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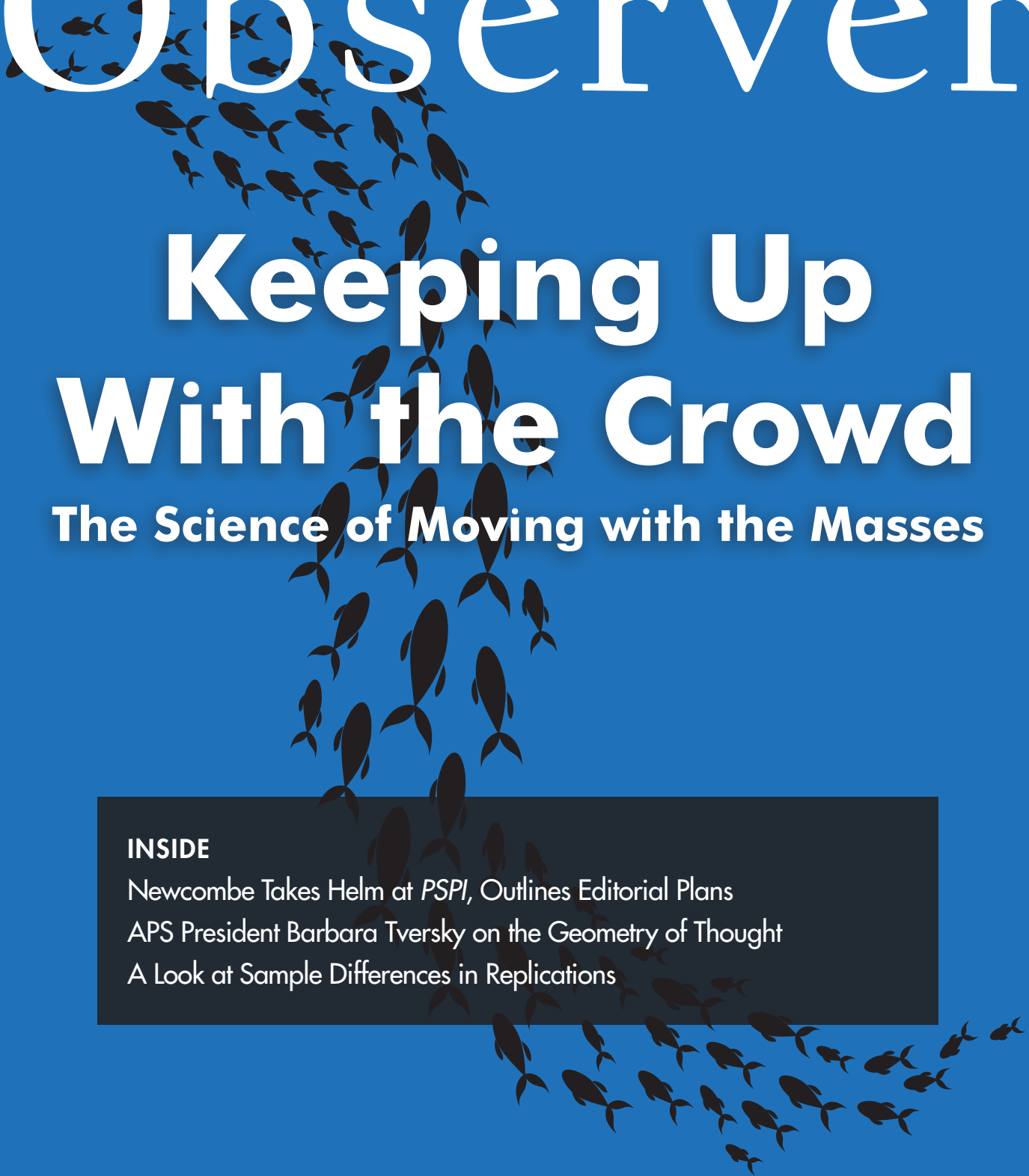
Keeping Up With the Crowd

The Science of Moving with the Masses



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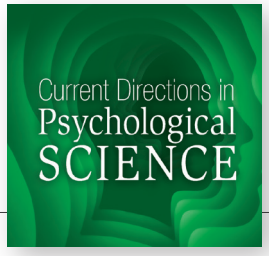

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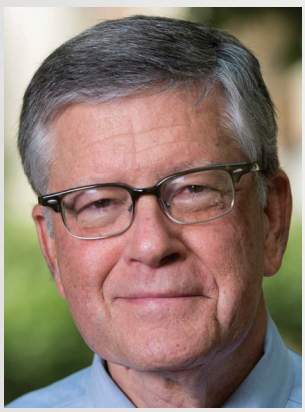

HENRY L. ROEDIGER, III
Washington University in St. Louis

APS Past President **Henry L. Roediger, III**, one of the most prominent memory researchers in psychological science, is interviewed by his former student, APS Immediate Past-President **Suparna Rajaram**.

Recorded before a live audience at the 30th APS Annual Convention in San Francisco.

Interviewed By

SUPARNA RAJARAM
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The Geometry of Thought

Paths, Places, and Perspectives

Barbara Tversky
APS President

In an undergrad philosophy course, I was introduced to the Law of the Hammer: give a kid a hammer and everything needs pounding. The Law is applied so ubiquitously that it has become self-describing. Our first child illustrated it literally and expensively. Instead of a hammer, he had a screwdriver that he carried and used everywhere, ultimately to pry open a locked car. My personal hammer is more benign: spatial thinking, which I see everywhere. Note: *see everywhere*.

An op-ed by Crispin Sartwell in the November 24, 2018 issue of *The New York Times* (nyti.ms/2KTAFF6) provides a delightful example. *How Would You Draw History?* he asks in the title, and proposes a series of increasingly complex spatial conceptions: linear, a one-way left-to-right arrow that is essentially a time line; *circular*, an arrow that returns to itself, *loop*, a spiral; *zig-zag*, dialectics, Hegelian thesis and antithesis; a Big Bang expanding *sunburst*; and last, what he calls a *loop-spiral*, a *Spirograph*, for those who remember that mesmerizing childhood toy. History is a sequence of events that are points on a line; the path that line takes is a view of history. Like a route: places on a path. Like data points on a dimension. Like a chain of thought: ideas and relations between them. Our minds move between ideas the way our bodies move between places. Those points are really boxes that can be filled with the rich set of diverse things that constitute places or memories or ideas. To express those paths through places, times, and ideas more directly, more efficiently, we draw them on a page. Or in the air. They form routes and timelines and line graphs and ultimately networks connecting places or memories or ideas.

Our representations of thoughts and actions of the mind and our representations of places and actions in space mirror each other in many ways. People can be *close* or *distant* and ideas close or distant just as places can be close or distant. Ditto *central* or *peripheral*. Even *up* or *down*, though these are special; they depend on gravity, not just geometry. Going up takes resources: health, strength, power, money. So, on the whole, good things go up. To the heavens. She's on the top of the heap; he's fallen on hard times. These uses aren't metaphors or analogies or figures of speech; those abstract relations are as core to the meanings of the concepts as the spatial relations. You can check your dictionary. Or check your brain. Places and episodes in the hippocampus. The same hippocampal structures that store the past allow imagining and planning the future (Addis & Schacter, 2012). Right next door to the hippocampus and richly interconnected with it: the grid cells in entorhinal cortex that represent the relative locations of places in space. It turns out that they also represent the relative locations of events in temporal space, people in social space, and ideas in conceptual space (Epstein, Patai, Julian, & Spiers, 2017; Garvert, Dolan, & Behrens, 2017; Milivojevic, & Doeller, 2017; Moser, Kropff, & Moser, 2008; Tavares, Mendelsohn, Grossman, Williams, Shapiro, Trope, & Schiller, 2015).

Now that we have arrays of places or memories or ideas in space, we can take a perspective on them. One perspective is from outside, from above; that gives us an overview, like a map. That outsider perspective provides the overall structure of the space, if without details. It allows us to see many possibilities, many interconnections, many solutions. But so many possibilities can be overwhelming. Maybe all we need is a view from inside, how to get from where we are to where we need to be, in real space, in conceptual space. We need a particular path from a particular point, ours: a route to get from the train station to the hotel or the string of events that awaits us when we arrive or retracing the path that led us from one thought to another to arrive at a solution. For that, an insider view.

Once inside with a clear view of what's in front and behind and around us, we can take our own perspective, but we can use that to imagine those of others. You might be at a different hotel and we need to find a place to meet; you might have gotten to the same solution by a different path. If I know where you are and how you are oriented in the network of paths, the landscape, around you, then I can jump into your shoes and take your perspective.

The nuances of insider perspective-taking are endlessly fascinating. Jumping into your shoes turns out to be something people can do for spatial perspectives. This in spite of the fact that it was assumed almost as a truism that our own egocentric perspective is primary and that taking someone else's requires extra effort. That view has been eroding; for one thing, the fact that from exploring routes we — and rats — can form mental overviews that are egoless, cognitive maps, was famously demonstrated by Tolman, whose rats found shortcuts. More recently, a slew of studies showing that when we explain to others where something is or how to get somewhere or how to do something, we take their perspective far more often than our own (e.g. Schober, 1993). More surprisingly, when viewing someone in action, we are more likely to take the actor's opposing perspective than our own, even when the actor is present only in a photo and our presumed conversation partner has the same

perspective as we do (Tversky & Hard, 2009; Cavallo, Ansuini, Capozzi, Tversky, & Becchio, 2016). Taking the perspective of the actor might allow us to better understand and learn the action; it should also allow us to better prepare our own actions. Think of batters and pitchers, or boxers or, in another realm, debaters.

Which brings us to social and emotional perspective-taking, of enormous importance in these divided days. In face-to-face encounters, when I can see your face or hear your voice, a degree of social and emotional perspective-taking seems to happen by itself, mediated by the mirror system (e.g. Iacoboni, 2009). But what about in the imagination? Spatial perspective-taking works in the imagination. So far, to my knowledge, no one has found a close relationship between spatial perspective-taking and social or emotional perspective-taking. On reflection, that makes sense. We can't see the social and emotional and semantic landscapes of others, so that kind of perspective taking has to be in the imagination. Still there are illuminating parallels. To take your spatial perspective, I need to know the spatial landscape around you, where you are in it, and how you are oriented. Similarly, to take your social or emotional perspective, I would need to know the social, emotional, or conceptual landscape around you as well as your place and orientation in it. Knowing the social or semantic or emotional landscape around you and your orientation in it is complicated and challenging, especially when the ground is shaky.

Back to paths and places — in particular, our own. We don't sit in place for long, not in real space, not in conceptual space. *Here* and *Now* keep changing and we keep moving, to the future, but, like Janus, also to the past. Past paths guide future paths. Past paths create the threads from which we braid the everchanging stories of our lives: places, people, events, and ideas, intertwined with those of others.

My very best wishes to each and all for the coming year. May your paths be graceful and take you to wonderful places.

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Robinson and Berridge Receive Grawemeyer Award for Addiction Research

Kent Berridge and Terry Robinson

APS William James Fellow **Terry Robinson** and APS Fellow **Kent Berridge** of the University of Michigan have won the 2019 University of Louisville Grawemeyer Award For Psychology for their research on the role of neural sensitization in drug addiction.

Robinson and Berridge's Incentive-Sensitization Theory of Addiction focuses on how our brains process "liking" verses "wanting." The theory suggests that the dopamine system in the brains of people struggling with addiction may become hypersensitive to drugs and drug-related cues, producing an excessive desire for drugs that can last for years to come. This sensitization effect can make it difficult for individuals to resist drug-use even when they are actively attempting to avoid them.

When Robinson and Berridge first published this theory in 1993, it ran contrary to all thinking about pleasure systems in the brain, said award director Woody Petry in a press release. Since then, the theory has been supported by numerous studies and the original paper has been cited over 6,500 times.

"Their idea has had a broad impact on how we understand drug addiction and other addictive compulsions such as gambling, binge eating, and sex," said Petry. "Its scope also extends to brain disorders such as schizophrenia and depression."

Robinson spoke about the implications of individual variation in resisting temptation for our understanding of addiction during his William James Fellow Award address at the 2014 APS Annual Convention in San Francisco. Robinson and Berridge have also been elected fellows of the American Association for the Advancement of Science, and have received other distinguished prizes.

Grawemeyer Awards are presented annually by the University of Louisville to individuals working in psychological science, education, music composition, religion, and improving world order. Each prize includes $100,000.

To see Terry Robinson's 2014 APS William James Fellow Award Address, go to www.psychologicalscience.org/r/robinson-address.

Eleanor E. Maccoby, 1917-2018

APS William James Fellow **Eleanor E. Maccoby**, widely considered to be one of the most influential psychological scientists of the 20th century, passed away December 11, 2018 at the age of 101. She is recognized worldwide for her research on gender development and differentiation and parent-child relationships.

Maccoby was the first woman to serve as chair of Stanford University's Department of Psychology, holding that position from 1973 to 1976. At Stanford, she was associated with the university's Center for the Study of Families, Children and Youth, where she became known for research on the social and intellectual development in children. She made key contributions to the study of differential development in girls and boys, infants' emotional attachments, and the effects of divorce on children.

To learn more about Maccoby's career and scientific contributions, watch her 2013 interview with APS Past President Kay Deaux for the APS video series I*nside the Psychologist's Studio*, available at www.psychologicalscience.org/observer/eleanor-maccoby-itps.

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PSPI Report Examines Collaborative Problem-Solving

Few People Trained to Collaborate on 21st Century Problems, Researchers Conclude

From companies trying to resolve data security risks to coastal communities preparing for rising sea levels, solving modern problems requires teamwork that draws on a broad range of expertise and life experiences. Yet individuals receive little formal training to develop the skills that are vital to these collaborations.

In a new report in *Psychological Science in the Public Interest*, an interdisciplinary team of researchers identifies the essential cognitive and social components of collaborative problem solving (CPS) and shows how integrating existing knowledge from a variety of fields can lead to new ways of assessing and training these abilities.

The report, authored by APS Fellow **Arthur C. Graesser** (University of Memphis), **Stephen M. Fiore** (University of Central Florida), **Samuel Greiff** (University of Luxembourg), **Jessica Andrews-Todd** (Educational Testing Service), **Peter W. Foltz** (Pearson and University of Colorado), and **Friedrich W. Hesse** (Leibniz-Institut fur Wissensmedien and University of Tübingen), is accompanied by a commentary by APS Fellow **Mary Gauvain** (University of California, Riverside).

"CPS is an essential skill in the workforce and the community because many of the problems faced in the modern world require teams to integrate group achievements with team members' idiosyncratic knowledge," the authors of the report say.

As societies and technologies become increasingly complex, they generate increasingly complex problems. Devising efficient, effective, and innovative solutions to these complex problems requires CPS skills that most students lack. According to a 2015 assessment of more than 500,000 15-year-old students conducted by the Organisation for Economic Cooperation and Development, only 8% of students around the world showed strong CPS skills.

"The experiences of students in and out of the classroom are not preparing them for these skills that are needed as adults," Graesser and colleagues write.

This unique set of cognitive and social skills support core aspects of CPS, including:

- **Shared understanding**: Group members share common goals when solving a new problem
- **Accountability**: The contributions that each member makes are visible to the rest of the group
- **Differentiated roles**: Group members draw on their specific expertise to complete different tasks
- **Interdependency**: Group members depend on the contributions of others to solve the problem

One reason for the lack of CPS training is a deficit in evidence-based standards and curricula. Secondary school curricula typically focus on educating task- and discipline-specific knowledge, placing little emphasis on educating students' ability to communicate and collaborate effectively.

"Students rarely receive meaningful instruction, modeling, and feedback on collaboration," the researchers note.

When students do receive training relevant to CPS, it is often because they participate in extracurricular activities such as band, sports, student newspapers, and volunteer activities. Even then, the collaborative competencies are not directly relevant to problem solving. The authors argue that it is time to make CPS activities a core part of the curriculum.

Although considerable psychological, educational, and management research has examined factors that contribute to effective learning, teamwork, and decision making, research that directly examines how to improve collaborative problem solving is scarce.

"In essence, we are nearly at ground zero in identifying pedagogical approaches to improving CPS skills."

Developing and implementing effective CPS training stands to have significant societal impacts across a wide range of domains, including business, science, education, technology, environment, and public health. In a project funded by the National Science Foundation, for example, Fiore and other research team members are training students to collaborate across disciplines — including environmental science, ecology, biology, law, and policy — to identify ways to address social, business, and agricultural effects of rising sea levels in Virginia's Eastern Shore.

"It's exciting to engage in real-world testing of methods developed in laboratory studies on teamwork, to see how feedback on collaboration and reflection on that feedback to improve teamwork strategies can improve students' problem solving," explained Fiore.

Identifying the necessary components of this kind of training and determining how to translate those components across a variety of real-world settings will, itself, require interdisciplinary cooperation among researchers, educators, and policymakers.

In her commentary, Gauvain, a cognitive development expert, emphasizes that achieving a comprehensive understanding of CPS requires taking a developmental perspective, and she notes that psychological scientists will be essential in this endeavor. Graesser and colleagues agree:

"When psychological scientists collaborate with educational researchers, computer scientists, psychometricians, and educational experts, we hope to move forward in addressing this global deficit in CPS," they conclude.

Replications Don't Hinge on Sample and Setting Differences, Multilab Project Shows

Failures to reproduce psychological research findings are often attributed to differences in the study population being examined. But results from a massive research project have upended that claim.

A report on the international project, which involved replications of 28 classic and contemporary findings in psychological science, appears in *Advances in Methods and Practices in Psychological Science*. A team of 190 researchers involved in the effort found that population characteristics had little to no bearing on the failure of a finding to replicate.

The project, called Many Labs 2, was designed specifically to address the argument that variations in study samples may result in a failed replication. Each of the 28 studies was repeated in more than 60 labs across 36 nations and territories, and collectively generated sample sizes that on average were more than 60 times larger than the original samples.

Fourteen of the original findings replicated, although some at variable degrees across the different labs. But for the 14 studies that did not replicate, sample diversity had minimal if any effect on the results.

"We were surprised that our diversity in our samples from around the world did not result in substantial diversity in the findings that we observed" said Rick Klein, a researcher at the University of Grenoble Alpes in France and one of the project leaders, in a press release. "Among these studies at least, if the finding was replicable, we observed it in most samples, and the magnitude of the finding only varied somewhat depending on the sample."

The studies selected included many studies published within the last 20 years but also some classics in the research literature, including the well-known framing effect on choices, identified by APS William James Fellows Amos Tversky and Daniel Kahneman; and a 1977 finding on the false consensus effect, in which people overestimate the consensus around their own beliefs and preferences. (Both of those findings were reproduced, although the framing effect proved only half as strong in the replications compared to the original finding.)

Among the findings that did not replicate were a 2014 study showing that people's belief in climate change can be increased by priming heat-related words and a 2009 study showing that people prone to feelings of disgust are also more likely to view portrayals of gay relationships in media as intended to make a statement.

Many Labs 2 represents a far greater undertaking compared to the first Many Labs project from 2013, in which 36 labs collaborated to examine 13 findings — replicating 10 of them. As part of the initiative, the collaborating labs collected the original materials from each study and had the experimental procedures peer-reviewed in advance by experts and, in some cases, authors on the original work.

The results of the latest project do not definitively mean that did not replicate findings were invalid, said Michelangelo Vianello, a professor at the University of Padua in Italy and another of the project leads.

But, he added, "they do suggest that they are not as robust as might have been assumed. More research is needed to identify whether there are conditions in which the unreplicated findings can be observed. Many Labs 2 suggests that diversity in samples and settings may not be one of them."

The pre-press version of the article, "Many Labs 2: Investigating Variation in Replicability Across Sample and Setting," along with commentaries, is available online at www.psychologicalscience.org/publications/ampps.

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QUOTE OF NOTE

"It's something that we have always done and other major universities do, but there's a debate over whether this is a reasonable thing to ask. I could see arguments … this is exploitative … but most people agree that it is reasonable as long as you provide an alternative."

APS Fellow **Sam Gosling**, University of Texas at Austin, on the fairness of asking Introduction to Psychology students to participate in research, as told to the *Daily Texan* student newspaper.

Congratulations APS Rising Stars

The APS Rising Star designation is presented to outstanding psychological scientists in the earliest stages of their post-PhD research careers.

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PCSAS Recognition Continues to Expand Support for Clinical Science Training Model

The Psychological Clinical Science Accreditation System (PCSAS) has achieved a new and important milestone in its work to strengthen science-centered clinical training. The Association of Psychology Postdoctoral and Internship Centers (APPIC) recently revised its policies to enable internship matches for trainees from PCSAS accredited programs.

APPIC is the organization that controls how and where clinical psychology students spend their internship year, which they are required to complete before earning a doctoral degree and any license to practice. Prior to this policy change, only students from programs accredited by the American Psychological Association (APA) or the Canadian Psychological Association (CPA) were eligible for APPIC matching. This poses no current impediment to individuals seeking internships, since all PCSAS accredited training programs also are accredited by APA or CPA. But PCSAS Executive Director and APS Executive Director Emeritus Alan G. Kraut explains why the new policy will be important for *future* trainees in PCSAS-accredited programs

"The APPIC action will increase interest in PCSAS programs, which is especially promising considering that now nearly 40% of our programs have announced they may move to carry the PCSAS accreditation *only*," Kraut says. Those include training programs at University of California-Berkeley, University of California, Los Angeles, University of Illinois, Stony Brook University, University of Delaware, Indiana University, University at Buffalo, University of Wisconsin, University of South Florida, Washington University in St. Louis, University of Arizona, University of Pennsylvania, Emory University, and, most recently, the University of Washington.

"We look forward to working collaboratively with APPIC in the coming years to pursue our shared commitment to supporting high quality internship training," says PCSAS President and APS Past President Robert W. Levenson.

PCSAS's role is to promote science-based training and, by extension, to introduce a new culture of scientific clinical psychology. It advocates for training programs to take more advantage of cutting-edge research in cognition, psychobiology, social psychology, and neuroscience among many other disciplines; focus more on dissemination of evidenced based treatments to a broad group of mental health practitioners; and, importantly, create new clinical science to serve the many people with mental disorders who are not being helped today even with the best current methods available.

"PCSAS arose in large part to foster the development and ensure the quality of those doctoral programs that are committed to training students who will be able to both: (a) deliver evidence-based clinical services, and (b) conduct basic and applied research that addresses the staggering mental health problems currently being faced in the US and abroad," Levenson explains.

"APS has been a major supporter of PCSAS as part of our long-term objective of bringing about changes in accreditation that benefit both science and practice," says APS Executive Director Sarah Brookhart, who also serves as a member of the PCSAS Board of Directors. A long list of psychological and mental health organizations have also endorsed PCSAS.

The APPIC recognition marks the second major opening to internships that PCSAS has secured for students in the programs it accredits. In July 2016, the US Department of Veterans Affairs, by far the largest trainer and employer of psychologists in the world, revised federal regulations to make the students and graduates of PCSAS programs eligible for VA internships and staff positions.

PCSAS also is working to garner support and recognition from other relevant entities, including the US Department of Defense and Public Health Service, with the goal of ensuring that they'll hire graduates of PCSAS accredited programs.

For years, the only accrediting body for clinical psychology training programs was the Committee (since renamed Commission) on Accreditation (CoA), which is governed by the American Psychological Association. But since its first program review of the University of Illinois in 2009, PCSAS has accredited 37 programs in the United States and Canada, with many others in various stages of the application process. Additionally, states including California, Delaware, Illinois, Missouri, New Mexico, and New York now have laws or regulations that permit graduates from PCSAS accredited training programs to qualify for professional licensure.

All 36 of the US-based PCSAS approved programs are listed among the top 50 clinical training programs in *U.S. News & World Report* (US News ranks only US programs), and McGill University in Canada is also PCSAS- accredited. Similarly, all PCSAS programs are ranked highly by the National Academies of Science.

For more information on the PCSAS mission, history, and accreditation procedures, visit www.pcsas.org.

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Newcombe Takes the Helm at *PSPI*

Nora S. Newcombe

APS William James Fellow Nora S. Newcombe has begun her 4-year term as Editor of *Psychological Science in the Public Interest*. Newcombe is the Laura H. Carnell Professor of Psychology at Temple University. She researches education and learning, specifically STEM learning and education, spatial learning, and cognitive maps. In addition to her James Fellow Award, which recognizes her lifetime of intellectual contributions to basic psychological science, she is a recipient of numerous other honors, including the Distinguished Scientific Contributions to Child Development Award from the Society for Research in Child Development and the G. Stanley Hall Award for Distinguished Contribution to Developmental Psychology. She has served as editor of the *Journal of Experimental Psychology: General, Cognitive Psychology,* and *Cognitive Research: Principles and Implications*, and as associate editor of *Psychological Bulletin*, along with her service on numerous editorial boards and grant-review panels. The *Observer* recently asked Newcombe about her goals for the journal during her term as Editor.

What goals do you have for the journal under your tenure? Do you plan any significant changes or additions to the journal itself or to the types of articles being published?

I have always admired *PSPI*, so I don't plan changes to the essential idea — bringing together a carefully selected small group to work on synthesizing what we know from psychological research to inform issues in which the public has an interest. The groups sometimes contain researchers with contrasting points of view, or perhaps from different research traditions or even disciplines. *PSPI* is always changing because each year, it tackles three different significant issues on which psychological science has something useful to say that can influence decisions in the public arena. That's intrinsically exciting and challenging.

What topics are you most interested in pursuing for *PSPI*?

I have a list of topics that interest me and that I think are ripe for *PSPI* treatment. There are so many possible issues to address—for example, *PSPI* has only done one report on aging, and it appeared a while ago. So I'd like to do reports in that area. Another example is the crisis around addiction. Valerie Reyna has one report on this topic in the works, and I am looking to commission others. My new Board has generated other great ideas. However, although *PSPI* traditionally uses the solicitation approach, if readers have themes for us, either that they would pursue or that they just think we should cover, please email me!

How might you try to bring authors together to write about topics that might be somewhat controversial or contentious?

Carefully. *PSPI* has an admirable history of adversarial collaboration that has ended up at least civil, and often much more. A recent example is the report on which John Wixted and Gary Wells collaborated, which shed a great deal of light on the complicated issue of eyewitness identification. Such groups can craft valuable syntheses that really move the ball forward. It takes flexible intellects and agile personalities to work together in this way, so selecting authors who have the right temperament as well as the relevant knowledge is crucial.

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FRED KAVLI KEYNOTE ADDRESS

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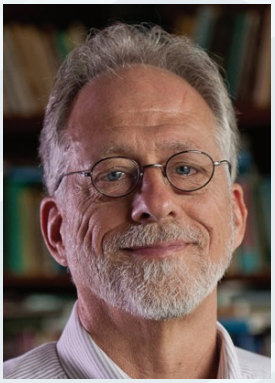

Michael Tomasello

Duke University and the Max Planck Institute for Evolutionary Anthropology, Germany

CLOSING KEYNOTE ADDRESS

How to Change Norms, and Why We Should

Betsy Levy Paluck

Princeton University

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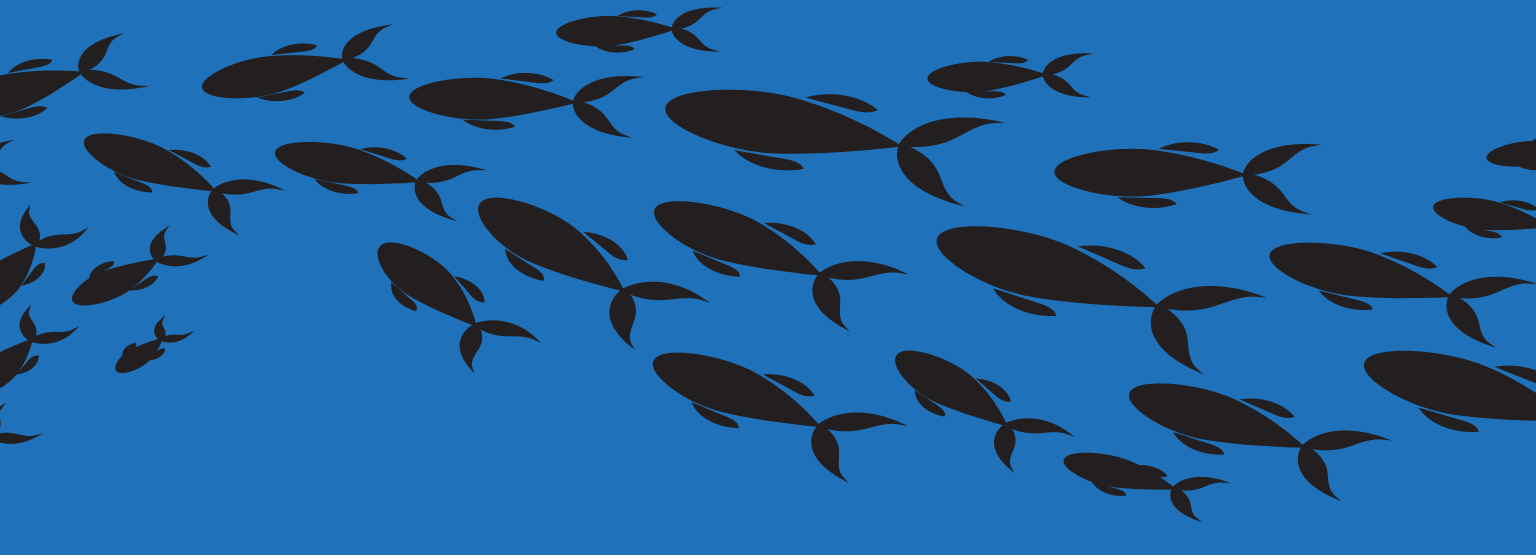
Keeping Up With the Crowd

The Science of Moving with the Masses



Flocks of starlings fill the skies above our heads and schools of fish paint the waters of our oceans and lakes with mesmerizing patterns. These collective motions make for some of the most iconic moments of animation in cinematic history – the wildebeest stampede in *The Lion King* and the bat swarms in *Batman*.

In the physical world, crowds are a fundamental part of everyday life: We pass through them, and become part of them, on our way to work, at school, and running errands.

Whether they are made up of pixels or pedestrians, however, the complex behaviors exhibited by crowds depend on a fairly simple set of psychological processes that make coordinated movement possible, APS Fellow William Warren of Brown University writes in *Current Directions in Psychological Science*.

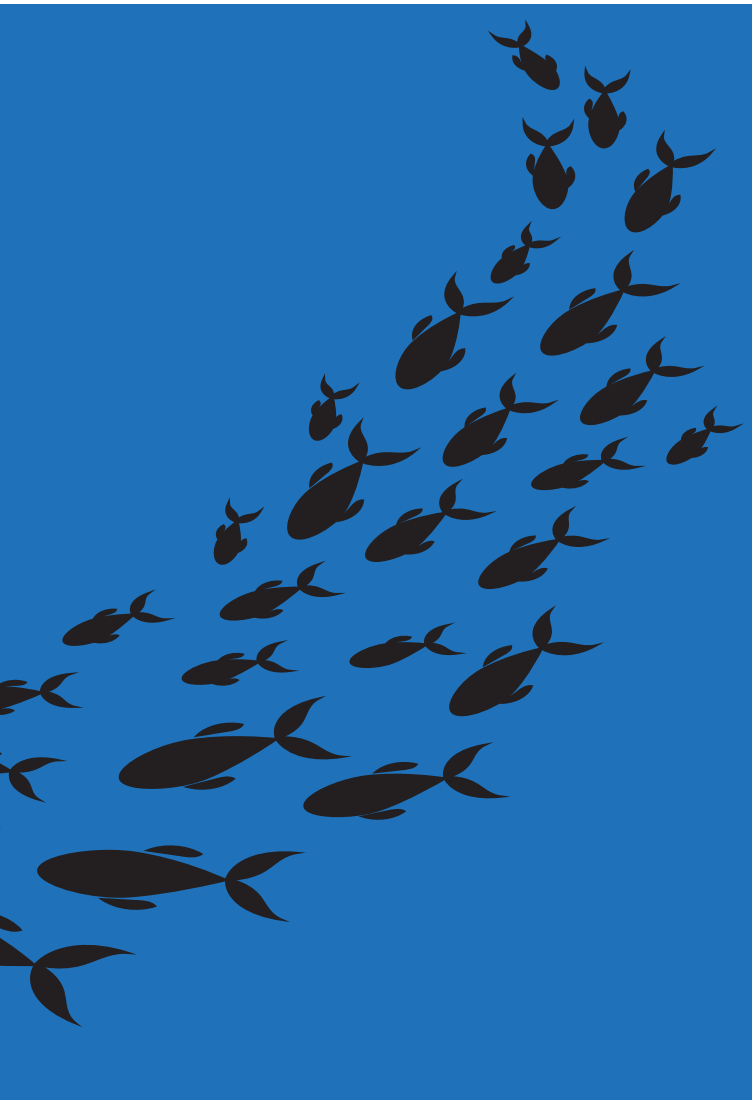
Similar to how physicists have yet to discover a "unified theory of everything" that might bridge the gap between their understanding of "very large" and "very small" elements of the universe, psychological scientists have yet to establish a model of collective behavior that successfully bridges the gap between the local behavior of individuals and the global behavior of the groups that contain them, Warren said.

"The problem is that people and animals are more complicated than particles," he explained. "We have energy supplies on board, can make decisions, there are multiple principles on which we operate."

On the microlevel, the attraction-repulsion framework holds that individuals move toward neighbors who are far away, away from neighbors who are nearby, and match the speed and direction of those in between.

Other computational models look at groups on the macrolevel, treating crowds as a fluid, Warren explained. Approximating a crowd's viscosity, density, and speed of movement based on a few parameters can work when you have a vast number of individuals, such as the more than 2 million Muslims who make the 5-day Hajj pilgrimage to Mecca each year, he continued. But the model begins to break down when it comes to predicting individual behavior.

By Kim Armstrong, *APS staff writer*



In the end, it may not be possible to create a single integrated model of collective motion that functions on both levels, Warren said. In the meantime, psychological scientists, mathematicians, physicists, and computer scientists, among many others, are collaborating to make crowds safer everywhere from concert halls to disaster zones.

Cauldrons, Clutters, Colonies, and Caravans

Prickles of porcupines, scurries of squirrels, and coalitions of cheetahs may be little more than a vestige of England's aristocratic hunting culture, but the fact remains that different kinds of animals move differently.

"There are some very general principles that govern behavior at all levels and across all species, from bacteria to humans," Warren said. "They aggregate, they swarm, they form flocks and schools, so there must be some general principles that these systems operate by, but the local rules might be slightly different from species to species."

Humans, for example, only tend to coordinate movement with "metric neighbors" who are within a few meters of us. Some species of birds such as starlings, on the other hand, don't seem to care about distance, focusing instead on their seven closest "topological neighbors," no matter how far away they are, Warren explained.

Crowds consisting of humans and other animals demonstrate many of the same basic physical phenomena (such as clogging up bottlenecks) and stimulus-response behaviors (such as steering and flocking), said Anna Sieben, a social psychology researcher at Ruhr University Bochum in Germany. But goal- and norm-oriented "collective actions" that build on these foundations such as intention-building and ethical decision making are, in many ways, uniquely human. Although physics-based models of collective phenomena predict lane creation even among plasmas and other particles, for example, no other species of animal would consciously self-organize into a queue or take a group vote on where they want to go next.

Even in less clear cut situations, humans tend to fall back on a dynamic set of generally accepted norms and behaviors, Sieben said. As part of a 2013 federal study of crowd safety at large-scale events such as concerts, a research team led by Armin Seyfried, a professor of computer science studying pedestrian behavior at the University of Wuppertal in Germany, studied more than 2,000 people as they participated in a 4-day series of scenarios involving crowds of up to 1,000 individuals per experiment. Their personal goal, participants were told, was to be one of the first people through a pair of turnstiles that would allow them to exit the experiment.

When participants were assembled around the entrance to the imaginary concert hall in a loose semi-circle with no guiding barriers, the crowd became denser, resulting in a constriction effect that limited entry and slowed the crowd's movement to a crawl – just 2 centimeters per second.

When barriers were used to create a corridor, however, participants created a queue, an unprompted collective action that reduced crowd density and allowed the throng of participants to move at a rate of 8.3 centimeters per second, four times faster than they could in the previous free-for-all.

In a follow-up analysis of these studies, Sieben and colleagues had a group of 60 participants evaluate overhead images and videos of the semi-circle and barrier conditions from the point of view of someone in the crowd trying to get one of just 100 tickets to see their favorite band.

After viewing the videos, participants reported perceiving two distinct sets of social norms, one for each of the conditions. In the semicircle set up, there were "no rules," resulting in a "first come, first served" and "right of the strongest" mentality. In the corridor, meanwhile, people were expected to queue and behave in an orderly fashion, as pushing and shoving were "forbidden." In line with these norms, 40.6% of participants reported that many or all people in the semicircle condition exhibited inappropriate behavior, such as pushing, shoving, and jostling, compared with just 5.1% in the corridor condition.

Not all of participants' perceptions held up to objective mea-

surement, however. While the majority of participants correctly reported that the crowd in the corridor condition moved more quickly than in the semi-circle condition , and found lining up to be more comfortable, it may not have been as equitable a situation as many believed. The tendency toward queueing in corridors creates the perception of fairness, the authors explained, but it also provides ample space for opportunistic individuals to violate the assumed norm and cut the line. Despite the more aggressive behavior observed in the semicircle set up, people were so tightly packed together that they could little more than wait for their turn to pass through the turnstile.

"In the semicircle setup, people's options to act are strongly limited after the constriction has taken place because it is too dense," the authors wrote. "Thus, natural and social psychology truly complement each other in their perspective on crowd dynamics."

Computing Complex Crowds

Physicists and psychological scientists aren't alone in their curiosity about the complexities of crowd movement, however — computer scientists have also been getting in on the action. Mehdi Moussaïd, a researcher studying adaptive rationality at the Max Planck Institute of Human Development in Berlin, is using his background in the computational and cognitive sciences to create simulations and virtual reality programs that account for the parallels between animal swarms, fluid dynamics, and human crowds.

"Crowd research is a bit of everything," Moussaïd said. "It's interdisciplinary in essence."

While complementary, the relevance of cognitive science-based and physics-based models of crowd behavior can vary based on the density of a system, he added. Moussaïd's cognitive science approach suggests that pedestrians in relatively open areas navigate their visual environment based on two behavioral heuristics:

1. They choose the direction that allows the most direct path to their destination, taking into account the presence of obstacles, including other people; and

2. They determine their walking speed based on the amount of time it would take to avoid those obstacles.

One of the primary differences between this and physical models of crowd movement is that rather than being repelled by their neighbors, individuals are characterized as actively seeking a free path through the crowd, Moussaïd and colleagues wrote in *Proceedings of the National Academy of Sciences*. In one of several tests of the heuristic pedestrian model, which accounts for speed, pressure, and body compression, computer simulations found the mathematical model closely matched recordings of participants passing each other in a hallway over the course of 200 trials.

Crowd movement isn't always so predictable, though. When an area becomes overcrowded — typically at a density above four to five people per square meter — it becomes important to distinguish between intentional movements resulting from the above heuristics and unintentional movements resulting from body collisions, which are better described by a physics-based model, Moussaïd said.

Crowds are often modeled as a collection of isolated individuals, he continued, but that is rarely the case – in a 2010 study of more than 4,500 pedestrians, Moussaïd and colleagues found that over half of people observed walking in two areas of Toulouse, France were with at least one other person. Analyzing the speed and spatial organization of these 1,353 groups of pedestrians also allowed the researchers to account for the role of crowd density in group behavior.

In a low-density public space, groups of four or fewer individuals tended to walk side-by-side. On a higher density commercial street, though, group behavior wasn't what you might expect – rather than bending backward into a more "aerodynamic" shape to cut through the crowd, pedestrian groups tended to bend forward into a 'V' or 'U'-shaped formation.

"There are some very general principles that govern behavior at all levels and across all species … They aggregate, they swarm, they form flocks and schools, so there must be some general principles that these systems operate by, but the local rules might be slightly different from species to species."
- APS Fellow William Warren

Using data gleaned from recordings of these pedestrians, Moussaïd was then able to create a series of computer simulations using the social force model, a mathematical model that describes pedestrian motion as a combination of an individual's motivations and their interactions with other pedestrians and the environment. In addition to simulating the same collective walking patterns observed on the streets of France, the mathematical model also allowed the researchers to identify a particular variable that may be responsible for pedestrians' tendency to bend forward in densely populated areas: the strength of a groups' desire for social interaction.

When the variable was set to 0, simulated groups were found to form the more practical 'V'-shape, whereas setting the variable higher caused groups to reverse that formation, slowing themselves down to support better communication, the authors wrote.

"Crowd dynamics is not only determined by physical constraints induced by other pedestrians and the environment, but also significantly by communicative, social interactions among individuals," Moussaïd said.

In cases of severe overcrowding, however, these physical interactions begin to take over, Moussaïd continued.

When these denser crowds encounter a bottleneck, such as a limited number of exits from a building, this can cause the coordinated motion of pedestrians to break down, creating uncontrollable patterns of fluctuating movement known as crowd turbulence. This results in a buildup of pressure around the bottleneck, which is eventually released from the system through the "earthquake-like" displacement of pedestrians. This can result in people falling, trampling over others, and suffering injuries, as seen in crowd disasters like the 2010 Love Parade disaster in Germany and the 2015 Hajj stampede.

Situations like these are often said to result in "mass panic," a theory rooted in the idea that becoming part of a crowd strips people of their ability to respond reasonably to an emergency, wrote John Drury, a professor of social psychology at the University of Sussex in England, in *Resilience*. Although 19th century social psychologists such as Gustave Le Bon dismissed crowds as impulsive, "hypnotized" individuals incapable of reason, Drury's research suggests that, in many disaster situations, crowds may instead serve as a source of psychosocial resilience.

"There's a long history of saying that in crowds people become mad because look at the destructive things that they do, but, in reality, what that crowd gives you is power," Drury said. And the key to unlocking this power may lie in shared identity.

How Crowds Keep Calm and Carry On

More often than not, family, friends, or tightknit communities come together when faced with natural disasters and other calamities, Drury said. But most contemporary terrorist attacks take place in urban environments where victims have few existing relationships to rely on.

Take the perpetrators of the London bombings in 2005, which resulted in over 700 injuries and 56 deaths, the largest casualty count in the United Kingdom since World War II . The attack targeted morning commuters on the city's bus and subway systems. Many survivors of the attacks were left stranded underground in the dark with no way of knowing when they would be rescued, or even if there would be another explosion.

Despite the fact that most survivors were surrounded by strangers, Drury's analysis of publicly available personal accounts and researcher-led interviews with survivors suggest that the sense of shared fate created by danger and disaster may create a psychological crowd, pushing us to overcome our fears in favor of helping others. In fact, while Drury and colleagues identified three reports of selfish behavior in coverage of the attacks – for example, people elbowing each other to escape a bombed bus – they found 214 instances of survivors and witnesses reassuring each other, pulling people from wreckage, and supporting the wounded as they evacuated.

This "collective resilience," as Drury calls it, was present in first-hand accounts and interviews as well. Of the 90 survivors and 56 witnesses involved in the study, only a handful reported observing or experiencing any kind of selfish behavior or panic in the aftermath of the bombings. Far more often, crowds of survivors were described as outwardly calm, helpful, and united despite the majority of victims reporting they either anticipated their own death or that those around them seemed to do so.

"My initial feelings of anxiety did turn to being scared early on," said one interviewee, "but when it became obvious that I would have to ensure my colleague got home, the challenge of that overtook any feelings of worry or fear I had."

Survivors seem to have engaged in widespread helping behavior despite the unpredictably dangerous situation created by the unexpected explosions, Drury wrote. While not everyone has such prosocial aims in an emergency, this interview and observational data suggests that, instead of creating yet another hurdle for survivors, crowds have the potential to be a valuable psychosocial resource, he explained.

"Being part of a psychological crowd increases individuals' chances of physical survival and psychological recovery," Drury continued. "The crowd enables them practically to realize goals they cannot achieve alone, including organizing the world around them to minimize the risks of being exposed to further trauma."

While we often think about how to stand out from the crowd, Drury's research suggests that we may not want to be so quick to separate ourselves from the pack. When it comes to the psychological science of crowd movement and behavior, other people aren't just obstacles between us and where we want to be — they're what gets us there.

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APS Student Caucus: Advancing Our Community of Students

By Amy Rapp

Each fall, the APS Student Caucus (APSSC) Executive Board meets at APS headquarters in Washington, DC to discuss student engagement and convention programming. This annual meeting gives us a chance to reflect as a group on the progress we have made as an organization and the path forward during the upcoming year. In this article, I want to highlight some talking points from this meeting, particularly the existing opportunities and future directions for student members of APS.

The APSSC works to fund and recognize excellence in student research. Year after year, we are surprised at the number of students who do not know about these funding and award opportunities. We try to keep members up to date on deadlines and submission details through our Facebook page (https://www.facebook.com/apssc/) and Twitter (find us @APSStudent) but are always trying to find creative ways to bolster awareness — we are even venturing into Instagram (search aps.student to follow)! As the deadline for convention approaches, student members can consider applying for the:

- **Student Grant Competition** – This competition provides $500 to eight recipients to support costs associated with a research project. Many winners of this award use funds for participant compensation or acquisition of materials (https://www.psychologicalscience.org/members/grants-awards-and-symposia/student-grant-competition).
- **Student Research Award** – This award recognizes exceptional student research in all areas of psychological science. In addition to a generous monetary award, recipients present their research at the APS Annual Convention. (https://www.psychologicalscience.org/members/apssc/about/student-research-award).
- **RISE Research Award** – The goal of this award is to cultivate psychological science in fields related to underrepresented groups. The RISE Research Award was recently expanded to also acknowledge research from students who belong to underrepresented groups. (https://www.psychologicalscience.org/members/rise/research-award).

While these opportunities have allowed APSSC to promote and support the research of many exceptional student members, we are always looking for ways to further empower our members to make progress in their research careers. At our annual meeting, we discussed expanding existing grants and awards in a few ways. First, the APSSC is attempting to expand the scope of the RISE award to align with our commitment to the diverse range of researchers in our field. Second, we are actively discussing ways to engage later stage graduate students and support them in transitioning to life after graduation.

Next, the Executive Board members talked about what we are doing to build a connected and engaged student community. We have a few existing programs that are in line with this aim, including our:

- **Mentorship Program** – This program is designed to connect undergraduate students seeking peer mentorship with graduate students. Our Undergraduate Advocate matches pairs of students based on their shared goals and interests. I can personally vouch for this program: I was a graduate mentor and found it very rewarding to support my incredibly talented mentee through the graduate school application process. (https://www.psychologicalscience.org/members/apssc/mentorship_program).
- **Campus Representative Program** – This program is critical for fostering engagement at the local level. Campus Reps play an important role in connecting the APSSC Executive Board and our many student members. Our Membership and Volunteers Officer works tirelessly to ensure the success of this program. Interested parties can contact the MVO for more details about the position.
- **Peer review** – Student members can volunteer to review grant and award applications. This CV building experience provides an introduction to the ever-present peer- review process. As a former RISE Research Award coordinator, I can tell you that this service is hugely appreciated.

It is important to the Executive Board that there be a range of ways to feel connected to APSSC — whether through something as small as liking our Facebook page or as big as stepping into a Campus Representative role. But we want to make sure your involvement is worth the time you invest. At our annual meeting we talked about providing more structure and recognition for mentors/mentees, Campus Reps, and peer reviewers.

Finally, the big-ticket discussion point at our meeting was the APS Annual Convention. Our student member survey revealed what we already knew to be the case: travel to and registration for Convention are expensive and can feel burdensome for students. We want students to know that there are ways to reduce costs, such as volunteering at convention and applying for travel as-

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sistance. We also understand that even with financial support, it is not always possible to make the trip to Convention. That is why we are trying to expand our web-based resources and social media presence.

For those who are able to attend Convention, our programming is specifically geared to meet the needs of students at different career development stages. Our Naked Truth panel series promotes discussion of how to navigate graduate school from admission to the post-doc search, and provides information about venturing into the job market as well. Champions of Psychological Science is a roundtable event where students can meet in small groups with luminaries in the field. Where else can you have a casual conversation with your science heroes?

At the 2019 Annual Convention in Washington, DC, student attendees can expect some updates and tweaks to existing programming. Make sure to attend our student social to network and socialize with other members, meet the Executive Board, and learn in greater detail how students can maximize their time at Convention.

As I reviewed my notes from our fall meeting, a few messages became clear to me. First, we want to **empower students through recognizing excellence in research**. By being an active member of the APSSC, you are contributing to the future of psychological science, no small feat. This is why we want to provide opportunities for our members to have their research recognized and disseminated. Next, **connection is key**. We understand that with our diverse community of students, it is not always possible to connect in person. Online resources and forums, as well as local campus representatives, are critical to cohesion and communication among our members. Lastly, **we hear you**. Our student members have provided crucial insights into how we can expand and improve, and we are responsive to that. Please keep the lines of communication open and contact our Executive Board members with your concerns and ideas. Even better — apply to be an Executive Board member yourself.

Explore APSSC opportunities online at https://www.psychologicalscience.org/members/apssc.

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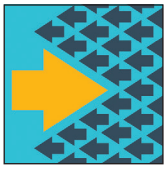


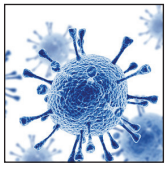
Changing Minds and Behaviours Throughout Society: The Greatest Challenge of Our Times

Tom Beckman, *Global Head of Creative, Prime Public Relations, Sweden*

Enny Das, *Centre for Language Studies Faculty of Arts, Radboud University Nijmegen, The Netherlands*

Stephen Fleming, *Wellcome Trust Centre for Neuroimaging, University College London, United Kingdom*

Susan Michie, *Centre for Behaviour Change, University College London, United Kingdom*



Our Minds Are Not Our Own: The Role of Guts and Germs

Alyssa N. Crittenden, *Department of Anthropology, University of Nevada, Las Vegas, USA*

Robert Dantzer, *Department of Symptom Research, Division of Internal Medicine, The University of Texas MD Anderson Cancer Center, USA*

Jane A. Foster, *Department of Psychiatry & Behavioural Neurosciences, McMaster University, Canada*

William P. Hanage, *Department of Epidemiology, Harvard University, USA*

Mats Lekander, *Department of Clinical Neuroscience, Karolinska Institutet, Sweden*

The Consequences of the Evolution of Language on the Mind

Lera Boroditsky, *Department of Cognitive Science, University of California, San Diego, USA*

José Morais, *Centre for Research in Cognition & Neurosciences, Université Libre de Bruxelles, Belgium*

Jennie E. Pyers, *Department of Psychology, Wellesley College, USA*

Alexandra Rosati, *Department of Psychology, University of Michigan, USA*

Collective Emotions in Cooperation and Conflict

Emma Cohen, *Institute of Cognitive and Evolutionary Anthropology, University of Oxford, United Kingdom*

Paolo Gerbaudo, *Department of Digital Humanities, King's College London, United Kingdom*

Eran Halperin, *School of Psychology, Interdisciplinary Center, Israel*

Bernard Rimé, *Faculté de psychologie et des sciences de l'éducation, Université catholique de Louvain, Belgium*

Christian von Scheve, *Institute of Sociology, Freie Universität Berlin, Germany*

Dan Zahavi, *Department of Media, Cognition and Communication, University of Copenhagen, Denmark*

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Human Culture: What Is It and How Does It Work?

Marcus Feldman, *Department of Biology, Stanford University, USA*

Miriam N. Haidle, *Heidelberg Academy of Sciences and Humanities, Germany*

Henrike Moll, *Department of Psychology, University of Southern California, USA*

Dan Sperber, *Institut Jean Nicod, France*

How Changing Our Bodies Changes Our Selves

Henrik Ehrsson, *Department of Neuroscience, Karolinska Institutet, Sweden*

Carolyn Mair, *Psychology for Fashion, United Kingdom*

Melvyn Slater, *Department of Clinical Psychology and Psychobiology, Universitat de Barcelona, Spain*

Integrative Science Symposia explore major scientific topics in a cross-cutting, interdisciplinary manner, with presentations from investigators in neuroscience, genetics, anthropology, linguistics, and many other fields.

From the Heart to the Eye: Interoception and Awareness

Lisa Feldman Barrett, *Department of Psychology, Northeastern University, USA*

Martin Paulus, *Laureate Institute for Brain Research, USA*

Catherine Tallon-Baudry, *Laboratoire de Neurosciences Cognitives, Ecole Normale Supérieure, France*

Manos Tsakiris, *Department of Psychology, Royal Holloway, and the Warburg Institute, School of Advanced Study, University of London, United Kingdom*

Studying Perception: Is It Worth It?

Ned Block, *Department of Philosophy,* New York University, USA

John McGann, *Department of Psychology, Rutgers, The State University of New Jersey, USA*

Yael Niv, *Princeton Neuroscience Institute and Department of Psychology, Princeton University, USA*

Aude Oliva, *Computer Science & Artificial Intelligence, Massachusetts Institute of Technology, USA*

Brian Scholl, *Department of Psychology, Yale University, USA*

Martin Antony, Ryerson University, Canada, *The Atlantic*, November 5, 2018: The Problem With Being Perfect.

Laura Carstensen, Stanford University, *The Wall Street Journal*, November 20, 2018: The Trick to Keeping Friends As We Get Older.

William J. Chopik, Michigan State University, *The Wall Street Journal*, November 20, 2018: The Trick to Keeping Friends As We Get Older.

Developing an Immunity to Misinformation

Vaccines work by exposing our bodies to weakened viruses so we can create the antibodies necessary to fight off infection. **Sander van der Linden's** research suggests that we may be able to defend against fake news in the same way. Informing media consumers that politically motivated groups may try to mislead them on topics like climate change can inoculate against misinformation, research shows.

BBC

November 14, 2018

Molly Crockett, Yale University, *Scientific American*, December 1, 2018: Bad First Impressions Are Not Set in Stone.

Ashley Ebbert, Arizona State University, *The Wall Street Journal*, November 23, 2018: The Right Way for Parents to Question Their Teenagers.

Barbara Fredrickson, The University of North Carolina at Chapel Hill, *Scientific American*, November 3, 2018: Happy, With a 20 Percent Chance of Sadness.

Elizabeth Gershoff, University of Texas at Austin, *The New York Times*, November 5, 2018: Spanking Is Ineffective and Harmful to Children, Pediatricians' Group Says.

Alison Gopnik, University of California, Berkeley, NPR, November 23, 2018: Radio Replay: Bringing Up Baby.

Greg Holden, Southern Methodist University, *The Atlantic*, November 6, 2018: Spanking Is Still Really Common and Still Really Bad for Kids.

Frank Infurna, Arizona State University, *The Wall Street Journal*, November 23, 2018: The Right Way for Parents to Question Their Teenagers.

Thomas Joiner, Florida State University, *USA Today*, December 2, 2018: Suicide Rate Up 33% in Less Than 20 Years, Yet Funding Lags Behind Other Top Killers.

Alan Kazdin, Yale University, *The Atlantic*, November 6, 2018: Spanking Is Still Really Common and Still Really Bad for Kids.

Evan Kleiman, Harvard University, *Scientific American*, November 3, 2018: Happy, With a 20 Percent Chance of Sadness.

Jonas Kunst, Yale University, *Pacific Standard*, November 5, 2018: Fear of Disloyalty Drives Anti-Immigrant Bias.

Kang Lee, University of Toronto, Canada, *The New York Times*, October 29, 2018: How Children Learn to Recognize Faces.

Suniya Luthar, Arizona State University, *The Wall Street Journal*, November 23, 2018: The Right Way for Parents to Question Their Teenagers.

Christina Maslach, University of California, Berkeley, *The New Yorker*, November 12, 2018: Why Doctors Hate Their Computers.

Peter Mende-Siedlecki, University of Delaware, *Scientific American*, December 1, 2018: Bad First Impressions Are Not Set in Stone.

Yuri Miyamoto, University of Wisconsin, Madison, *The Atlantic*, November 19, 2018: Psychology's Replication Crisis Is Running Out of Excuses.

Matthew Nock, Harvard University, *Scientific American*, November 3, 2018: Happy, With a 20 Percent Chance of Sadness.

Brian Nosek, University of Virginia, *The Atlantic*, November 19, 2018: Psychology's Replication Crisis Is Running Out of Excuses.

Stephanie Preston, University of Michigan, *Quartz*, November 14, 2018: In the Autumn, Squirrels Think About Nuts so Much That It May Make Their Brains Bigger.

Neal Roese, Northwestern University, *The Wall Street Journal*, November 20, 2018: The Trick to Keeping Friends As We Get Older.

Sarah A. Schnitker, Baylor University, *The New York Times*, November 5, 2018: How to Be a More Patient Person.

Rom Schrift, The Wharton School of the University of Pennsylvania, *Scientific American*, November 16, 2018: How to Trick Yourself Into Improving Your Performance.

Paul Slovic, Decision Research, NPR, November 9, 2018: Another Mass Shooting? 'Compassion Fatigue' Is a Natural Reaction.

Getting a Second Chance at a First Impression

People are often open to giving "nasty" individuals the benefit of the doubt when it comes to bad behavior, **Molly Crockett** and **Peter Mende-Siedlecki** have found. This may be good for conflict resolution, Crockett notes, but it can also trap us in bad relationships

SCIENTIFIC AMERICAN

December 1, 2018

Leah H. Somerville, Harvard University, *Science*, November 5, 2018: A Social Media Survival Guide for Scientists.

Jay Van Bavel, New York University, *Science*, November 5, 2018: A Social Media Survival Guide for Scientists.

Sander van der Linden, University of Cambridge, UK, BBC, November 14, 2018: Could This Be the Cure for Fake News?

Simine Vazire, University of California, Davis, *The Atlantic*, November 19, 2018: Psychology's Replication Crisis Is Running Out of Excuses.

Gal Zauberman, Yale University, *Scientific American*, November 16, 2018: How to Trick Yourself Into Improving Your Performance.

Navigating for Nuts

Squirrels may seem single-minded when it comes to collecting acorns, but APS Fellow **Stephanie Preston's** research suggests there's actually a lot going on in those fuzzy little heads. Not only do these animals keep a mental map of where each of their tiny treasures is buried, but doing so may actually cause their brains to grow seasonally.

Quartz

November 14, 2018

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Current Directions in Psychological SCIENCE

Teaching Current Directions in Psychological Science

Edited by C. Nathan DeWall and David G. Myers

Aimed at integrating cutting-edge psychological science into the classroom, Teaching Current Directions in Psychological Science offers advice and how-to guidance about teaching a particular area of research or topic in psychological science that has been the focus of an article in the APS journal Current Directions in Psychological Science. Current Directions *is a peer-reviewed bimonthly journal featuring reviews by leading experts covering all of scientific psychology and its applications and allowing readers to stay apprised of important developments across subfields beyond their areas of expertise. Its articles are written to be accessible to nonexperts, making them ideally suited for use in the classroom.*

Visit the column online for supplementary components, including classroom activities and demonstrations: www.psychologicalscience.org/teaching-current-directions.

Visit David G. Myers at his blog "Talk Psych" (www.talkpsych.com). Similar to the APS *Observer* column, the mission of his blog is to provide weekly updates on psychological science. Myers and DeWall also coauthor a suite of introductory psychology textbooks, including *Psychology* (*12th Ed.*), *Exploring Psychology* (*10th Ed.*), and *Psychology in Everyday Life* (*4th Ed.*).

The Psychological Asymmetry of Experiencing Loss Versus Gain

By David G. Myers

Sokol-Hessner, P., & Rutledge, R. B. (2018). The psychological and neural basis of loss aversion. *Current Directions in Psychological Science*, doi/10.1177/0963721418806510

Imagine — or invite your students to imagine — these well-researched everyday situations:

1. You're about to buy a $4,000 used car, which you can purchase by selling either of two stocks you own. Which would you sell?

   a. Your $4,000 in stock X, which you purchased for $2,000.

   b. Your $4,000 in stock Y, which you purchased for $8,000.

2. Your basketball team trails by two points with time for one last shot. As its coach, would you prefer:

   a. a two-point shot attempt, hoping to put the game in overtime?

   b. a three-point shot attempt, hoping to win now?

3. Your baseball or softball team is tied in the bottom of the last inning, with one out—meaning a single run will win. As you take your lead off first base, your teammate hits a fly ball, which an outfielder is sprinting to catch. What odds of its being caught would compel you to hesitate before running (in hopes of making it to third base)?

In these and other such situations, people routinely exhibit *loss aversion*. Psychologically, loss looms larger than gain. In experiments, people prefer taking a sure gain over flipping a coin for double-or-nothing — but will flip the coin on a double-or-nothing chance to avert a loss (Kahneman & Tversky, 1979). When stock trading, the current value of a stock represents the market's collective prediction about its future value. Yet most investors similarly prefer to lock in a profit rather than a loss (Odean, 1998).

APS Fellow **David G. Myers** *is a professor of psychology at Hope College. His scientific writing has appeared in three dozen academic periodicals, and he has authored or coauthored 17 books, including* Psychology *(11th ed.),* Exploring Psychology *(9th ed.), and* Social Psychology *(12th ed.). Myers can be contacted via his website at www.davidmyers.org.*

In sports, loss aversion can steal one's chances to win. Most basketball coaches, aware that an average three-point shot will produce a win only one-third of the time, prefer a two-point shot attempt to put the game into overtime (Thaler, 2000). But if the team averages 50% of its two-point attempts — a median team result in NCAA basketball — and has a 50% chance of winning in overtime, the loss-aversion strategy will yield only a 25% chance of victory. New studies of "myopic loss aversion" confirm this irrational preference at the end of National Basketball Association games (Walker et al., 2018). Caution impedes conquest.

In baseball, Peter MacDonald and colleagues (2016) assembled big data showing that if that fly ball has even a 38% chance of falling as a hit, the runner should abandon caution and streak for third base — where a subsequent fly ball, hit, or infield roller could produce a win. Yet first-base runners will rarely take off running on a fly ball that has any chance of being caught. The runners are loss averse — better not to look like a fool if the ball is caught. But as these sports examples illustrate, loss aversion can, ironically, increase the odds of losing.

In their essay, Peter Sokol-Hessner and Robb Rutledge (2018) explore loss aversion's biological roots and psychological fruits. For our ancestors, loss aversion helped avert starvation and death. "First, do no harm" has evolutionary as well as medical merit. For those on the margins, lost income can have more impact than equivalent gained income. Small wonder that loss-averse behaviors appear across species, note Sokol-Hessner and Rutledge, and that people who are most attuned to their own internal emotions are also most loss averse.

Moreover, they report, neuroimaging studies have identified two brain regions associated with loss aversion. The amygdala's noradrenergic pathways mediate "actions to avoid aversive stimuli." Thus, amygdala damage can eliminate loss aversion. Offsetting this is the reward-mediating striatum, with its dopamine circuits designed to reflect the subjective value of potential rewards.

It is possible that, when these mediators are unbalanced, extreme loss aversion may contribute to psychiatric disorders such as depression and hoarding. Hoarding is the "endowment effect" — our attachment to what we own and our aversion to losing it — taken to excess. In one oft-replicated experiment, people given a coffee mug demanded more money to sell it than those not given the mug were willing to pay for it (Kahneman et al. 1990). And so our homes become cluttered with things we wouldn't today buy, yet can't part with.

To help your students grasp the concept, invite them to imagine themselves as a big-city taxi driver. On a day when they're not getting a lot of fares, rather than swallow a loss on the day, would they keep working until they break even, and quit sooner on days when they're getting lots of fares and have met their goal? If so, they are like actual taxi drivers. Rationally, taxi drivers *should* drive more on days with lots of fares (they make more per hour) than days with few fares. But many do the opposite, because they are loss averse (Camerer et al., 1997).

Loss aversion exemplifies an even larger principle, observed by Roy Baumeister and others (2001): "Bad is stronger than good." Bad events trigger more misery than good events produce joy. Criticism hurts more than compliments please. Bad health decreases happiness more than good health increases it. "In everyday life," Baumeister et al. conclude, "bad events have stronger and more lasting consequences than comparable good events."

And so it is that, as Kahneman and Tversky (1979) memorably concluded, "losses loom larger than gains."

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QUOTE OF NOTE

"On average, a person with a larger brain will tend to perform better on tests of cognition than one with a smaller brain. But size is only a small part of the picture, explaining only about 2% of the variability in test performance. For educational attainment the effect was even smaller: an additional 100cm3 cup full of brain would increase an average person's years of schooling by less than 5 months."

Gideon Nave, University of Pennsylvania, on a study in *Psychological Science* showing a link between brain size and cognitive performance

Does Montessori Schooling Work?

By Beth Morling

Lillard, A. (2018). Rethinking education: Montessori's approach. *Current Directions in Psychological Science*, 27, 395-400. doi.org/10.1177/0963721418769878

When famous people talk about their career trajectories, how often do they attribute successes to their experiences in *preschool*? That's exactly what Julia Child, Sean "P Diddy" Combs, and Jeff Bezos say about their own Montessori backgrounds (Sims, 2011).

More than 100 years ago, Italian physician Maria Montessori used close observation and trial and error to develop a new approach to schooling and a theory of child development. Today, Montessori schools, including 500 public schools in the United States (public-montessori.org), thrive around the world. Lillard (2018) summarizes key elements of Montessori education and describes empirical studies of the method's effectiveness.

A visit to a Montessori school reveals children alone or in small groups, working on mats or child-sized tables. Children choose their own activities. Inviting, carefully designed toys lead children to practice cognitive and motor tasks for as long as they wish, sometimes repeating a task multiple times. For example, a toddler might choose a set of 10 cylinders that gradually increase in size, slotting them into their respective holes. A 4-year-old might select a toy that invites him to tie and untie four shoelaces. Pairs of older children might work with sets of "golden beads" to practice multiplying 4-digit numbers.

Montessori education provides an opportunity for psychology instructors to integrate several key lessons about psychology into a significant, real-world context, while reinforcing students' grasp of research methods.

Teaching Content in Context

Montessori education is based on core psychological principles (Lillard, 2017), several of which are typically introduced in General Psychology, Child Development, or Educational Psychology courses. They include:

- Children are not "empty vessels" ready to be filled; they engage actively in their own learning.
- Children learn by physically manipulating their environments.
- Children are intrinsically motivated to learn; outside rewards like gold stars can inhibit learning.
- Children learn best when they have choice over their learning.
- Adults can interact with children in ways that help them learn.
- Peer learning is effective.

To introduce Montessori in your own classroom, first ask students to reflect on what the goals have been of their schooling so far. Some may wryly comment that one salient goal was to pass standardized assessments. Now, shift the discussion: What *should* be the goal of schooling? Students might nominate goals such as being an independent learner, being kind, or solving problems. Many schools hope to achieve these goals; however, the Montessori curriculum holistically integrates motor skills, reading, mathematics, art, music, and social skills.

Video is an excellent way to introduce Montessori practices. A short overview like "My Day" (at www.montessoriguide.org/video-listing/) shows multiple children choosing tasks, engaging in work, and cleaning up. Students can identify examples of principles such as free choice, motor-mind integration, concentrated attention, and self-guided social interaction.

"Montessori education provides an opportunity for psychology instructors to integrate several key lessons about psychology into a significant, real-world context, while reinforcing students' grasp of research methods."

For a more focused discussion, find a clip of a toddler engaging with a Montessori cylinder set (such as www.bit.ly/2QtdNSb). Ask, "What does this toy help develop in the child who plays with it?" Students might mention that:

- he must notice how width, height, or volume changes from cylinder to cylinder;
- he needs to observe, compare, and decide;
- small knobs at the top strengthen pincer grip, building strength for writing;

APS Fellow **Beth Morling** *is professor of psychological and brain sciences at the University of Delaware. She attended Carleton College and received her PhD from the University of Massachusetts at Amherst. She regularly teaches methods, cultural psychology, a seminar on the self-concept, and a graduate course in the teaching of psychology.*

- as sets of 10, cylinders develop the foundation of the base-10 system in mathematics; and
- materials are self-correcting, so the child receives immediate feedback on whether his choices are correct;

Teaching Research Methods

Do Montessori schools work better than other types of schools? Montessori makes an engaging case study for teaching research methods.

One study tracked families who had applied for a public Montessori school — only about half of whom were randomly selected for the Montessori program (Lillard & Else-Quest, 2006). Because the lottery process worked like random assignment, we can be reasonably sure that students in the Montessori and control schools were similar. The results showed that on a number of measures (e.g., achievement tests, executive function, and prosocial play), kids in the Montessori school did better.

“During discussion, students can propose characteristics of an ideal study of Montessori education. According to Lillard (2018), it would involve random assignment to schools, Montessori schools that use true Montessori materials and have well-trained teachers, a variety of teachers and classrooms, a large sample, and long-term follow up on multiple measures.”

Present the results of the study and ask students:

- What is the independent variable in this study? What are its levels?
- What are the dependent variables?
- Is this an experiment or a correlational study?
- Does this study allow us to say that Montessori schools *cause* kids to learn more? What are some alternative explanations for the results?

During discussion, students can propose characteristics of an ideal study of Montessori education. According to Lillard (2018), it would involve random assignment to schools, Montessori schools that use true Montessori materials and have well-trained teachers, a variety of teachers and classrooms, a large sample, and long-term follow up on multiple measures.

Teachers can anticipate a few student concerns. Students might assume that Montessori is an elite child's education. Most Montessori schools are private, but hundreds of public Montessori schools reach mostly low-income and non-White children. Students might wonder how children move from the choice-filled Montessori curriculum to traditional schools where autonomy is reduced. Research suggests that Montessori-educated students do very well in high school and college (Dohrmann et al., 2007; Shankland et al., 2010). Finally, some students are surprised that children actually choose to work at challenging — rather than fun — tasks. Our undergraduates might benefit from discussing autonomy and mastery in the Zone of Proximal Development (Vygotsky, 1978), ideas they can apply to their own education.

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QUOTE OF NOTE

“Our research sheds light on the pernicious gender bias in how we perceive others — we judge masculine looking people as competent, a judgment that can affect our leadership choices.”

DongWon Oh, Princeton University, on a study published in *Psychological Science* on how we perceive competence from an individual’s appearance.

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ALABAMA

University of Alabama — **Assistant/Associate Professor in Quantitative Psychology**

The Psychology Department at the University of Alabama announces an opening for a tenure track Assistant or Associate Professor with expertise in quantitative methods to begin August 2019. Qualifications include a Ph.D. in psychology or a related field and a strong record of achievement in research and teaching. We particularly welcome applicants with expertise and a successful publication record in advanced quantitative and statistical methods such as structural equation modeling, intensive longitudinal data analysis, hierarchical data analysis, multivariate data analysis, Bayesian analysis, or machine learning methods. Preference is for applicants whose substantive research is in social psychology or cognitive psychology, and who can contribute to one of these concentrations. Responsibilities include maintaining an active program of research, pursuing external funding, teaching undergraduate and advanced graduate quantitative courses, and a willingness to serve as a quantitative consultant to faculty and graduate students. Candidates should be interested in both undergraduate and graduate teaching and invested in the mentorship model of research. The University of Alabama, founded in 1831, is the flagship campus of a three-campus system. The University is located in Tuscaloosa, a city of approximately 100,000 that was named an All-America City by the National Civic League. Tuscaloosa is home of the Crimson Tide football team, as well as the historic Bama Theatre, the Paul R. Jones Art Gallery, the Tuscaloosa Amphitheater, the Tuscaloosa Farmer's Market, and nearby Kentuck Festival of the Arts and Moundville Archeological Park. The Psychology Department has 31 faculty and 100 graduate students distributed in four clinical (Law, Health, Gerontology, and Child) and three experimental (Cognitive, Developmental, and Social) concentrations. The Department offers a bachelor's degree in psychology, doctoral degrees in both clinical and experimental psychology, and a graduate minor in statistics. The University of Alabama values diversity, and we actively seek members of diverse backgrounds to apply for this position. Applicants should submit a cover letter outlining their qualifications and interest, a current CV, three letters of recommendation, a research statement, and a teaching statement that includes courses taught, teaching philosophy, and indicators of teaching effectiveness. Application review will begin immediately and continue until the position is filled. With the exception of letters of recommendation, materials should be submitted online at https://facultyjobs.ua.edu/postings/44141. Letters of recommendation should be emailed to the Search Chair, Dr. Beverly Roskos, broskos@ua.edu. For more information on our department, visit https://psychology.ua.edu.

GEORGIA

Georgia State University **Language and Literacy Faculty Position**

Georgia State University (www.gsu.edu) invites applications for one anticipated tenure-track (rank of Assistant) faculty position to contribute to its funded initiative: Research on the Challenges of Acquiring Language and Literacy. This anticipated position is part of a major initiative to enhance existing strengths in language and literacy at Georgia State and continues our successful hiring in this area. The focus of this initiative is research with children and adults, with or without disabilities, who face challenges in acquiring language and literacy. In this university-funded initiative, more than 40 faculty members from 10 departments in the Colleges of Arts & Sciences and Education & Human Development come together to engage in interdisciplinary research. The initiative's faculty has a broad range of external support including two national research and development centers from the Institute of Education Sciences in the areas of deafness and adult literacy and grants from the National Institutes of Health including a learning disabilities research innovation hub on reading and reading disabilities of African American children and a program project on neurocognitive factors for children with developmental dyslexia.We encourage applicants whose program of research addresses basic or applied, conceptual or methodological issues concerning challenges in the acquisition of language and literacy with a particular interest in intervention research. Applicants must have a Ph.D. degree in special education, psychology, educational psychology, communication sciences and disorders or related areas. The appointment is open to all programs within the initiative. The successful applicant will be the individual who is prepared to take advantage of the interdisciplinary collaborative research opportunities available within the Language & Literacy Initiative, have a strong record of programmatic research, obtain external grant support, and have a commitment to and experience in the instruction of undergraduate and graduate students. We are particularly interested in applicants whose research programs complement other faculty within this initiative (www.researchlanglit.gsu.edu). Inquiries may be made to Dr. Rose A. Sevcik (rsevcik@gsu.edu) or Dr. Amy Lederberg (alederberg@gsu.edu). Submit curriculum vitae, a brief statement of professional goals and research interests, evidence related to teaching interests and effectiveness, and the names and three letters of reference either electronically to Keneé Stephens at kstephens@gsu.edu, with the subject line "Language & Literacy Faculty Search", or by mail to Attn. Ms. Keneé Stephens, Georgia State University, Language & Literacy Initiative, P.O. Box 5010, Atlanta, GA 30302-5010, USA. The review of applications will begin October 13, 2017 and will continue until the position is filled contingent on available funding. An offer of employment will be conditional on background verification. Georgia State University is an Equal Opportunity Employer and does not discriminate against applicants due to race, ethnicity, gender, veteran status, or on the basis of disability or any other federal, state or local protected class.

NEW YORK

Utica College **Assistant Professor of Psychology**

The Department of Psychology at Utica College invites applications for two tenure- track positions in Psychology beginning August, 1 2019. One position is in Clinical/Counseling Psychology and one position is in Developmental Psychology. A Ph.D. or Psy.D. in Clinical/Counseling Psychology is preferred to teach clinical courses. A Ph.D. in Developmental Psychology is preferred to teach developmental courses. The ideal candidates would be able to teach psychological assessment and testing and clinical practicum in psychology courses as well as introductory, developmental, and abnormal psychology courses.Founded in 1946, Utica College is a private comprehensive institution distinguished for its integration of liberal and professional study. Our dedicated faculty and staff have built a tradition of excellence in teaching and learning with particular emphasis on providing individual attention to students. The College enrolls approximately 3,700 students - approximately 2,700 undergraduates and 1,000 graduate students. Utica College is located in upstate New York near the foothills of the Adirondacks offering easy access to a broad variety of recreational and cultural attractions. A city of approximately 60,000, Utica is located at the foothills of the Adirondack Mountains in the Mohawk Valley region of upstate New York. The area offers easy access to a broad variety of cultural attractions, including the historic Stanley Performing Arts Center and renowned Munson Williams Proctor Arts Institute, as well as four-season recreation. In deciding whether to apply for a position at Utica College, candidates are strongly encouraged to consider the UC mission and culture to help determine their potential success at http://www.utica.edu/instadvance/marketingcomm/about/. Our Mission and Values Statement includes a commitment to fostering diversity in background, perspective, and experience within an environment that is dedicated to the freedom of expression and the open sharing of ideas. At UC, diversity means that we are a community that represents a range of human experience and makes conscious choices to appreciate, respect, and learn from each other. Utica College actively seeks and welcomes applications from candidates with exceptional qualifications, particularly those with demonstrable commitments to a more inclusive society. To apply, submit a letter of application, CV, research statement, statement of teaching philosophy, and three references. Candidates are asked to submit an additional reflective statement about teaching in the required applicant document titled "diversity statement". Since Utica College strives to be a diverse and inclusive community, it is essential that you include in this statement a reflection on the kinds of experiences you have had, and the kinds of approaches you would take, teaching and working with a diverse student body. (For the definition of diversity that we use at Utica College, please see the following web page: http://www.utica.edu/instadvance/marketingcomm/about/diversity/aboutus.cfm.) In line with the College's Affirmative Action Policy, there is no requirement or expectation that a candidate disclose their identity or membership in any protected class or group, either in the diversity statement or in other application documents submitted to the search committee. For additional information on what to provide in your diversity statement please reference the diversity statement guide at the following link: https://www.utica.edu/hr/media/Diversity_Statement_Guide.pdf.Applications that do not address diversity will be considered incomplete.**All application materials must be submitted online at the following link**: http://uc.peopleadmin.com/postings/2231 Active consideration of candidates will begin on January 15, 2018. References will be solicited to submit letters for candidates upon application. Utica College is an affirmative action/equal opportunity employer. We encourage applications from under-represented groups, including disabled and veterans as well as individuals who have experience with diverse populations.

ANNOUNCEMENTS

Send items to apsobserver@psychologicalscience.org

GRANTS

Russell Sage Foundation 2019 Summer Institutes

The Russell Sage Foundation is sponsoring summer institutes in biological approaches to social sciences, social-science genomics, and computational social science. The institutes are targeted at advanced PhD students and early career faculty/ researchers. Most participant costs, including housing, meals, and travel will be covered. The three institutes include the Summer Institute in Biological Approaches to the Social Sciences (Application Deadline: January 15, 2019), the Summer Institute in Social Science Genomics (Application Deadline: February 11, 2019), and the Summer Institute in Computational Social Science (Application Deadline: February 20, 2019). For more information, visit www.russellsage.org/summer-institutes. For questions, contact Chris Bail at rsfcompsocsci@gmail.com.

NSF Invites Grant Proposals for Studying Personalized Learning in the STEM Workforce

In a new Dear Colleague Letter, the National Science Foundation expresses interest in receiving new proposals and supplemental funding requests to support flexible personalized learning to prepare the science, technology, engineering, and mathematics (STEM) workforce.

"NSF seeks proposals that will broadly inform development of personalized learning systems or generalize the research results generated during the deployment of online courses. This could be accomplished either by using the data generated by those systems or by studying the systems themselves. NSF encourages innovative educational research and development proposals that will help the nation educate the STEM workforce of the future," says NSF in the DCL (NSF 19-025).

According to NSF, proposals might address topics in psychological science which include (but are not limited to):
effective design of personalized learning systems for STEM education at any level

- effective design of personalized learning systems for STEM education at any levelfactors that increase persistence, motivation, self-efficacy, and retention of learners
- the design of educational interventions that meet workplace expectations for knowledge and competencies
- measuring the effectiveness of these interventions for different audiences

Psychological scientists wishing to respond to NSF's letter should do so by engaging one of the many NSF programs mentioned in the letter. These programs include the Education and Human Resources Core Research, Cyberlearning for Work at the Human-Technology Frontier, and the Secure and Trustworthy Cyberspace program, to name several.

To learn more about NSF's request for new proposals, visit https://bit.ly/2G8Ed7v.

NIH Funding for "Short Courses" in Behavioral Science Methods

The National Institutes of Health (NIH) Office of Behavioral and Social Sciences Research (OBSSR) has announced funding for educational activities called "short courses" that enhance the development of skills in the behavioral and social sciences. According to OBSSR, this funding opportunity is available to educate scientists in cross-cutting methods that they might not have been exposed to in educational programs that are widely available.

According to OBSSR, the larger goal of the to-be-funded short courses is enhancing the capacity of the field across career stages and teaching integrative research methodologies and approaches that are widely applicable to behavioral science. Applicants should consider how to increase the reach and sustainability of their course, for instance, by teaching methods and models that apply to an audience that is broader than potential participants. OBSSR recommends developing courses that include ways for attendees to continue learning beyond the course, and expects applicants to assess and refine the training program throughout the grant period.

OBSSR and participating NIH institutes have set aside $1,000,000 annually for this opportunity, and will allow budgets of up to $200,000 per year per project funded.

Applications must include a description of course learning objectives, how the course will enhance the skills and abilities of attendees, and how the impact of learning will be measured. Applications are due on January 24, 2019.

Visit **https://bit.ly/2ruXw0H** *to see the full grant details and learn more.*

MEETINGS

3rd International Convention of Psychological Science
7–9 March 2019
Paris, France
icps2019.org

31st APS Annual Convention
May 23–26, 2019
Washington, DC
psychologicalscience.org/convention

13th Biennial SARMAC Meeting
June 6–9, 2019
Brewster, Cape Cod, Massachusetts, USA
www.sarmac.org

Conference on Children and Youth 2019
July 4–5, 2019
Columbo, Sri Lanka
youthstudies.co

Asifa Majid

SMELL TALK

APS Fellow **Asifa Majid,** *a psycholinguistics researcher, at the University of York in the United Kingdom, is uncovering cultural differences in the way people talk about odors, aromas, and scents.*

How did you become interested in the way we identify and talk about smells?

Smell was interesting to me because there is a long-standing assumption that it is impossible to talk about odors — that there is no vocabulary for smells. In addition, psychological scientists had found that, under experimental conditions, people struggled to name even familiar odors. These observations seemed at odds with the anthropological literature, where ethnographers had noted the existence of "smell cultures"— communities in which people were particularly oriented to odors in their daily lives.

You recently studied hunter-gatherer societies in the Malay Peninsula to examine people's ability to identify and name odors. Why did you select those particular groups?

The work sprang from a larger investigation into the language of perception across cultures. In early work, we realized that there was something unusual in the Jahai language spoken in the Malay Peninsula. It seemed as if there may indeed exist a smell vocabulary in this language. For example, *ltipt* is used to describe the smell of various flowers and ripe fruit, perfume, soap, Aquillaria wood, bearcat, etc; while *cŋɛs* is used for the smell of petrol, smoke, bat droppings and bat caves, some species of millipede, root of wild ginger, etc. There are around a dozen distinct smell words in Jahai.

My colleague Niclas Burenhult — the world-leading expert in the Jahai language — and I set out to test the hunter-gatherer Jahai for their ability to name odors. We compared them with age- and gender-matched English speakers, asking speakers from both groups to describe standardized color and odor stimuli. English speakers showed the typical asymmetry, with much higher agreement in how they talked about colors than odors. Jahai speakers, on the other hand, were just as eloquent in how they talked about odors and colors, and were much better in odor naming than English speakers were.

What might account for these cultural differences in olfactory language?

The Jahai and the US English speakers we tested differ in all sorts of ways — their languages are unrelated, they live in different environments, and their subsistence is poles apart. With data from only these two communities, we cannot tell which of these factors are crucial. To address this, my colleague Nicole Kruspe and I tested two communities related to the Jahai: the Semaq Beri— also hunter-gatherers — and the Semelai, who are swidden horticulturalists. Both groups are from the same language family as the Jahai, and both live in tropical rainforest. Once again, we compared odor and color naming in the two communities, and found that while the non-hunter-gatherer Semelai behaved just like English speakers, the hunter-gatherer Semaq Beri showed superior odor naming, just like the Jahai. It seems that there is something about the hunting-gathering lifestyle that is particularly conducive to olfactory communication.

Do you have a favorite aroma or fragrance?

There is nothing as comforting as the smell of my mum. But my favorite fragrance at the moment is *Hermes, Un Jardin Sur le Nil*. ●

See the full text of this interview online at www psychologicalscience.org/observer/smell-talk.

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Majid is Co-Chair of the Program Committee for the International Convention of Psychological Science 2019.

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