's needed. They've inserted prototype toolkits into yeast; mammalian immune system cells are next. These toolkits contain components collected from different cells and organisms. Increasingly and for the first time, they also include *de novo*-designed proteins that are computationally created, then synthesized and used as circuit building blocks. El-Samad is working to bring about a revolution in which scratch-built, programmable biological circuits harness the machinery of the cells in a safe and controllable way to correct dysfunction or destroy errant cells.

Hana El-Samad
Kuo Family Endowed Professor and vice chair in the Department of Biochemistry and Biophysics at the University of California, San Francisco

11:00 am

Break
Alumni Lobby

11:00 am

Ceramics Studio tour R
Departs from lobby

Radiation Science and Engineering Center (Breazeale Nuclear Reactor) tour R
Departs from lobby

11:20 am

Concurrent sessions

Alumni Ballroom ABC

Going there: Tackling genetics and racism

Science + Science Writing panel organized and moderated by Leah Shaffer

As ancestry and genetic testing services proliferate – a total of 26 million people have taken such tests in the past year, according to data compiled by *MIT Technology Review* – the public's understanding of race, heredity and DNA remains muddled. The history of the study of heredity is intertwined with racist pseudoscience, and present-day research can get hijacked by white supremacists looking to further their cause. What role do scientists and journalists have in actively combating misinformation on genetics and race? How do science writers report on the science while also clarifying how race is different from heredity? This Q-and-A with scientists and science writers will

offer journalists a guide to handling these complex issues.

#RaceandGenetics
@big_data_kane
@AngelaDSaini
@leahabshaffer

C. Brandon Ogbunu
assistant professor of ecology and evolutionary biology, Brown University

Angela Saini
science journalist

Pat Shipman
anthropologist and author

Alumni Ballroom DE

New data and new ideas about the Big Bang and black holes

#LoopQuantumG

Theorists who work on big questions in relativity and quantum physics are awash in new data these days. Observations arrive continually from instruments measuring gravitational waves, neutrinos and cosmic microwave background fluctuations, testing ideas about black holes, the Big Bang, spacetime and the building blocks of physics. One of the leading theorists is Abhay Ashtekar, a pioneer of a theory called loop quantum gravity, in which space and time are quantized and the building blocks of the universe are expressed through geometry. Recently Ashtekar and collaborators made the startling assertion that the black hole singularity – a point within a black hole where spacetime simply ends, according to general relativity – does not exist. He will share this and other predictions and assess how they're holding up against the new data.

Abhay Ashtekar
Evan Pugh professor of physics and director, Institute for Gravitation and the Cosmos, Penn State

12:30 pm

Lunch with a Scientist R

Various locations; pick up box lunch in the Atrium

2 pm

Patrusky Lecture

Alumni Ballroom ABC

Spirit and Opportunity: The Mars Exploration Rover Project

#MarsRovers

In January of 2004, twin robotic explorers named Spirit and Opportunity landed on Mars. Planned to operate for just 90 days, their mission lasted for more than 14 years. Its objective was to search for evidence of past water on Mars, and to determine if Mars ever had conditions that would have been suitable for life. Steven Squyres will provide a summary of the missions of Spirit and Opportunity, from their initial conception through their development, launch, landing, and operations on the surface of Mars, and his thoughts on planetary exploration in the 21st century.

Steven Squyres
chief scientist, Blue Origin

3:10 pm

Break

Alumni Lobby

3:30 pm

Concurrent sessions

Alumni Ballroom ABC

Is Antarctica's ice collapsing? An update on the science behind rising seas

Far from State College, the West Antarctic ice sheet holds the future of the world's coastal cities in its icy grip. Will Thwaites Glacier unzip, as

Greenland's Jakobshavn Glacier did in the 1990s? Will it disintegrate like the Larsen B Ice Shelf to its north? Richard Alley and other glaciologists are intensively monitoring and modeling ice sheets around the world to understand their complex dynamics and help the world's leaders understand the complex uncertainties around sea-level rise – which could total as much as 11 feet in a few decades with the crumbling of the West Antarctic ice sheet. Alley will share the latest evidence from the field and explain why, as a scientist working on phenomena that portend possible global catastrophe, he finds reason for optimism.

#IceSheetCollapse

Richard Alley
Evan Pugh University Professor of geosciences and associate of the Earth and Environmental Systems Institute, Penn State

Alumni Ballroom DE

Smart textiles: Transforming our relationship with the space around us

Most of us know a bit about wearable technology through devices like the Fitbit and Apple Watch. Felecia Davis looks far beyond consumer applications, seeing a transformation of our relationship to the space around us. Her textile systems can sense their environment and be programmed to use the quality of the material itself in connection with environmental cues such as humidity, temperature and light. Davis will talk about medical applications of smart textiles: leggings to aid in Parkinson's disease diagnosis, and a "cough shirt" for pulmonary fibrosis patients. She also is working on a soft tent for emergency shelter that would collect solar energy and emit light. As a faculty member in an architecture school, she is concerned with the new concepts of "walls" that are emerging in the age of pervasive digital technology–how privacy, boundaries and social norms are affected when physical spaces are replaced by digital ones.

#SmartTextiles
@fadamit

Felecia Davis
assistant professor, Stuckeman Center for Design Computing, Penn State

4:30 pm

Concurrent sessions

Alumni Ballroom DE

A report from the front lines of multimessenger astronomy

Although half a century in the making, the field of gravitational wave astrophysics is suddenly moving rapidly and contributing to the flowering of so-called multi-messenger astronomy, where signals from many wavelengths combine to paint a vivid picture of a massive event in the universe. ScienceWriters2019 will take place during an observing run by the US-based LIGO gravitational-wave observatory and the Virgo observatory in Italy, one with increased sensitivity and a new automated event alert system in place. Chad Hanna, who studies binary star mergers, will provide an update on discoveries being enabled by automated multimessenger astronomy, where computers rapidly analyze detection data and send worldwide public alerts, triggering telescopes to immediately scan the same patch of sky for signals in other wavelengths. One new tool is the Penn State-based effort AMON (for Astrophysical Multimessenger Observatory Network), which looks for "sub-threshold"

#MassiveAstronomy

(continued next page)

correlations across instruments, signals that are too weak to trigger any single instrument but might prove significant when data are combined.

Chad Hanna
associate professor of physics and astronomy and astrophysics, Penn State

Alumni Ballroom ABC

The end of statistical significance

#EndofThresholdStats

This March, readers of *Nature* were greeted by the headline "Scientists rise up against statistical significance." More than 800 signatories had joined in a call to retire the term "statistically significant," and the case was argued in 43 articles published in a special issue of *The American Statistician* the same week. What's up, and what's next? Nicole Lazar is a leader in the movement away from hypothesis testing and arbitrary thresholds in scientific statistics. Her work with brain-imaging data is published in psychology journals, where reliance on p-value thresholds has been a source of controversy and confusion for years. She will join us for a discussion of the crisis in inference, and the related challenge of communicating the meaning of research results in a post–*p*-value world.

Nicole Lazar
professor of statistics, University of Georgia

7 – 9 pm

Celebration R

Alumni Ballroom

MONDAY, OCTOBER 28

7:30 am

Continental breakfast

Atrium

8:30 am

Metabolomics Facility tour R

Departs from lobby

8:30 am
Boardroom

The #CRISPRtwins story

Science + Science Writing panel organized and moderated by Dan Vergano

#CRISPRstory
@MMarchioneAP
@antonioregalado
@dvergano

Two journalists who reported the year's most startling story in science – the birth of genetically modified human twins in China – reflect on the story's lessons with an expert who consulted with both outlets. Come for a discussion of the science, ethics, and journalism behind a story that shook science to its foundations and is still reverberating.

Marilynn Marchione
chief medical writer, The Associated Press
Kiran Musunuru
associate professor of cardiovascular medicine and genetics, Perelman School of Medicine, University of Pennsylvania
Antonio Regalado
biomedicine editor, MIT Technology Review

9:30 am

Concurrent sessions

Boardroom

A troubled planet warms to solar geoengineering

Science-based policies have succeeded in moderating many of the hazards humans have inflicted on themselves, from the ozone hole to

leaded gasoline. And David Keith is optimistic that science can play that role again on the climate front. He heads a research group working on a controversial technology: solar geoengineering, or blocking or reflecting some of the sun's radiation to slow warming. Public discussion of this once-taboo topic is now heating up. Keith will share an update on the research and his thoughts about the role of journalism in shaping the discussion. Although he's concerned about the ways that opponents of greenhouse-gas emissions cuts exploit his work, he insists that scientists must talk openly about geoengineering if there is a possibility that science could reduce climate risks. He notes the Einstein quotation engraved on the memorial outside Washington's historic National Academy of Sciences building: "The right to search for truth implies also a duty; one must not conceal any part of what one has recognized to be true."

#SolarGeoengineering
@DKeithClimate

David Keith
professor of applied physics, Harvard Paulson School of Engineering and Applied Sciences; professor of public policy, Harvard Kennedy School; and founder, Carbon Engineering

Assembly

SETI: Bringing a neglected field of astronomy in from the cold

#AstroSETI
@Astro_Wright

The search for extraterrestrial life (SETI) has long been treated as a problem child of astronomy, and it has been deprived of significant government support for decades. But SETI made a move into the mainstream last winter when U.S. astronomers came together to prepare a report for the National Academies describing how the NSF and NASA could support the field next decade. One of those orchestrating that move was Jason Wright. Wright's nascent PSETI (Penn State ExtraTerrestrial Intelligence) Center will leverage private gifts to fund SETI research and fold it into Penn State's existing astrobiology graduate curriculum. Wright argues that the search for alien intelligence or "technosignatures" should not be a fringe activity; rather, he believes SETI scientists will help find answers to important questions about astrophysics and the cosmos in the age of multimessenger astronomy. He will describe new SETI research that is providing imaginative hypotheses for powerful new instruments to probe. "It's the unexpected," Wright says, "that's often the most important thing."

Jason Wright
associate professor of astronomy and astrophysics, Penn State

10:30 am

Break

Alumni Lobby

Astronomy Rocket Lab tour R

Departs from lobby

Sensory Evaluation Center tour R

Departs from lobby

10:50 am

Concurrent sessions

Boardroom

A new fungus stalks the amphibian world

Earlier this year, a major paper laid out the dimensions of the ongoing "amphibian apocalypse," a worldwide loss of amphibian populations

#SalamanderFungus
@KWren88

accelerated by a chytrid fungus. Biologist Karen Lips has been studying the ecosystem and human health effects of this crisis, but meanwhile she is preparing for the next one. A chytrid fatal to salamanders and newts has been wiping out wild populations in Asia and now in Europe. It is only a matter of time, Lips says, until it reaches the world's hotspot of salamander biodiversity – North America – most likely by legal or illegal importation of an infected animal. Lips and other biologists are documenting the status of salamanders and their ecosystems to provide monitoring and possible protection of these doubly threatened creatures.

Karen Lips
professor of biology, University of Maryland

Assembly

What changes in primate brains can tell us about ours

#OurApeBrains

What can we learn about the evolution of the human brain by studying our nearest relatives? A great deal, says Chet Sherwood, who is applying new tools such as MRIs and genome analysis to questions about human brain evolution. Comparative studies of the human brain have emphasized its remarkable size, but Sherwood believes more interesting insights lie elsewhere. He is investigating how the organization and composition of great ape brains varies with ecological and behavioral factors, even when brain size stays the same. Recently discovered hominin fossils likewise show variations in brain organization but not brain size. A growing collection of primate brains is allowing Sherwood and others to understand the ways that environment and experience have shaped our exquisite brains.

Chet Sherwood
professor and chair, Department of Anthropology, and co-director of the Mind-Brain Institute, George Washington University

11:50 am

Lunch and Learn: New frontiers in science journalism at the AP and *The Atlantic*

Alumni Ballroom ABC

12:50 pm

Concurrent sessions

Boardroom

When ideology or special interests hijack science topics

Science + Science Writing panel organized and moderated by Beryl Benderly

#HijackedStories
@johnfocook
@tamarhaspel

What's a science writer to do when ideologues or economic and political interests construct narratives that "hijack" discussions of science-based policy issues? How to report accurately on public questions when belief and misinformation swamp evidence and scientific consensus? Climate change is probably the most publicized example, with religious, economic and political concerns contending against scientific conclusions for the public's attention and concurrence. But the same dynamic also plays out in other issues. In this session, two journalists who write about such "hijacked" policy questions, GMO foods and the science talent "shortage," will describe the challenges they face in providing accurate coverage. A cognitive scientist who studies the effects of various communication strategies on public understanding of climate change will offer guidance on effective ways of conveying the truth amid such controversies.

John Cook
research assistant professor, George Mason University

Tamar Haspel
freelance writer

Assembly

Using physics to root out error and bias

#PhysicsinModels

As science and industry become more and more dependent on complex numerical models for making predictions and designing structures and devices, how can we know whether a model is an accurate representation of reality? Sez Atamturkur's work aims to measure uncertainty and systematic error in these models. Modelers often focus on building logical algorithms and incorporating massive amounts of data, but Atamturkur says that process can introduce systematic error or bias, which are exacerbated when models are coupled. She and colleagues have focused on rooting out the nature of error or bias and representing it in a physically meaningful way so that models can be validated. She will share some of the important applications of this work in various fields.

Sez Atamturkur
Harry and Arlene Schell Professor and head of the Department of Architectural Engineering, Penn State

1 pm

CSL Behring Fermentation Facility tour R

Departs from lobby

Stuckeman Center for Design Computing tour R

Departs from lobby

1:50 pm
Boardroom

Clearing the air on global climate and greenhouse gases

#LowCWorld

As another presidential election approaches, it's unlikely that the debate about climate will remain on the back burner as it did in 2016. Rob Jackson's Global Carbon Project continuously synthesizes and analyzes data on what's happening with greenhouse gases in the atmosphere in order to recommend actions on climate. Jackson and colleagues are currently looking at options for removing and reducing both methane and carbon dioxide from the atmosphere. Other studies are assessing the connection between climate change and wildfires. Jackson is keenly interested in how a low-carbon economy might work, and the trade and ethical implications of proposed climate solutions. This session will aim to clear the air at a time when there's likely to be a fair amount of rhetorical fog choking the public debate over climate change.

Rob Jackson
professor of earth and environment, Stanford University

2:50 pm

Break

Alumni Lobby

3 pm

Immersive Construction (ICon) Lab tour R

Departs from lobby

Materials Research Institute Nanofabrication Laboratory tour R

Departs from lobby

MONDAY

3:10 pm
Boardroom

#Roots4Food

Food security and climate: Attacking problems at the roots

How will we feed ourselves in 2050? The linked challenges of world food security and climate change, Jonathan Lynch notes, confront both rich and poor countries. U.S. food production is dependent on the costly, polluting use of nitrogen fertilizers and has a huge carbon footprint, while farmers in Africa and elsewhere struggle with poor soils and droughts. Lynch hopes the solutions to these problems can be found at their roots, a part of the plant that's been hard to include in breeding programs because it's unseen. His Roots Lab is working on ways to substantially improve crop yields, reduce fertilizer and irrigation use, and capture carbon through deeper, more efficient root systems. Their work combines new imaging technology, genomics, and phenomics for a sophisticated understanding of root traits. The hope is to breed high-yielding crop varieties that can also reduce carbon in the atmosphere.

Jonathan Lynch
University Distinguished Professor of plant science, Penn State

4:10 pm
Boardroom

#WhyFakeNews
@shyamer

Why do we fall for fake news, and what can be done about it?

Fake news can be deadly. During 2017 and 2018, 46 people were lynched by vigilante mobs after false rumors of child kidnappings and organ harvesting spread through rural India in the form of doctored videos shared via the WhatsApp encrypted message system. Government efforts to encourage people to think critically about news sources had little effect, and WhatsApp had few tools to control the spread of fake videos in an encrypted environment. S. Shyam Sundar, with funding from WhatsApp, is engaged in understanding this tragic example of the viral nature of fake news transmitted by video. His research indicates that people do not process video critically or differentiate between news sources, especially when the news arrives in a customized environment through a social connection. Sundar and his colleagues have received NSF funding to build an algorithm to detect fake news. He hopes to come up with a way for human and artificial agents to work together to reduce the problem. The grant itself, he says, triggered a flurry of FOIA requests and "fake news about our fake news project."

S. Shyam Sundar
James P. Jimirro Professor of media effects and co-director, Media Effects Research Laboratory, Penn State

TUESDAY, OCTOBER 29

All field trip groups meet in the Nittany Lion Inn lobby.

8 am — **Shale Hills Critical Zone Observatory (CZO) field trip** R

9 am — **Cow to Cone field trip** R

Marcellus Shale drilling pad field trip R

1 pm — **Insectary field trip** R

1:15 pm — **AccuWeather tour** R

New Horizons in Science

2019 SPEAKERS

Richard Alley

Evan Pugh University Professor of geosciences and associate of the Earth and Environmental Systems Institute, Penn State University

Richard Alley studies the great ice sheets to help predict future changes in climate and sea level. He has made four trips to Antarctica, nine to Greenland, and more to Alaska and elsewhere. He has been honored for research (including election to the U.S. National Academy of Sciences and foreign membership in the Royal Society), teaching, and service. Alley participated in the U.N. Intergovernmental Panel on Climate Change and has provided requested advice to numerous government officials in Congress and the White House. He has authored or coauthored more than 300 refereed scientific papers. He was presenter for the PBS TV miniseries on climate and energy "Earth: The Operators' Manual," and is author of the companion book. His popular account of climate change and ice cores, *The Two-Mile Time Machine*, was Phi Beta Kappa's science book of the year.

www.geosc.psu.edu/academic-faculty/alley-richard

Abhay Ashtekar

Evan Pugh Professor of Physics and director, Institute for Gravitation and the Cosmos, Penn State University

Abhay Ashtekar's research has advanced our understanding of the asymptotic structure of spacetime, gravitational waves in full nonlinear general relativity, the atomic structure of spacetime geometry on the Planck scale, and the quantum nature of black holes and the big bang. His reformulation of general relativity as a gauge theory has led to loop quantum gravity, an approach to the unification of general relativity and quantum physics now being pursued in dozens of research groups worldwide. He has continued to play a seminal role in the development of this field as well as its subfield, loop quantum cosmology. Ashtekar is a member of the National Academy of Sciences and is one of only 51 honorary foreign fellows of the Indian Academy of Sciences. Now holder of the Eberly Chair at Penn State, he was awarded the senior Forschungspreis by the Alexander von Humboldt Foundation. He has held the Krammers Visiting Chair in Theoretical Physics at the University of Utrecht, Netherlands; a senior visiting fellowship of the British Science and Engineering Research Council; and the Sir C. V. Raman Chair of the Indian Academy of Science. He was awarded Doctor Rerum Naturalium Honoris Causa by the Friedrich-Schiller Universität, Jena, Germany, in 2005 and by the Université de Aix-Marseille II (France) in 2010. Ashtekar has authored or co-authored over 270 scientific papers and written or co-edited nine scientific books on general relativity,

cosmology and quantum gravity. He is a past president of the International Society for General Relativity and Gravitation and a past chair of what is now the Division of Gravitational Physics of the American Physical Society.

igc.psu.edu/people/Ashtekar/

Sez Atamturkur

Harry and Arlene Schell Professor and head of the Department of Architectural Engineering, Penn State

Sez Atamturkur's research focuses on uncertainty quantification in scientific computing. Her work, documented in more than 100 peer-reviewed publications, has received funding from the National Science Foundation, the U.S. Department of Energy, the U.S. Department of the Interior, the U.S. Department of Transportation, the U.S. Department of Education, and Los Alamos National Laboratory, as well as industry organizations and partners. She joined the Penn State faculty in 2018 after serving as associate vice president for research development and a Provost's Distinguished Professor at Clemson University. There she directed the NSF-funded Tigers ADVANCE project, which focuses on improving the status of women and minority faculty at Clemson, and the NSF-funded National Research Traineeship project, with funding for over 30 doctoral students and a goal of initiating a new degree program on scientific computing and data analytics for resilient infrastructure systems. She served as one of the four co-directors of Clemson's Center of Excellence in Next Generation Computing and Creativity. Prior to joining Clemson, Atamturktur served as an LTV technical staff member at Los Alamos National Laboratory. She holds a doctorate in civil engineering from Penn State and earned her undergraduate degree in architecture and civil engineering from Orta Dogu Teknik Universitesi in Ankara, Turkey.

www.ae.psu.edu/department/directory-detail-g.aspx?q=hsa109

John Cook

research assistant professor, George Mason University

John Cook is a research assistant professor at the Center for Climate Change Communication at George Mason University. He obtained his PhD at the University of Western Australia, studying the cognitive psychology of climate science denial. His research focus is understanding and countering misinformation about climate change. In 2007, he founded Skeptical Science, a website that won the 2011 Australian Museum Eureka Prize for the Advancement of Climate Change Knowledge and 2016 Friend of the Planet Award from the National Center for Science Education. Cook co-authored the college textbooks *Climate Change: Examining the Facts* and *Climate Change Science: A Modern Synthesis and the book Climate Change Denial: Heads in the Sand.*

www.skepticalscience.com

Felecia Davis

assistant professor, Stuckeman Center for Design Computing, Penn State

Felecia Davis is the director of SOFTLAB@PSU. Her work in design explores the role of communication to people through computational textiles or e-textiles, textiles that can sense and respond to the environment with embedded electronics and sensors. Davis has lectured, taught workshops, published, and exhibited her work in textiles, computation, and architecture internationally, including at the Swedish School of Textiles, Microsoft Research, and the MIT Media Lab. Davis has taught architectural design for more than 10 years. Principal in her own design firm, FELECIADAVISTUDIO, she has received several finalist awards for her architectural designs in open and invited design competitions. Davis earned a PhD from the Design and Computation Group in the School of Architecture and Planning at MIT. She received her M. Arch. from Princeton and her BS in engineering from Tufts University. While at MIT, she designed computational textiles – textiles that respond to commands through computer programming, electronics, and sensors for use in architecture. Such responsive textiles, used in lightweight shelters, will transform how we communicate, socialize, and use space.

stuckeman.psu.edu/faculty/felecia-davis

Hana El-Samad

Kuo Family Endowed Professor and vice chair in the Department of Biochemistry and Biophysics at the University of California, San Francisco

Hana El-Samad's research group emphasizes the role of control theory and dynamical systems in the study of biological networks. Her group works at the interface of systems and synthetic biology, focusing on the architecture, roles, principles, and evolution of feedback loops in biological circuits. A major current focus is to develop rationally designed, programmable, plug-and-play, cellular recognizance and repair circuits that can be broadly deployed for therapies and biotechnological applications. El-Samad is a 2009 Packard Fellow and recipient of many honors, including the 2011 Donald P. Eckman Award and the 2012 CSB2 prize in systems biology. She was also named a Paul G. Allen Distinguished Investigator in 2013 and senior investigator of the Chan-Zuckerberg Biohub in 2017. El-Samad joined UCSF after obtaining a doctorate degree in mechanical engineering from the University of California, Santa Barbara, preceded by a master's degree in electrical engineering from the Iowa State University.

elsamadlab.ucsf.edum

Chad Hanna

associate professor of physics and astronomy and astrophysics, Penn State

Chad Hanna's research focuses on studying the universe with gravitational waves using the Laser Interferometer Gravitational-Wave Observatory (LIGO). Specifically, he and his group work to enable multi-messenger astronomy through gravitational wave observations of merging neutron stars and black holes. Hanna earned his physics PhD at Louisiana State University and was a senior postdoctoral researcher at the Perimeter Institute for Theoretical Institute before joining the Penn State faculty. He was awarded an NSF CAREER Award in 2015.

Tamar Haspel

freelance writer

Tamar Haspel is a James Beard award-winning journalist who's been on the food and science beat for the best part of two decades. She's a *Washington Post* columnist and a contributor to (among others) *National Geographic*, *Discover*, and *Edible Cape Cod*. When she's tired of the heavy lifting of journalism, she gets dirty. She and her husband, Kevin Flaherty, raise their own chickens, grow their own tomatoes, hunt their own venison, and generally try to stay connected to the idea that food has to come from somewhere. They also have an oyster farm, Barnstable Oyster, where they grow about 250,000 oysters a year in the beautiful waters off Cape Cod.

washingtonpost.com/unearthed

Rob Jackson

professor of earth and environment, Stanford University

Rob Jackson and his lab study the many ways people affect the earth. They're currently examining the effects of climate change and droughts on forest mortality and grassland ecosystems. They are also working to measure and reduce greenhouse gas emissions through the Global Carbon Project, which Jackson chairs. As an author and photographer, Jackson has published a trade book about the environment (*The Earth Remains Forever*, University of Texas Press), two books of children's poems, *Animal Mischief* and *Weekend Mischief* (Boyds Mills Press; *Highlights* magazine), and recent poems in literary journals such as *Southwest Review, Cortland Review, Cold Mountain Review, Atlanta Review*, and LitHub. His photographs have appeared in many media outlets, including the *New York Times, Washington Post, USA Today*, and *National Geographic News*.

jacksonlab.stanford.edu • profiles.stanford.edu/jackson

David Keith

professor of applied physics, Harvard Paulson School of Engineering and Applied Sciences; professor of public policy, Harvard Kennedy School; and founder, Carbon Engineering

David Keith has worked near the interface between climate science, energy technology, and public policy since 1991. He took first prize in Canada's national physics prize exam, won MIT's prize for excellence in experimental physics, and was one of *Time* magazine's Heroes of the Environment. He is the founder of Carbon Engineering, a Canadian company developing technology to capture CO_2 from ambient air to make carbon-neutral hydrocarbon fuels. Best known for his work on the science, technology, and public policy of solar geoengineering, Keith led the development of Harvard's Solar Geoengineering Research Program, a Harvard-wide interfaculty research initiative. His work has ranged from the climatic impacts of large-scale wind power to an early critique of the prospects for hydrogen fuel. Keith's hardware engineering work includes the first interferometer for atoms, a high-accuracy infrared spectrometer for NASA's ER-2, the development of Carbon Engineering's air contactor and overall process design, and the development of a stratospheric propelled balloon experiment for solar geoengineering. Keith teaches science and technology policy, climate science, and solar geoengineering. He is author of more than 200 academic publications with a total citation count exceeding 12,000. He has written for the public in op-eds and "A Case for Climate Engineering."

keith.seas.harvard.edu

Nicole Lazar

professor of statistics, University of Georgia

Nicole Lazar received her undergraduate degree in statistics and psychology from Tel Aviv University, her MS in statistics from Stanford University, and her PhD in statistics from the University of Chicago. She was on the faculty of the Statistics Department at Carnegie Mellon University before moving to the University of Georgia in 2004. She is an elected member of the International Statistical Institute and a Fellow of the American Statistical Association. Past editor-in-chief of *The American Statistician*, she has also served on the editorial boards of leading statistics journals. She is currently president of the Caucus for Women in Statistics. Her research interests include likelihood theory, the analysis of functional neuroimaging data, and the foundations of statistics.

stat.uga.edu/directory/people/nicole-lazar

Karen Lips

professor of biology, University of Maryland

Karen Lips is a field ecologist who studies how global change (wildlife disease, climate change, land use) affects biodiversity of amphibians and reptiles in Latin America and the U.S. A primary focus of her research is determining the ecological and environmental factors that influence amphibian species' response to disease, and how that information might be used in conservation and recovery plans. She is interested in how the loss of biodiversity affects communities and ecosystems, and how human activities contribute to the spread of disease and loss of biodiversity. Before joining the University of Maryland, Lips was a Jefferson Science Fellow at the U.S. Department of State, where she worked in the Bureau of Western Hemisphere Affairs, in the Office of Public Diplomacy and Public Affairs, and served as an Embassy Science Fellow in Colombia. Lips is a research associate at the U.S. Museum of Natural History, an AAAS Leshner Leadership Public Engagement Fellow, an AAAS fellow, an ESA fellow, and an Aldo Leopold Leadership Fellow. She was awarded the President's Award of the Chicago Zoological Society, a Bay and Paul Biodiversity Leadership Award, the Sabin Amphibian Conservation Award in 2012, and the inaugural UMD Impact Communicator Award. She holds a BS in zoology from the University of South Florida and a PhD in biology from the University of Miami. Lips is interested in increasing engagement on environmental issues, promoting scientific leadership, and fostering international scientific collaborations.

lipslab.weebly.com

Jonathan Lynch

University Distinguished Professor of plant science, Penn State

Jonathan Lynch's research focuses on understanding the basis of plant adaptation to drought and low soil fertility. This encompasses physiology, genetics, and ecology, centered on organismic processes. Lynch completed his PhD and postgraduate research in plant physiology at the University of California, Davis, and continued his research at the International Center for Tropical Agriculture in Colombia before joining the Penn State faculty in 1991. He has been honored for his work by the Mexican Academy of Sciences and the government of China. In the U.S., he is a Fellow of the Crop Science Society of America and last year was awarded the Dennis Hoagland Award by the American Society of Plant Biologists. He holds a Chair in Root Biology at the University of Nottingham in the U.K. and serves on the Advisory Council of the Foundation for Food and Agriculture Research.

roots.psu.edu

Marilynn Marchione

chief medical writer, The Associated Press

Marilynn Marchione joined the Associated Press in 2004 after 28 years as a reporter and editor at the *Milwaukee Journal Sentinel*, the *Chicago Sun-Times* and the *Akron Beacon Journal*. As the AP's chief medical writer, she covers medical meetings and looks for consumer-oriented stories with an eye for news you can use. In 2010, she won CASW's Victor Cohn Prize for Excellence in Medical Science Reporting. Her work has also been recognized by the Associated Press Managing Editors Association and others. She has held numerous fellowships, including a four-month Knight epidemiology fellowship at the U.S. Centers for Disease Control and Prevention. Her journalism degree is from Kent State University.

apnews.com

Mónica Medina

professor of biology, Penn State

Mónica Medina is an integrative biologist interested in the ecology and evolution of marine organisms. Her current research focuses on different aspects of cnidarian-algal symbiosis and cnidarian-microbe interactions. Her lab uses a combination of experimental field based approaches with molecular and genomic tools in the lab. Medina earned her PhD in marine biology and fisheries at the University of Miami and taught at the University of California, Merced, before joining Penn State.

medinalab.org

Kiran Musunuru

associate professor of cardiovascular medicine and genetics, Perelman School of Medicine, University of Pennsylvania

An actively practicing cardiologist and a committed teacher, Kiran Musunuru holds an MD and PhD and master's degrees in law and public health. He trained at Harvard University, Cornell University Medical College, The Rockefeller University, Brigham and Women's Hospital, Johns Hopkins University, and the University of Pennsylvania. His research focuses on the genetics of heart disease, seeking to identify genetic factors that protect against disease and use them to develop therapies to protect the entire population. In his recent work he has been using gene editing to create a one-shot "vaccination" against heart attacks, the leading cause of death worldwide. He is a recipient of the Presidential Early Career Award for Scientists and Engineers from the White House and the American Heart Association's Award of Meritorious Achievement. He is the author of *The CRISPR Generation: The Story of the World's First Gene-Edited Babies*, which is being published in October 2019.

C. Brandon Ogbunu

assistant professor of ecology and evolutionary biology, Brown University

C. Brandon Ogbunu is a geneticist whose research interest focuses on complex interactions between genes and the environment. In addition, Brandon writes for various venues at the intersection between science, data and culture. His writing has appeared in *Wired*, *Deadspin*, *The Conversation*, *Greater Good* magazine and Boxing.com.

medium.com/ogplexus

Andrew Read

director, Huck Institutes of the Life Sciences; Evan Pugh University Professor of biology and entomology; Eberly Professor in biotechnology, Penn State

Andrew Read's research group investigates drug and insecticide resistance as well as the evolution of virulence, infectiousness, and vaccine escape. He is particularly interested in the question of how best to treat patients so as to minimize resistance evolution. Originally from New Zealand, Read did a D. Phil. in evolutionary biology at the University of Oxford. He held various fellowships at Oxford and then at the University of Edinburgh before becoming chair of natural history there, a professorship established in 1767. He has taught ecology, evolution, microbiology, and statistics. He has authored more than 250 peer-reviewed publications, 30 book chapters and four edited volumes, and been elected to fellowships from the Royal Society of Edinburgh; the Institute of Advanced Studies, Berlin; the AAAS; the American Academy of Microbiology; the Royal Society; and the American Academy of Arts and Sciences. He also worked as a science journalist for several weeks in 2003 as a British Science Association Media Fellow, writing for the *Irish Times* in Dublin. In 2007, he moved to the Center for Infectious Disease Dynamics at Penn State.

www.thereadgroup.net

Antonio Regalado

biomedicine editor, MIT Technology Review

Antonio Regalado looks for stories about how technology is changing medicine and biomedical research. Before joining *MIT Technology Review* in July 2011, he lived in São Paulo, Brazil, where he wrote about science, technology, and politics in Latin America for *Science* and other publications. He was the science reporter at the *Wall Street Journal* from 2000 to 2009 and later a foreign correspondent.

Angela Saini

science journalist

Angela Saini is an award-winning British science journalist and broadcaster. She regularly presents science programs on the BBC, and her writing has appeared in *New Scientist*, the *Guardian*, the *Sunday Times*, and *Wired*. Her latest book is *Superior: The Return of Race Science*. Her previous book, *Inferior: How Science Got Women Wrong*, was published in 2017 to widespread critical acclaim and has been translated into 11 languages. Angela has a master's in engineering from the University of Oxford and was a Knight Science Journalism Fellow at the Massachusetts Institute of Technology.

angelasaini.co.uk

Chet Sherwood

professor and chair, Department of Anthropology, and co-director of the Mind-Brain Institute, George Washington University

Chet Sherwood's research is driven by an interest in how brains differ among species, how this variation is correlated with behavior, how it is constrained by the rules of biological form, and how it is encoded in the genome. Within the scope of this research, he focuses on the examination of human brain organization in comparison to other primates, especially our closest living relatives, the great apes (chimpanzees, bonobos, gorillas, and orangutans). His research has been supported by the National Science Foundation, National Institutes of Health, the Wenner-Gren Foundation, and the Leakey Foundation. He was a recipient of a James S. McDonnell Foundation Scholar Award (2012). He is co-director of the National Chimpanzee Institute and serves as associate editor of the journals *Brain Structure and Function* and *Brain, Behavior and Evolution*.

columbian.gwu.edu/chet-sherwood • www.chimpanzeebrain.org

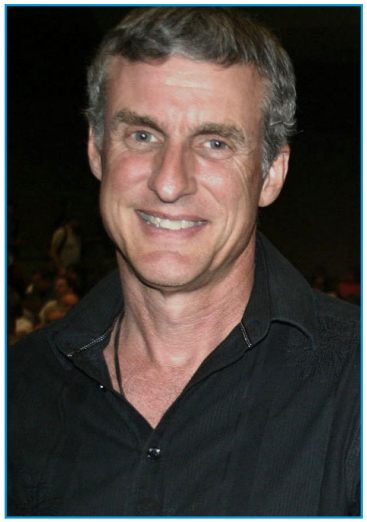
Pat Shipman

anthropologist and author

Pat Shipman is a paleoanthropologist specializing in human evolution and a well-known writer of books and articles for the general public about evolution and human biology. Her 1994 book *The Evolution of Racism: Human Differences and the Use and Abuse of Science* traced the complex interaction of genetics, anthropology, and racism from Darwin's day to the 20th century. Now retired from the anthropology department at Penn State, Shipman in 2015 published her 10th book,

The Invaders, in which she argued provocatively that the Neanderthals were eradicated by modern humans hunting cooperatively with dogs – 20,000 years before wolves were thought to have been domesticated. Shipman is a Fellow of the AAAS and in 2006 was awarded the Leighton Wilkie Prize by the Stone Age Institute at Indiana University for her lifetime contributions to paleoanthropology. A long-time contributor to *American Scientist* magazine, she has also won several literary prizes and in 2000 was selected as the A. Dixon and Betty F. Johnson Lecturer in the Communication of Science at Penn State.

Steven Squyres
2019 PATRUSKY LECTURER
chief scientist, Blue Origin



Planetary scientist Steven W. Squyres has played a pioneering role in numerous explorations of objects in our solar system and was the principal investigator for the science payload on the Mars Exploration Rover Project. He received his Ph.D. from Cornell in 1981, and after five years at NASA's Ames Research Center became a faculty member at Cornell in 1986. In September 2019, he stepped down from his position as James A. Weeks Professor of physical sciences to join the spaceflight company Blue Origin. His planetary exploration missions include Voyager, Magellan, NEAR, Cassini, Mars Express, MRO, Mars Odyssey, and the Mars Science Laboratory. Squyres led the most recent National Research Council Planetary Decadal Survey and served as Chairman of the NASA Advisory Council. He is a Fellow of the American Academy of Arts and Sciences.

S. Shyam Sundar
James P. Jimirro Professor of media effects and co-director, Media Effects Research Laboratory, Penn State

S. Shyam Sundar is the founder of the Media Effects Research Laboratory, a leading facility of its kind in the country. He teaches courses in the psychology of communication technology, media theory, and research methodology. He earned his doctoral and master's degrees in communication. His industry experience includes more than eight years as a journalist. He holds joint faculty appointments in the departments of film-video and media studies, advertising, architecture, and communication arts and sciences at Penn State. Sundar's research investigates social and psychological effects of technological elements unique to online communication, ranging from websites to newer social and personal media. In particular, his studies experimentally investigate the effects of interactivity, navigability, multi-modality, and agency (source attribution) in digital media interfaces upon online users' thoughts, emotions, and actions. His research is supported by the National Science Foundation, Korea Science and Engineering Foundation, the MacArthur Foundation and Lockheed Martin Information Systems and Global Services, among others. A frequently cited source on technology, Sundar has testified before Congress as an expert witness and delivered talks at several universities in the United States, Germany, Netherlands, Hong Kong, Korea, China, Singapore, and India. He has served on the editorial boards of 18 journals. From 2013 to 2017, Sundar was editor-in-chief of the *Journal of Computer-Mediated Communication*. He is a Fellow of the International Communication Association and recipient of the Deutschmann award for research excellence from the Association for Education in Journalism and Mass Communication (AEJMC).

bellisario.psu.edu/people/individual/s.-shyam-sundar

Jason Wright
associate professor of astronomy and astrophysics, Penn State

As a member of Penn State's Center for Exoplanets and Habitable Worlds, Jason Wright studies stars, their atmospheres, their activity and their planets, and also works on the search for extraterrestrial intelligence (SETI). He is a project scientist for NEID (NN-explore Exoplanet Investigations with Doppler spectroscopy), a principal investigator with NExSS (Nexus for Exoplanet System Science), a co-PI of the MINERVA (Miniature Exoplanet Radial Velocity Array) observatory, and a member of the Habitable Zone Planet Finder team. He teaches at the University Park campus and has an active research group of students and postdocs. He maintains the Exoplanet Orbit Database and Exoplanet Data Explorer at exoplanets.org, a powerful guide to the orbits of known exoplanets; and the RVLIN and BOOTTRAN packages of Interactive Data Language routines for efficiently fitting multiple Keplerian curves to radial velocity data, and extracting accurate uncertainties for orbital parameters, including transit times.

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Beryl Benderly
freelance journalist and author

Prize-winning journalist Beryl Lieff Benderly has written the "Taken for Granted" column on the scientific labor force and careers for "Science Careers" on the *Science* website since 2003. Her hundreds of articles have also appeared in *Scientific American, Scientific American Mind, Discover, Undark, Prism, Slate*, the *Washington Post, the New York Times* and many other prominent publications. Author or co-author of eight trade books, including *The Growth of the Mind* with Stanley I. Greenspan; *In Her Own Right: The Institute of Medicine Guide to Women's Health Issues; Challenging the Breast Cancer Legacy* with Renee Royak-Schaler; and the classic *Dancing Without Music: Deafness in America* (in print since 1980), she is working on her ninth as a non-resident visiting scholar at the John J. Heldreth Center of Rutgers University. Organizations including IEEE-USA, the American Association of University Professors, the American Psychological Association, the American Society of Journalists and Authors, and Radcliffe College have given Benderly awards for her writing on the scientific labor force, biomedical engineering, cancer genetics, depression, women's health, electronic medical records, apes that use sign language, and other topics. She is a Fellow of the American Association for the Advancement of Science.

www.linkedin.com/in/berylliefbenderly

Leah Shaffer
environmental investigative journalist and photojournalist

Leah Shaffer is a science writer based in St. Louis whose stories have appeared in publications such as *Wired*, *The Atlantic, Discover*, NOVANext and *Undark*. She writes about biology, medicine, and the weird critters inside and outside the human body.

leahabshaffer.wordpress.com

Dan Vergano

science reporter, BuzzFeed News

Dan Vergano is a science reporter for BuzzFeed News in Washington, D.C., where he focuses on the intersection of science and politics. He was formerly at *National Geographic* and *USA Today*. He is a judge for science journalism prizes sponsored the American Association for the Advancement of Science and the U.S. National Academy of Sciences. He serves as a board member of the Council for the Advancement of Science Writing and chairs CASW's New Horizons Committee.

www.buzzfeed.com/danvergano

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