Observer

LOVE

STORIES

ADVENTURES IN THE
STUDY OF ATTRACTION

INSIDE

Barbara Tversky on Imagining Other Perspectives
How Psychological Science is Benefiting the World
A Rural Reach for STEM Education

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ASSOCIATION FOR
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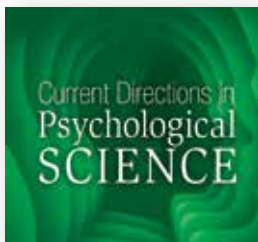LOVE STORIES

ADVENTURES IN THE STUDY OF ATTRACTION

In a nod to Valentine's Day, researchers including APS Fellows **Lisa Diamond**, **Eli Finkel**, **Nickola Overall**, and **Harry Reis** share discoveries, challenges, and new directions in the study of love, desire, dating, and commitment.

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OBSERV**ATIONS**

Published 10 times per year by the Association for Psychological Science, the *Observer* educates and informs the Association on matters affecting the research, academic, and applied disciplines of psychology; promotes the scientific values of APS Members; reports and comments on issues of national interest to the psychological scientist community; and provides a vehicle for the dissemination of information on APS.

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FRED KAVLI KEYNOTE ADDRESSES

Arrested Development or Adaptive? The Adolescent and Self Control

BJ Casey
Department of Psychology, Yale University, USA

Evolution of Emotions and Empathy in Primates

Frans B.M. de Waal
Department of Psychology, Emory University, USA, and Utrecht University, The Netherlands

The Brain in the Ecosystem: Cognition, Culture, and the Environment

Atsushi Iriki
Laboratory for Symbolic Cognitive Development RIKEN Brain Science Institute, Japan

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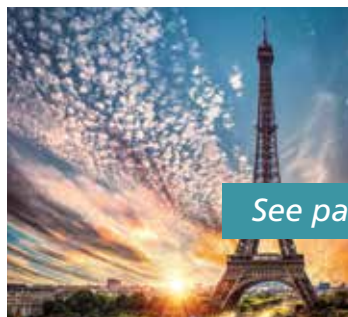
See page 28 for more program information

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Questions? Contact **Neil S. Lutsky, Committee Chair**
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Imagining Other Perspectives

In January, I began with an obsession that I come by naturally, spatial thinking, and observed, perhaps self-referringly, that it is ubiquitous. Paths take us from place to place in the world, and from thought to thought in the mind, along lines that can go in many directions. I ended with perspective, contrasting a perspective from inside the paths, the route that takes you from place to place or idea to idea, and a perspective from above, a map-like view that allows you to see many possible routes. With a caveat: In order to see many possible routes, you need to know the landscape, and that that can be a challenge. This month, more musings about perspective-taking, in particular, perspective-switching. But first a detour, not to worry, we'll get back on track.

As you know, anything with "mind" catches the attention of the public. It doesn't seem to matter if it's *mind-wandering* or *mindfulness*, and few see the contradiction. Hence excitement about research showing that mind-wandering increases creativity (e. g., Baird, Smallwood, Mrazek, Kam, Franklin, & Schooler, 2012). What a boon to day-dreamers! Taking a break, letting your mind wander, going for a walk all seemed to lead people to find more unusual uses for a common object. In tasks like these, people often get stuck in a rut and go around and around the same ideas. Brick-doorstop; brick bookend; brick-doorstop, brick, brick…. Mind-wandering seems to disrupt that unproductive cycle, perhaps by bringing in new associations, new starting points. Ah, yes, brick-hammer. Mind-wandering might break set, unlock fixation, but it doesn't provide good ways to search for new ideas. We thought an empathetic or human-centric approach could provide an effective search strategy (Chou, 2016). People have a large store of information about professions. From an early age, we have to figure how to answer, "What do you want to be when you grow up?" We gave one group the mind-wandering instructions as a strategy for finding novel uses for familiar objects and we gave another group empathetic instructions. The empathetic group was asked to take the role of an artist or a gardener or an electrician and think about how each might use the object differently. In essence, the empathetic group was asked to take different perspectives, perspectives that they had sufficient knowledge to adopt. And they came up with far more new uses than those who simply let their minds wander.

Now another jump, to superforecasters. These are a group of people who consistently outperform others and outperform chance in making political and economic predictions (Tetlock and Gardner, 2016). What makes them succeed? They are news junkies. They have nuanced probability judgments, not just *sure*, *maybe*, *no way*, and they constantly revise their judgments in the light of incoming evidence. But most of all, you guessed, it, they take many perspectives. They challenge their own analysis, how could it go wrong? They try to figure out what

others' perspectives would be, where others are thinkers with opposing views.

Here's a third case. For years, the dominant metaphor for cancer was war. Cancer invaded the body, and needed to be slaughtered. As a consequence, the efforts of medicine were to kill the invading cells, even if there was collateral damage. And there was. A different metaphor, a new perspective, has enabled new approaches to treating

Barbara Tversky
APS President

cancer (Mukherjee, 2017). Autopsies have shown that many people die with cancers that never metastasized, never spread through the body, stayed put and didn't cause general damage. That discovery led to a change of perspective, to see cancer not as an invading army, but as a seed that needed the proper soil. If it didn't have the proper soil, it didn't spread. The new approach: spoil the soil. Or keep it confined.

One more example of the utility of perspective-switching and I'll stop. It's hard to escape the fear-mongering about AI. It will take out jobs away, replace us, or worse, enslave us. All of this makes for terrific, if scary, sci-fi movies. But here's another way to look at AI: We can learn from it. AlphaZero, described as "a general reinforcement learning algorithm," taught itself to play chess, shoji, and Go by playing against itself. It beats not only all the masters but all the other programs (Silver, et al., 2018). It can't explain what it's doing—yet, but the group that developed AlphaZero is working on that too. Its moves often astound and fascinate experts, if only because they would not have dared to take those moves or even thought of them. Some of the moves seem to go against accepted game lore, they even look reckless. But they work! Chess, shoji, and Go players are learning from AlphaZero's moves, and we psychological scientists can too: what is it about the human mind that biases us against taking certain moves that turn out to be excellent moves?

I hope I've convinced you that perspective-taking and perspective-switching can work beautifully for problem-solving. Perspective-taking often arises in discussions of interpersonal relations. Surely managing interpersonal relations is a form of problem-solving, and the advantages of perspective-taking in interpersonal relations are well-known. But being convinced of the value of perspective-taking doesn't in and of itself tell you how to do it. For that, we return to spatial perspective taking, from inside and from above. From inside, we can imagine

➡

someone else's position and the paths they might take. This is one trick of superforecasters, to put themselves in the place of an opposing analysis, and one benefit of role-playing, whether to increase empathy or to find novel uses. From above, we go abstract, we can see the entire panorama, we can try to figure out the structure of that space. We can find similarities and differences across different paths and places. We can rearrange the places and the paths, after all, this is in the imagination, no cement required. ◉

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CALL FOR NOMINATIONS: APS PRESIDENT AND BOARD

The APS Election Committee seeks nominations for President and for two vacancies on the Board of Directors. The election will take place in April 2019.

QUALIFICATIONS
Candidates must be Members of APS. Nominees should be distinguished psychological scientists committed to the goals of APS and interested in contributing their time, expertise, and leadership to the organization.

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including the nominee's name and institutional affiliation

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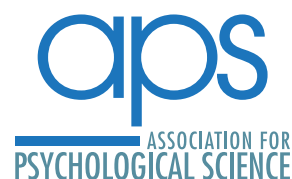
THE EDITORS' CORNER: CONDUCTING AND PUBLISHING INTEGRATIVE SCIENCE

A unique panel of editors of leading psychological science journals will share
their perspectives on the best practices and challenges in publishing integrative research.

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University of York, United Kingdom*

John Carson
Behavioural and Social Sciences (Senior Editor),
Springer Nature, United Kingdom

Lindsey Drayton
Trends in Cognitive Sciences (Editor), Cell Press , USA

Nora S. Newcombe
Psychological Science in the Public Interest (Editor in Chief),
Department of Psychology, Temple University, USA

Simine Vazire
Advances in Methods and Practices in Psychological Science
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Nathan Kuncel, University of Minnesota

Charles Murray, American Enterprise Institute

Richard H. Sander, University of California, Los Angeles

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Science and Ethics of Genetic Engineering

Gregory Cochran, University of Utah

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Razib Khan, Insitome

Neven Sesardić

Distinguished Contributor Interview
Randall W. Engle
Georgia Institute of Technology

Holden Memorial Address for Distinguished Scientific Journalism
Being Intelligent About the End of the 20th Century

Razib Khan
Insitome

Cooperation in Chimpanzees Reveals Aspects of Our Evolutionary Past

At the Jane Goodall Institute's Tchimpounga Chimpanzee Sanctuary in the Republic of Congo, more than 150 chimpanzees roam the tropical plains and islands that make up their new home, orphaned as a result of hunting and the exotic pet trade. These chimps, who are free to navigate their rain forest environment in the large social groups that come naturally to them, are the closest to wild chimpanzees that most psychological scientists are likely to get, said Alexandra Rosati, a professor of psychology and anthropology at the University of Michigan.

In a study examining helping, donation, and punishment in 40 of these free-range chimps, published in *Psychological Science*, Rosati and colleagues found that chimpanzees were often faster to cooperate than to behave selfishly. These findings align with modern theories of human cooperation, suggesting that some kinds of prosociality may be automatic and do not require individuals to overcome the desire to be selfish, as has historically been believed, she explained.

In the instrumental-helping task, apes engaged with a scenario in which one experimenter threw another researcher's stick into chimpanzee's dormitory while the ape was alone. The researcher then reached for the stick, making effortful vocalizations and later calling the chimpanzee's name in an attempt to recruit the chimpanzee's help in handing over the object within a period of 1 minute.

*APS Fellow **Frans de Waal** will share further scientific insights into what chimpanzees and other primates can teach us about sharing, cooperation, and conflict resolution in his Fred Kavli Keynote Address, "Evolution of Emotions and Empathy in Primates," at the International Convention of Psychological Science in Paris, March 7-9, 2019. For more information, visit www.psychologicalscience.org/r/icps2019keynotes.*

On average, the chimpanzees, who received no reward for cooperating, chose to hand the out-of-reach object to the researcher just over 50% of the time — but the rate of cooperation varied significantly among the individuals, with some helping in all 10 trials and others not at all. Chimps who chose to help more often also chose to help more quickly, supporting the conclusion that more cooperative individuals tend to make decisions faster than more selfish individuals do, the authors wrote.

When they had an opportunity to punish a thief who stole food from them, the chimps often chose to collapse the experimenter's table to prevent the thief from consuming the ill-gotten treats. Over the course of 10 trials, individuals who punished more often were found to punish more quickly, in line with the findings from the helping task. As with the helping task, the chimpanzees who punished the most frequently did so more quickly.

Importantly, prior work shows that chimpanzees do not punish indiscriminately, Rosati noted. Although the aggrieved chimps often pulled out the table's false leg when their food was stolen by the thief, they were less likely to do so if the experimenter moved the food—so the 'thief' was not really at fault.

The apes showed relatively little interest, on the other hand, in donating resources to others, Rosati said. When presented with two sets of plates, one that contained a snack for both the chimpanzee and a familiar caretaker and another that had a treat only for the chimp, the apes were basically indifferent to whether the experimenter got something to eat. Yet chimpanzees still chose to "donate" food by choosing the prosocial option more quickly than they chose the selfish option.

Taken together, these findings suggest that although there is individual variation among chimps, they do show some natural inclination toward cooperation — but the kinds of tasks that chimpanzees cooperate on don't appear to follow a particular pattern. In adult humans, Rosati explained, helping and sharing behaviors are positively linked, whereas these behaviors don't appear to be related in chimpanzees.

"We found that chimpanzees more closely resemble children, with uncorrelated responses across the donation, helping, and punishment tasks," the authors wrote. "Human developmental processes may build on cognitive structures that more closely resemble our ape relatives."

Furthermore, Rosati and colleagues found that chimpanzees' responses to tasks measuring delay of gratification and self-control were not correlated with prosocial responses. This suggests that cooperative behavior among chimpanzees may have more to do with the intrinsic value that apes assign to prosocial actions, as has recently been proposed to be the case in humans.

Rosati's work aims to cast a light on the evolutionary roots of cooperation in humans by studying these same behaviors

in one of our closest primate relations. Much like humans, chimpanzees have been shown to help others in need and punish theft, and are known to engage in sophisticated group hunting behavior and boundary patrols in the wild. A fast prosocial bias is most likely to have evolved in an environment where cooperation is a highly successful strategy, the authors wrote.

"They're kind of like us, but they're not showing the scope of cooperation we see across human societies," Rosati said.

"Understanding what the difference is in the psychological mechanisms that support cooperation in chimps verses humans can tell us something about how this came about in our evolutionary history." ◗

Reference

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Reinventing Introductory Psychology

APS presents a series of science-focused lesson plans to help psychology instructors expose and correct the myths and misconceptions that students bring to the classroom.

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How Psychological Science is Benefiting the World: A Special Issue of *Perspectives*

One of APS's guiding commitments is to advance human welfare and the public interest. The latest issue of *Perspectives in Psychological Science* focuses exclusively on the field's efforts and successes in achieving that goal.

In the special issue, more than 25 APS leaders and other accomplished psychological scientists write about how they have expanded on their research, applying their findings to the betterment of society and the environment.

"Their work spans ways to make the world a better place by considering individuals, relationships, and interactions among people, and broad-scale social and national policies," APS Fellow **June Gruber**, the journal's interim editor and an assistant professor at University of Colorado Boulder, writes in an introduction to the issue.

Gruber and her colleagues highlight the importance of researchers' involvement in addressing societal challenges, including mental illness, isolation and loneliness, sexual harassment, policies that harm vulnerable refugees, lack of concern for animals, and environmental deterioration.

The issue highlights how psychological science has helped disadvantaged youth achieve academic success, improve the efficacy of psychotherapy, helped military officers surmount errors and biases in their decision-making, and fostered peace and reconciliation in ethnic conflicts, among other impacts. Contributors to the issue, titled "How Can Psychological Science Cultivate a Healthier, Happier, and More Sustainable World?", include APS William James and James McKeen Cattell Fellow **Albert Bandura**, who discusses how social cognitive theory can be used to change behaviors and create sustainable social and environmental futures. APS James McKeen Cattell Fellow **Aaron Beck** describes how his pioneering work on cognitive behavioral therapy has led to one of the most widely used treatments for increasing individual well-being. APS James McKeen Cattell Fellows **Carol S. Dweck** (Stanford University), **Kathy Hirsh-Pasek** (Temple University), and **Roberta Michnick Golinkoff** (University of Delaware) all discuss how their research has contributed to advances in education. And APS Fellow **Ervin Staub** (University of Massachusetts, Amherst) provides an overview of how his research on peace and violence has helped temper ethnic conflict in Rwanda and equip law enforcement with new strategies for reducing vioent behavior among their fellow officers.

Other contributors to the special issue include APS James McKeen Cattell Fellow **J. Frank Yates** (University of Michigan), APS Fellows **Teresa M. Amabile** (Harvard Business School), **Ana Mari Cauce** (University of Washington), **Andreas Demetriou** (University of Nicosia), **Mesmin Destin** (Northwestern University), **Angela L. Duckworth** (University of Pennsylvania), **James M. Jones** (University of Delaware), **Arie W. Kruglanski** (University of Maryland College Park), **Jennifer S. Lerner** (Harvard University), **Rodolfo Mendoza-Denton** (University of California, Berkeley), **David G. Myers** (Hope College), **Sonja Lyubomirsky** (University of California, Riverside), and **Roger P. Weissberg** (University of Illinois at Chicago), and psychological scientists **Michelle Fine** (City University of New York), **Adam Grant** (University of Pennsylvania), and **Neil A. Lewis, Jr.** (Cornell University).

Gruber and her editorial board say the special issue is intended to inspire future and current scientists hoping to make a positive difference in the world. ◉

The issue is available online at
https://journals.sagepub.com/toc/pps/current

QUOTE OF NOTE

"The machines have severe limitations that we need to understand. We're saying, 'Wait, not so fast.'"

APS Fellow **Philip Kellman**, University of California, Los Angeles, on a study he led showing that deep learning computer networks are easily fooled, as their visual methods of identifying objects differs substantially from human vision.

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The Nomination Process
The University invites nominations from throughout the world by individuals, professional associations, university administrators, and publishers or editors of journals and books in Psychology. Self-nominations are not permitted. Upon receipt of their nomination, nominees will be notified about the award conditions, the selection process and the supporting materials needed.

Nominations Must Include:
- A one-page to two-page letter of nomination, in English, identifying the specific idea being nominated and delineating the reasons why the idea merits the award, based on the criteria above.

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Animal Research Accrediting Group Welcomes Psychological Scientist to Top Governance Position

Steven I. Dworkin, a Western Illinois University psychology professor, has begun serving as Board of Directors Chair at the Association for Assessment and Accreditation of Laboratory Animal Care (AAALAC) International.

Dworkin has represented APS on the board for the past 3 years, and says his new role serves as a testament to the significant influence that psychological science has on the organization's activities.

"I have had the opportunity to stress the importance of behavior standards in providing high quality care for animals used in our research endeavors," Dworkin, who studies neurobehavioral pharmacology, said of his involvement with AAALAC. "Most recently I have provided a behavioral research perspective on reproducibility and replication."

AAALAC is a private, nonprofit organization that promotes the humane treatment of animals in science through a voluntary accreditation program, a Program Status Evaluation service, and educational programs. More than 1,000 universities, government agencies, hospitals, and other research institutions in 47 countries have earned AAALAC accreditation, including the Sloan-Kettering Cancer Center, St. Jude Children's Research Hospital, the American Red Cross, and the National Institutes of Health. Under AAALAC's voluntary accreditation process, research programs earn the organization's endorsement by demonstrating that they go beyond minimum legal standards to achieve excellence in animal care and use. Programs are evaluated on factors such as housing conditions, veterinary care, and environmental stimuli.

Among the 70 organizations that are members of AAALAC, in addition to APS, are the American Association for the Advancement of Science, the Society for Neuroscience, Scientists Center for Animal Welfare, and the National Association for Biomedical Research.

Dworkin urges APS members to contact him with any questions or concerns they have about AAALAC activities. He can be reached at SI-Dworkin@wiu.edu. ◉

Steven I. Dworkin

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PEOPLE ARE TALKING ABOUT THE TEACHING INSTITUTE AT ICPS 2019

The pre-conference Teaching Institute features talks from leading experts in the research and application of empirical approaches to teaching psychological science.

Thursday, 7 March 2019
09:00 – 15:15 (9:00 AM – 3:15 PM)

Opening Plenary
Using Virtual Reality for Implicit Learning

Mel Slater
Department of Clinical Psychology and Psychobiology, University Of Barcelona, Spain

Closing Plenary
Why Good Teaching Evaluations Might Reward Bad Teaching

Wolfgang Stroebe
Department of Psychology, University Of Groningen, The Netherlands

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Presented by the **Association for Psychological Science** and the **APS Fund for Teaching and Public Understanding of Psychological Science**, and cosponsored by the **Society for the Teaching of Psychology**.

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Context Shapes Choice of Healthy Foods

Given a choice between indulgent and healthy foods, what will most people pick? The answer may depend on what other foods sit nearby on the grocery shelf, research published in *Psychological Science* suggests.

Paradoxically, the nearby presence of an indulgent treat can cause more people to opt for a healthy food, said study coauthor Scott Huettel, professor of psychology and neuroscience at Duke University. Context, in other words, affects food choices.

"When people choose foods, they don't simply reach into their memory and pick the most-preferred food. Instead, how much we prefer something actually depends on what other options are available," Huettel said.

"If you see one healthy food and one unhealthy food, most people will choose the indulgent food," he said. "But if you add more unhealthy foods, it seems, suddenly the healthy food stands out."

With obesity rates climbing, the authors wanted to examine factors that drive dietary choices. So they designed a study to look at how viewing indulgent sweet treats such as Snickers and Oreos affected the choice of healthier foods such as salmon or grapefruit.

They invited study participants — 79 young adults from the Durham-Chapel Hill area — to fast for 4 hours beforehand, so they arrived hungry.

First, study participants chose between indulgent foods (tasty but not healthy) and disciplined foods (healthy but not tasty). When given a simple one-to-one choice, say between canned salmon and Oreo cookies, nearly all subjects preferred the indulgent snack.

But researchers then took the same options and paired each with an indulgent food. For instance, participants saw salmon paired with Oreos, and Snickers paired with Oreos. Participants were told they had a 50% chance of getting either item in a pair.

When presented with that choice, participants were twice as likely to choose the pair that included a healthy option, such as salmon and Oreos.

One possible explanation involves attention. Researchers tracked subjects' eye movements and found that subjects spent more time looking at salmon and other healthy foods when they were surrounded by indulgent treats.

The results could have implications for the nation's ongoing battle with obesity.

"Right now, food items are very segregated: here's the produce, here are the candy bars," said study coauthor Nicolette Sullivan, a postdoctoral associate in psychology at Duke. "Yet maybe if we put something healthy in the middle of the snack food section, perhaps that might encourage people to choose it."

All data and materials have been made publicly available via the Open Science Framework. This article has received the badges for Open Data and Open Materials. ◐

APS recognizes the following members for their generous contributions to support the APS Student Travel Fund, and the Fund for the Advancement of Psychological Science.

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APS Award Address

Janet Shibley Hyde Sinks Stereotypes With Data

Growing up, one of APS James McKeen Cattell Fellow **Janet Shibley Hyde**'s favorite activities in school was Around the World, a math game in which students compete to "travel" around their classmates by answering as many problems as possible without making a mistake.

"Nobody told me I was a girl and I wasn't supposed to be competitive," Hyde, a professor of psychology and women's studies at the University of Wisconsin-Madison, said during her Award Address at the 2018 APS Annual Convention in San Francisco. "I just loved the competition, what can I say?"

Even today, the kind of benevolent, and sometimes not so well-meaning, sexism epitomized by John Gray's 1992 book *"Men Are from Mars, Women Are from Venus"* remains popular in mass media portrayals of gender. People think they're being kind when they say women are hardwired by hormones or other "immutable" biological factors to be nurturing and caring, or possess a "nearly psychic" ability to perceive emotions. But none of that corresponds to the data, Hyde explained.

"Unfortunately, it's all wrong," she said. "As I'm fond of saying, you'll never hear a good neuroscientist use the term 'hardwired' because the brain is anything *but* hardwired — it is plastic, so anyone who is trying to sell you on [that notion], you know you have to be suspicious of."

Hyde's meta-analyses of the current body of research on gender difference cast aside both the difference and deficit models — the idea that women just aren't *quite* as capable as men overall — in support of what she has titled the gender similarities hypothesis: the theory that "men and women are very similar on most (not all) psychological variables."

Or, to put it even more simply: "women are from Earth and men are from Earth."

Order and Method

Hyde's approach to psychological science revolves around quantitative literature reviews, a method of combining the results of numerous studies on a given topic to identify not only whether an effect exists, but how large it is.

Meta-analysis is the "gold standard" for conclusions in medicine, education, and psychological science, Hyde said, and, in the case of gender differences, comes down to computing a weighted average, *d*, that estimates the standardized difference between male and female scores across a set of studies.

Typically, researchers examining gender differences calculate this number so that it has a positive score if males score higher on a particular measure and a negative score if females score higher. According to psychological scientist Jacob Cohen's guidelines for interpreting effect sizes, the number can be small (0.2), medium (0.5), or large (0.8) — or, Hyde added, completely trivial (less than 0.1), indicating an almost complete overlap in scores. For example, data indicate that the effect size of the height difference between men and women is about 2.0. This suggests a noticeable and meaningful difference between males and females, but even then,

Janet Shibley Hyde

taller-than-average women can still stand head and shoulders above shorter-than-average men. A *d* of 0.15, on the other hand, would suggest an almost complete overlap in the distributions of scores for males and for females.

One limitation of reviewing research on gender difference, Hyde noted, is that the bulk of studies available for review are based primarily on the gender binary — a social construct facing increasing academic and cultural criticism. As such, the focus tends to be on cisgender men and women to the exclusion of both transgender and non-binary individuals. Hyde's recent paper, "The future of sex and gender in psychology: Five challenges to the gender binary," further elaborates on the empirical evidence for a more diverse range of gender experiences.

Running the Numbers on Women in Mathematics

In 2005, former President of Harvard University Lawrence Summers made a lengthy statement to the United States' National Bureau of Economic Research outlining his belief that women simply don't have the math ability to compete with men for jobs in science and engineering.

"His speech annoyed me, but I fight not with my fists, but with data, so I went to NSF and got a grant to test whether Larry Summers was right," Hyde said.

To start, a quick glance at the National Science Foundation's website nipped the myth that women simply aren't interested in math in the bud: 47% of undergraduate degrees in mathematics were awarded to women in 2002.

"If women can't do math, I don't see how they're getting half the undergraduate degrees in math, despite what Larry Summers says, so this is our first clue that things are not quite what the stereotypes say," Hyde quipped.

Next, she held the question of women and girl's performance in mathematics up to meta-analytic scrutiny using the annual state assessment scores mandated by No Child Left Behind policies in the United States. Just 10 states responded to Hyde's request for data sorted by gender, grade level, and ethnicity, but even that was enough to provide information on more than 7 million kids.

The result? The difference between boys' and girls' scores in grades 2–11 had an effect size that ranged from about 0.01 to 0.06 d, with an average d value for all grades of just 0.0065.

"I don't know what could be more 'no gender difference' than that," Hyde said.

A previous meta-analysis Hyde had conducted in the 1990s found evidence of a gender performance gap in math, but these new data showed that female students had clearly reached parity with their male peers. Another 1990 study by Max Lummis and Harold W. Stevenson found that boys performed better on word problems than girls in all cultures — but that wasn't the real take-away. Lummis and Stevenson also found that American students were outperformed substantially by their peers of both genders in other countries.

"If girls can't do math, why is it that girls in Taiwan do so much better than American boys?" she asked. "The big effect here is culture and how cultures treat math and how they teach math and so on. The big effect here is not gender differences."

In fact, a 2008 study by APS Fellow Edward C. Melhuish et al. found that the best predictor of a child's mathematical ability wasn't gender, but their mother's education level, a possible proxy for social class, Hyde said. Other strong predictors included their home learning environment, elementary school quality, and their family's socioeconomic status, all factors that influence children's educational outcomes regardless of gender.

Assertions that boys and girls learn differently due to girls' inherent ability to cooperate and sit still for extended periods of time or higher rates of Attention Deficit/Hyperactivity Disorder (ADHD) in boys simply aren't supported by the data, Hyde continued, but that hasn't stopped so-called education "gurus" from promoting single-sex classrooms. In a 2014 meta-analysis of well-controlled studies with random assignment, Erin Pahlke of Whitman College, Hyde, and colleagues found no performance differences in math and other domains between single-sex and co-ed classrooms.

"What you want is a mixing," Hyde said. "Getting them to work together and minimizing, rather than emphasizing, differences between boys and girls."

Encouraging existing mathematical talent is important not only on the individual level, where it grants access to prestigious, high-paying jobs, Hyde explained, but on the national level.

To watch video of Janet Shibley Hyde's award address, visit www.psychologicalscience.org/r/gender.

"We can't afford to waste 50% of our talent in the US," she said. "We're no longer a manufacturing society. The thing that's going to save us in the global economic competition is our scientific and technological innovation."

The Data on Depression

Gender stereotypes aren't harmful only to women, of course — the depiction of depression as a "female problem" can lead clinicians to overlook boys who are struggling with the condition as well.

Rates of depression in boys and girls were thought to diverge around ages 13 to 15 years old, when rates in girls jump dramatically. But studies on the topic of gender and depression had never been subject to meta-analysis until Hyde and her team took on the challenge in 2017 — possibly because there were over 56,000 studies to wade through on the topic.

Hyde and colleagues narrowed down their search by excluding studies based on convenient samples of college students, focusing instead on representative samples drawing on populations from over 90 countries worldwide. They then split the analysis into two parts: one drawing on diagnostic measure datasets from 66 articles with 1.7 million participants, and the other drawing from 97 articles featuring over 1.9 million participants' self-reported symptoms of depression.

The diagnosis-based meta-analysis confirmed much of the current thinking on gender and depression. Rather than computing a weighted average, Hyde used a female-to-male odds ratio (OR) to find that, averaged over all ages and nationalities included in the study, roughly 1.95 females per male met the diagnostic criteria for depression — just slightly under the commonly cited 2.0 OR.

Beyond that, there were some surprising findings, Hyde said. To begin with, the OR at age 12 was found to be 2.37, suggesting that gender differences in depression diagnoses may arise even earlier than previously believed.

Furthermore, the OR was highest — at nearly 3.0 — among 13- to 15-year-olds. From there, the OR declined across age groups, reaching the overall average of 2.0 for participants in their 20s, and remaining stable thereafter, a previously unidentified trend in adulthood, Hyde continued.

These findings have significant clinical, methodological, and theoretical implications, Hyde said. An OR of 2.0 suggests that the majority of people with depression are female, but that still means 1/3 of depressed adults are men. Yet the perception of depression as a somehow "feminine" condition can make men reluctant to seek help. The prevalence of studies on depression with single-sex designs that exclude male participants exacerbates these stereotypes, preventing progress on the question of how depression manifests in boys and men, she added.

Theoretically, Hyde continued, conceptualizations of how depression may emerge as a reaction to factors such as pubertal hormones, stress, and sexual harassment victimization in adolescence need to account for the narrowing of the gender gap in the 20s.

When Sexuality Met Gender Empowerment

Educational outcomes and measures of mental health can tell us a lot about the similarities and differences between men and women,

but there are few domains of life where traditional stereotypes remain more resilient than when it comes to sexuality.

In a 2010 meta-analysis of datasets from 840 articles involving more than 1.4 million participants from 82 countries, Jennifer L. Peterson and Hyde found that although differences between men's and women's sexual attitudes (such as supporting gay rights or premarital sex) were generally small or trivial, men were more likely to view pornography, engage in masturbation, and have casual sexual encounters.

The researchers also identified an important moderating factor: gender empowerment. In countries that the United Nations Development Programme rated as having higher gender empowerment — a measure that factors in the ratio of women to men holding parliamentary seats, average estimated income, and the percentage of women working in high-level positions such as senior management, public office, and academic jobs — the behavioral differences between men and women were smaller.

Hyde notes that they did not observe this trend for every behavior they examined, but the overall effect aligns with the social role theory, which posits that men and women behave differently in large part due to societal expectations.

In 2005, when Hyde first put forward the gender similarities hypothesis, the data created a clear pattern in support of her claim: of 124 effect sizes from 46 existing meta-analyses, 78% reported *d* values that were small or close to zero. The "meta-meta-analysis," independently replicated in 2015, found evidence of some gender differences, but not nearly enough to suggest that men and women come from different psychological worlds — and studies of very young children suggest that the differences that do exist may take years of socialization to develop.

"What we need to do is think more systematically about where the messages are coming from that create those early differences," Hyde said. "I don't for a minute believe they're hardwired into the brain." ◉

-**Kim Armstrong**

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LOVE STORIES

ADVENTURES IN THE STUDY OF ATTRACTION

Commitment, openness, appreciation, creativity, patience — these qualities underlie the strongest romantic relationships, but they could just as well apply to the scientists *who* study relationships. Love, desire, and romance are far from simple phenomena, but this hasn't deterred psychological scientists from diving in to explore the full range and complexity of these fundamental aspects of the human experience.

In a nod to Valentine's Day, the *Observer* asked APS Fellows **Lisa Diamond** (University of Utah), **Eli Finkel** (Northwestern University), **Nickola Overall** (University of Auckland), and **Harry Reis** (University of Rochester) and psychological scientists **Jessica Maxwell** (Florida State University) and **Meredith Chivers** (Queen's University) about the discoveries, challenges, and new directions in the study of love, desire, dating, and commitment.

How did you originally become interested in your line of research?

Samantha Joel: In the relationships unit of my intro to social psychology class in undergrad, our instructor introduced the Investment Model, and why it is that people wind up in unhappy relationships. The model puts forth two reasons — low investment and high alternatives. Are those the only reasons? How do they work? What other reasons could be out there? I became obsessed.

I switched my major to psychology, transferred to a university with labs that were studying relationships (University of Toronto), and I never looked back.

Jessica Maxwell: I first learned about sex and relationship research in my undergraduate studies, after taking a human sexuality course, and a course on intimate relationships. I always knew I was passionate about this area of research, but it wasn't until a few years into my graduate studies that I really began pursuing this line of inquiry.

Eli Finkel: I always wanted to know how relationships work — why we find some people sexier than others, why some marriages succeed while others fail, etc. The major development for me came in a social psychology course at Northwestern where I discovered that it was possible to make a living by asking and answering questions like those.

Meredith Chivers: My interest in sexual psychophysiology emerged when working in a clinical sexuality research lab that focused on male sexuality. The large gaps in our knowledge of women's sexual response intrigued me, and when I started grad school at Northwestern University, I jumped at the opportunity to be trained in sexual psychophysiology at the Kinsey Institute.

Harry Reis: I have always been fascinated by relationships. As soon as I discovered that you could study them empirically, I was hooked. It was an easy, no-brainer decision.

Lisa Diamond: When I was applying to graduate school, I was extremely interested in studying LGBT youth (this was the early 1990s, and it was actually a relatively new topic at the time). I was interested in studying the role of romantic relationships in the early development of lesbian and bisexual women, and that led me to a broader interest in love, attachment, and close relationships.

Have you made any discoveries that were unexpected?

Jessica Maxwell: I am working on a project right now where I've found that sex after conflict ("make-up sex") is less satisfying than sex on days without conflict, which goes against lay notions that make-up sex is something that is really hot and passionate.

Another finding that may be unexpected to some is that believing sex takes work is associated with higher relationship and sexual satisfaction. It doesn't always sound sexy to say your sex life takes effort and work, but my research shows it's a beneficial belief.

Nickola Overall: Many people, including psychological scientists, may believe that conflict is bad for relationships, and that the best way to maintain relationships is to soften conflict with expressions of love and forgiveness. However, our research has shown that anger and hostility can sometimes produce increases in relationship well-being because these types of behaviors directly target problems, motivate change, and convey commitment and investment in the relationship. Although conflict can be tough and difficult to manage, it can also offer the opportunity for relationships to grow and become more secure.

Eli Finkel: I'd always assumed that it was possible, in principle, to develop algorithms that could use some sort of self-report data to match people who are more compatible than chance, but it looks like that's impossible (Finkel et al., 2012; Joel, Eastwick, & Finkel, 2017). I'd always assumed that the expectations we bring to our marriages have increased systematically across the centuries, but it turns out that our expectations are actually decreasing in major ways (Finkel, 2017).

Meredith Chivers: Over the past two decades, we have discovered that cisgender women who are sexually attracted to men have unique patterns of sexual response. These women show significant sexual response to visual and narrative stimuli that depict women, although they do not report feeling sexual attraction to women, or report a history of sexual interactions with women. This is unexpected because women are showing an appetitive response — sexual arousal and desire — to sexual cues that have no incentive history associated with them.

We have observed this pattern using a number of methodologies, including genital responses measured using plethysmography and thermography, self-reported sexual arousal, neural responses assessed using fMRI and EEG, visual attention, and other cognitive measures, and it has been replicated in my lab and by others.

This discovery raises questions about how sexual orientations manifest, how sexual attractions develop, how sexual cues acquire their emotional salience, and, most intriguing to me, why this pattern of response is found with cisgender, heterosexual women but not with queer women (including trans women) or men.

Lisa Diamond: Probably the most unexpected discovery, and the one that really changed my own thinking, was the fact that sexual orientation doesn't necessarily "orient" one's capacity for romantic love. In my research, I found that lesbian women sometimes fell in love with their close male friends, even when they weren't attracted to them, and heterosexual women sometimes fell in love with female friends. I soon found that this has been true throughout human history, and it led me to investigating the biobehavioral independence of sexual desire and romantic attachment.

CONTINUED

What are some of the biggest practical challenges you face in conducting your research?

Samantha Joel: Perhaps the biggest challenge is that relationships are really messy (like many interesting human phenomena), and it can be hard to extract the signal from the noise. How do you know you're capturing these processes the way they really unfold, and that your conclusions are going to withstand the test of time?

If we want to produce nuanced, robust, and generalizable findings, we need to pool our resources more and coordinate our efforts. We need more team science.

Nickola Overall: My primary methodological aim is to assess how naturally-occurring emotional and behavioral dynamics shape the course of people's lives and relationships. This means getting couples to record their experiences repeatedly across daily life (experience or daily sampling studies), video-recording couples discussing relationship problems or trying to support each other (behavioral observation studies), and following couples across months or years to assess how these daily and behavioral dynamics predict changes in personal and relationship health and well-being (longitudinal designs).

Large dyadic longitudinal studies like these take years to collect, are hugely expensive, and — given the consequences of relationships for health and well-being — can produce ethical dilemmas regarding intervening with distressed couples. These complexities and challenges step up further when assessing families (couples and children), when targeting specific populations (e.g., low SES, violent couples, minority couples, etc.), and when examining processes that are harmful (e.g., aggression during conflict, poor parenting during family interactions).

Eli Finkel: At present, I'm working to launch a study of relationship dynamics in family businesses. We're recruiting four people linked to each business: two siblings who are actively involved in running the business, and each sibling's significant other. Doing so allows us to leverage Dave Kenny's social relations model (e.g., Kenny & La Voie, 1984) to answer lots of cool questions, but it requires time-consuming data collection.

Let's say we want to include a three-item measure of liking. For a participant to report on how much she likes each of the other three people, and how much each of those people likes her, she completes 18 items. Ideally, we would also assess perceptions of others' liking of one another (e.g., A's perception how much B likes C), which requires dozens of additional items. And we might want to know about perceptions of others' liking for one another (e.g., A's perception of how much C thinks B likes her).

But what if I also wanted to measure — with similar appreciation of interdependence — evaluations of competence, views about who works well together, etc.? Such a survey rapidly becomes prohibitively time-consuming, especially if we want to study atypical research samples (e.g., senior executives).

Meredith Chivers: Sexuality research is still associated with discomfort and taboo for people outside the area. When preparing ethics and grant applications, we need to take extra care to present our work as professionally as possible, and frame the work as scientific. I have, for example, had an ethics review board question the scientific merit of federal grant-funded research on women's sexual response, for no specific reason other than doubting the benefits of deeper knowledge about women's sexual arousal.

Harry Reis: Recruiting couples is much harder than recruiting individuals. If we had as much access to couples as we do to individuals, my lab would be much more productive!

Lisa Diamond: One of the biggest difficulties for the entire field of relationship research involves recruiting truly diverse samples. As Benjamin Karney has passionately argued, relationship researchers spend far too much time studying white, middle-class couples, well-functioning couples, and the knowledge we generate from this research doesn't necessarily generalize to couples from more diverse backgrounds, and especially couples under economic stress. In terms of studying sexual-minority individuals (and couples), it can be difficult to recruit individuals who are more closeted, and yet it's really important to make sure that we are not just studying the most openly-identified LGBT individuals.

Are there challenges to this work that people may not realize?

Samantha Joel: Compared with some other fields, it's harder for relationship researchers to openly share our data — particularly couples data — because of the risk of romantic partners finding the data and discovering each other's responses. For my field to get on board with open data sharing, we need infrastructure in place for sharing data that more fully protects the confidentiality of the participants. I think we'll get there, but we're not there yet.

Jessica Maxwell: A particular challenge that people may not think of is that sex doesn't happen as frequently as other life events. The average couple has sex about once per week. If you are designing a daily survey where you track people every night, you will have to make a longer survey (e.g. 3 weeks) to capture multiple instances of sex.

Another challenge is that participants may have different definitions of what "sex" is. Couple members can even disagree as to whether they had sex the night before, which can pose problems for data analysis.

What do you see as the most exciting new directions for this work?

Jessica Maxwell: Being able to access a wide participant pool through online recruitment allows researchers to collect data that captures a wider range of sexual experiences and orientations, as well as ethnicities. I'm excited to see the insights gained from examining more diverse relationships.

I am also excited to start applying implicit measurement to the study of sexual relationships, to look at how our automatic attitudes about sex with our partner can be improved.

Regarding technology, I do some research on casual sex, which has become a lot more readily available with the rise of smartphone apps. As dating apps and online dating continue to become more normative, it will be interesting to see whether existing relationship phenomena change.

Nickola Overall: The time and expense of large dyadic samples, coupled with the growing need for replication across studies and contexts, has set the scene for international collaborations between relationship scientists in different labs across many countries. These collaborations increase the quality and replicability of relationship science and make for a broader, more representative view of relationship processes.

Eli Finkel: The easy answer here involves the emergence of "big data" and computational research methods, but I'm not particularly sanguine about those developments when they are applied to the relationships space (i.e., what happens once people have actually met). Thus far, nobody's figured out how to use big data to track stuff like that.

At the moment, I'm more excited about the integration of relationship science with the broader marketplace of ideas. One idea I'm playing with these days, for example, is whether insights from relationship science can help to alleviate the extreme partisanship tearing apart many of our societies.

Harry Reis: We've now got the tools to examine couples' behavior in its natural context. That's so much more informative than surveys and lab observation. Two decades from now, we'll know a lot more than we know now, and that should pave the way for better interventions and prevention programs. ◓

Science Provides a Valentine Gift Giving Guide

Gifts to spouses and partners are a staple of Valentine's Day. But results of a recent preregistered study published in *Psychological Science* suggest that our romantic gift-giving may provide the recipients some momentary elation at the expense of genuine satisfaction.

Adelle Yang of the National University of Singapore and Oleg Urminsky of the University of Chicago's Booth School of Business theorized that people gravitate towards the gifts that they anticipate will elicit the most enthusiastic emotional responses, rather than those that the recipients themselves would prefer or would derive the most satisfaction from. The researchers tested this hypothesis in a series of studies involving both real and imaginary gift-giving decisions.

In one online study, 357 participants imagined they were either part of a gift-receiving couple or one of the couple's gift-giving friends. They then saw pictures and descriptions of two similarly priced pairs of mugs – one set was personalized and the other had an ergonomic design. They rated how much they liked each option, which option they preferred, and predicted the emotional response and satisfaction that each option would elicit.

Regardless of whether they were giving or receiving the gift, participants anticipated that the personalized mugs would elicit a stronger emotional response than the ergonomic mugs would. Givers thought the couple would be equally satisfied with the two mug options and tended to prefer the personalized mugs, a preference driven by the emotional response they anticipated from the couple. Receivers, on the other hand, showed no preference for one option over the other.

In another online study, 295 participants in romantic relationships evaluated pairs of similarly priced Valentine gifts. The choice pairs included a dozen roses in bloom or 2 dozen roses about to bloom, a bouquet of fresh flowers or a bonsai plant, and a heart-shaped basket containing cookies or fruit. Again, givers were more likely than receivers to choose the option that they thought would elicit the strongest immediate reaction, such as the bouquet of fresh flowers, over the option that was likely to deliver more long-term satisfaction, such as the bonsai plant.

Findings from additional studies revealed that givers' preference for gifts with a "wow" factor disappeared when they learned that they wouldn't be able to see the recipient's reaction.

When Yang and Urminsky asked people to think about gifts they had actually given or received, they found that people seem to derive the most enjoyment from receiving gifts, such as books and money, that givers often shy away from because they tend not to elicit strong emotional reactions.

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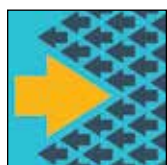
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# ICPS 2019 Integrative Science Symposia

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

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

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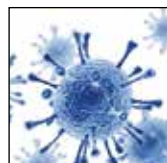
## Our Minds Are Not Our Own: The Role of Guts and Germs

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*

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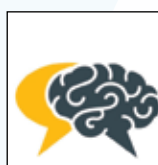
The Consequences of the Evolution of Language on the Mind

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*

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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*

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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?

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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*

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.*

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The Case for Implicit Associations: Teaching Students What Lurks Beneath their Awareness

By C. Nathan DeWall

Jost, J. T. (2019). The IAT is dead, long live the IAT: Context-sensitive measures of implicit attitudes are indispensable in social and political psychology. *Current Directions in Psychological Science,* **doi/full10.1177/0963721418797309**

Would you have a problem voting for an African American political candidate? If you saw two Muslim men with duffle bags in line for your flight, would you switch to a different flight if you could do so for free? Or, if you plan to adopt a child, would you (if you are Caucasian) decline an African American child?

Asked these questions, most people would respond *no, no,* and *no*. But psychologists know simple questions often have complex answers. Our two-track mind simultaneously processes information on separate conscious and unconscious tracks (Myers & DeWall, 2019). Although our conscious track might cringe when asked these questions, the unconscious track might have formed gut-level associations that indicate implicit bias toward

African Americans, Muslims, and other groups. Psychologists have developed tools to measure these potential implicit biases, such as the Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998).

The IAT is a reaction-time-based measure of how quickly people associate psychological concepts. For example, people may be faster to associate negative concepts (the word "unpleasant") with a typically African American name ("Jamal") than with a typically Caucasian American name ("James"). Few psychological measures have burst onto the academic scene with more impact than the IAT, accruing more than 10,000 citations (Google Scholar, 2019). More than 20 million people have completed various versions of the IAT online on the Project Implicit website (https://implicit.harvard.edu).

Jost (2019) tackles criticism that scholars have leveled against the IAT. Common critiques include

- modest test-retest reliability (between r=.40 and r=.70);
- contextual factors that affect IAT scores (e.g., experimenter's race/sex, exposure to admired group exemplars);
- no clear cut-off points between being "biased" and "unbiased"; and
- small correlations between IAT scores and discriminatory behaviors (between r=.13 and r=.24).

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In response, Jost argues that the IAT's test-retest reliability is normal, contextual sensitivity is expected, its scoring method is reasonable, and the IAT's small predictive validity effect sizes can have impressive and impactful implications (Greenwald, Banaji, & Nosek, 2015; see also Prentice & Miller, 1992).

To take this cutting-edge research into the classroom, instructors can have students complete the following two activities(at right). The first activity is an in-class demonstration of a race-assessing IAT. (Thanks to B. Keith Payne and Mahzarin Banaji for generously sharing this demonstration.) The second activity is designed to show students how people can have negative implicit associations toward their in-group.

Next, instructors can ask students how many *NO* responses they have. If they're comfortable doing so, ask students to raise their hands if they had five, four, three, two, one, or zero *NO* responses. Most students will have at least one *NO* response because it is counterintuitive for people to show implicit *out-group* favoritism. Instructors can then let students know that the scientific evidence suggests that each answer is *YES* (see Jost, 2019, for a review).

Students can form pairs and discuss why they think members of minority and disadvantaged groups may show implicit outgroup favoritism. Why might this happen? Time permitting, instructors can introduce *system justification theory*, which argues that people have needs to defend and justify the status quo, even when the system puts those same people at a disadvantage (Jost & Banaji, 1994). How might system justification theory help explain implicit outgroup favoritism?

Bias runs counter to goals of having an inclusive and free society. Although many people think of themselves as unbiased, their self-perception is based on their conscious awareness. Implicit bias lurks beneath our awareness, and can affect a variety of outcomes. Like any psychological measure, the IAT isn't perfect. But it offers a useful method to uncover hidden associations that can help or hinder social change. ⬤

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Activity #1

Instructors can download a PowerPoint presentation to show students at www.psychologicalscience.org/r/beneathawareness. It consists of three phases. First, students will complete a practice session to familiarize themselves with the task. Specifically, they will tap their left leg (with left hand) for words related to safety and tap their right leg (with right hand) for words related to crime. Second, students will complete a session that asks them to categorize names as White-typical or Black-typical. Third, students will complete several trials that combine what they did in the first two sessions.

After completing the demonstration, ask students whether they noticed their responses changing across the tasks. Were certain parts of the task easier to complete than other parts? How did students' responses match or not match their self-defined beliefs about Caucasian Americans and African Americans? Instructors can summarize the basic goals of the IAT, its history in psychology, and some of its common critiques. How do students consider their experience doing the IAT demonstration in light of these criticisms?

Activity #2

Instructors can ask students to answer the following questions by writing *YES* or *NO*

1. ___ Do you think people who are **poor** would favor people who are **rich** on the IAT?

2. ___ Do you think people who are **obese** would favor people who are **normal** weight on the IAT?

3. ___ Do you think people who are **Hispanic** would favor people who are **Caucasian** on the IAT?

4. ___ Do you think people who are **Black** would favor people who are **White** in South Africa on the IAT?

5. ___ Do you think **men who are gay and lesbians** favor **straight** people on the IAT?

Can Cognitive Flexibility be Learned?

By Cindi May and Gil Einstein

In our fast-paced world full of interruptions and multitasking, shifting mental gears is an essential skill. Professors exercise cognitive flexibility when they pause during a lecture to answer students' questions, and then turn to resume their lecture. The ability to shift seamlessly from one task to another offers advantages in any environment in which immediate goals can change, such as driving in heavy traffic (braking when traffic stops unexpectedly), playing a team sport like basketball (changing directions when the ball is stolen), or cooking a multi-course meal (preparing different menu items). Cognitive flexibility also allows people to suppress habitual behaviors in favor of less-practiced but contextually-appropriate behaviors, such as refraining from adult language in the presence of children. Braem and Egner (2018) explain how cognitive flexibility is measured in the lab and discuss evidence that cognitive flexibility can be encouraged through training and context.

To help students understand cognitive flexibility, have them engage in a task-switching exercise. Show students the words below, one at a time. Present each word for 1 second, with these instructions:

For every lowercase word, rate the pleasantness of the word on a scale of 1 (unpleasant) to 7 (pleasant). For every uppercase word, indicate whether the word is a noun (N), adjective (A), or verb (V). Write your response for each item as quickly as possible on a blank sheet of paper.

1. *List for Task-Switching Exercise*: flea saliva spit hungry sweaty drop sneeze EAGER CAPTIVATE FLOWER JUSTICE CAVITY jump kayak table sweaty drop sneeze PINCH HEAVY SQUEEZE GLOVE COLLAR HUGE METAL TERMITE GIFT HILARIOUS potato table

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Have students reflect on their performance. Did they make any mistakes? Were they slower to respond on some trials relative to others?

One measure researchers have used to assess cognitive flexibility is *switch cost* – slower and/or less accurate responses on trials in which the task switches (here, from pleasantness rating to grammar categorization or vice versa) relative to trials in which the task repeats. It is likely that if students stumbled, they did so on trials that required a shift in task.

Higher switch cost is an index of lower cognitive flexibility. Ask students to generate everyday situations in which cognitive flexibility plays an important role. Then ask students about the nature of cognitive flexibility – do they think it is a fixed ability? How is it controlled? Can it be developed over time, and if so, how?

Some researchers have conceptualized cognitive flexibility as a type of "meta-control" that guides lower levels processes (Goschke, 2003; Hommel, 2015). In this view, cognitive flexibility acts in an executive way to set and even override goals (Diamond, 2013). What controls cognitive flexibility? To some researchers' surprise, cognitive flexibility can be conditioned through practice, training, and even context. For example, simply increasing the number of times participants must engage in task-switching reduces the switch costs (Dreisbach & Haider, 2006).

To demonstrate the influence of practice or context, have students engage in the same task-switching exercise, this time using the list below:

2. *List for Task-Switching Exercise*: nail liver BLINK fruit TREE CERTAIN angry GRUMPY itch VELCRO rain DRIVE independent cold ENERGY swim LAUGH jealous BALL QUIRKY walk COOK HEART noisy passion CORRIDOR BARK flip FLEE finish

Ask students how the two lists differed. Both List 1 and List 2 include 15 items of each type. However, List 1 requires only 4 task shifts, while List 2 requires 22 task shifts. Although students may perceive List 2 as more difficult overall than List 1 because it contains many more switches, the average cost of making a switch *on any one trial* (that is, the speed of responding and/or the likelihood of making an error) is reduced in List 2 because the context requires extensive switching. As students practice switching, they seem more prepared to respond to change and the switch cost diminishes.

Another measure of cognitive flexibility is *switch* rate – how often people choose to switch tasks when given a choice. Higher voluntary switch rates are associated with increased cognitive flexibility. Switch rates can be conditioned by reward (Braem, 2017). In these studies, people engage in a task-switching exercise

like the one above. After each trial, however, participants are awarded points in a seemingly random fashion. Unbeknownst to participants, more points are awarded after task-switch trials than task-repetition trials. Although participants are generally not aware of the point contingencies, they are affected by them. Later, if given the option of task-switching or task-repeating in the absence of points, participants choose task-switching.

Cognitive flexibility has been considered by some investigators to be a hallmark of higher-order cognitive functioning. It has been characterized as an override mechanism that allows people to change goals or pursuits, thereby mediating adaptive behavior (e.g., Diamond, 2013). Others have speculated that deficits in cognitive flexibility may contribute to the behavioral challenges experienced by some populations, such as individuals with autism spectrum disorder, obsessive-compulsive disorder, or major depressive disorder (Geurts, Corbett, & Solomon, 2009; Meiran, Diamond, Toder, & Nemets, 2011). However, growing data suggest that cognitive flexibility — as measured by switch cost and switch rate — can improve with time, especially when people are rewarded or are required to switch tasks frequently. Although it is not clear whether these benefits are context-dependent or if they will generalize to everyday behaviors (e.g., a reduction in compulsive behaviors for an individual with OCD), the findings do challenge the notion that cognitive flexibility is a fixed skill and offer potential avenues for facilitating behavior change in individuals thought to be cognitively rigid. ●

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Using Amazon's Mechanical Turk: Benefits, Drawbacks, and Suggestions

By Danielle McDuffie

Amazon's Mechanical Turk (MTurk) is an online crowdsourcing platform designed to aid in recruiting people to complete various tasks (Buhrmester, Kwang, & Gosling, 2011). Overall, Amazon advertises its MTurk service as offering access to over 500,000 different workers from 190 countries; however, the majority (more than 75%) of MTurk workers live in the United States and India (Paolacci & Chandler, 2014). The tasks posted on MTurk by "requestors," referred to as human intelligence tasks (HITs), range in length and duration and are completed by "workers" for a set, usually small, fee. Tasks posted by requesters on MTurk are referred to as human intelligence tasks (HITs).

MTurk is a great data collection tool for graduate student researchers who are investigating a novel trend but might be concerned with finding large amounts of participants in a reasonable amount of time. MTurk can also be helpful for someone trying to expand the generalizability of their project from the typical research conducted using a predominantly Caucasian/European-American, affluent, undergraduate population. While MTurk can be beneficial for gathering a diverse sample in an abbreviated length of time, certain drawbacks should be considered when using this crowdsourcing service. Below are several benefits and drawbacks to using MTurk for data collection.

Benefits:

- Overall, the sample collected from MTurk is likely to be more diverse than a sample of undergraduate students (Buhrmester et al., 2011). Participants are generally older, more geographically representative of the US, and more diverse than participants collected from undergraduate samples.

- The reliability of data collected from MTurk has not been found to be significantly different than data collected by other means. Participants who respond using MTurk generally answer reliably and consistently, as evidenced by high test-retest reliability rates even after a period of 3 weeks (Buhrmester at al., 2011).

- MTurk software supports the embedding of other survey software (e.g., Qualtrics). In this regard, many different types of research methodology are possible using MTurk workers, including longitudinal, qualitative, and mixed methods.

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Drawbacks:

- Research shows that users of MTurk have some fundamental differences from the general population. MTurk workers are more educated, less religious, and more likely to be unemployed than the general population (Goodman, Cryder, & Cheema, 2013). If a researcher is trying to investigate specific trends within minority populations, such as levels of religiosity, or educational differences, these cultural differences could confound future results and limit generalizability.

- The range of ages and socioeconomic statuses of MTurk workers could be more limited than those found in the general population. While MTurk appears to include a diverse sample of workers, logically, older adults might be less likely to utilize technology. Fundamentally, MTurk requires the usage of some web-based platform along with the availability of the technology to accommodate such activities (e.g., a computer, a laptop, an iPad). With older adults and those within lower socioeconomic statuses, many might not have access to the technology needed to use MTurk. Additionally, particularly with older adults, there might be a lack of familiarity with web-based services such as MTurk, leading to a lower likelihood of use.

- Diversity is not synonymous with representativeness. Research suggests that the amount of workers using MTurk who belong to certain racial/ethnic groups might be lower than the amount found in the general population (Paolacci et al., 2014). Particularly, this trend has been found relative to African American and Hispanic American workers (Paolacci et al., 2014).

- Given the above limitations, when sampling workers in MTurk you may be most likely to encounter Caucasian, technologically-adept, highly educated secular workers. Several helpful strategies exist, however, to mitigate these drawbacks and obtain your desired sample.

Suggestions:

- ***Be very explicit in your HIT title and description***. Though MTurk has the capability for researchers to purchase "qualifications" that parcel out groups of people according to certain specifications, as of yet there is no "qualification" specifically for demographics, such as race and ethnicity. To control for this limitation, in both the title and description of the HIT, use uppercase letters for the demographic specifications of interest. This method can streamline the process and help gather many more participants from the population of interest.

• *Implement "checks" into your task that assess the demographics of the person responding.* An additional method to collect responses from participants consistent with the specification of interest is to include a "check" into your task. The participant should fill this "check" out before they begin the actual task. For example, in a study that I was working on, participants who were not African American were still submitting responses even though the title and description for the HIT explicitly indicated the desire for solely African American participants. To reduce the potential for these responses, we added a question before the administration of the research questionnaire asking, "What is your race/ethnicity?" In this way, we separated out those who had gotten through to the study who did not meet the demographic qualifications of interest.

• *Understand and accept that recruiting diverse populations through MTurk might be a slow process.* One of the advantages of MTurk is the ability to recruit a large number of participants in a relatively inexpensive, expedited manner (Follmer, Sperling, & Suen, 2017). It is important to remember, however, that the majority of MTurk users are Caucasian/European American. Therefore, if you are attempting to sample for participants from a specific minority group, you need to be persistent to collect a large sample. Often, researchers who are able to collect their data more quickly may not be seeking to gather participants from a specific minority group.

MTurk can be a great means of recruiting a diverse sample quickly and in a cost-efficient manner; however, the inherent differences observed between an MTurk sample and a sample collected using traditional methods might present significant challenges in generalizing the results of the study. These differences include faith-based, technological, educational, age-related, socioeconomic, and employment-related differences. Additionally, the same ethical guidelines that you would uphold with participants collected from any other population must be maintained with MTurk workers despite the limits this program places on personal interaction. Always be mindful of the implications of using MTurk, and good luck with data collection. ◉

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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.

ICPS 2019
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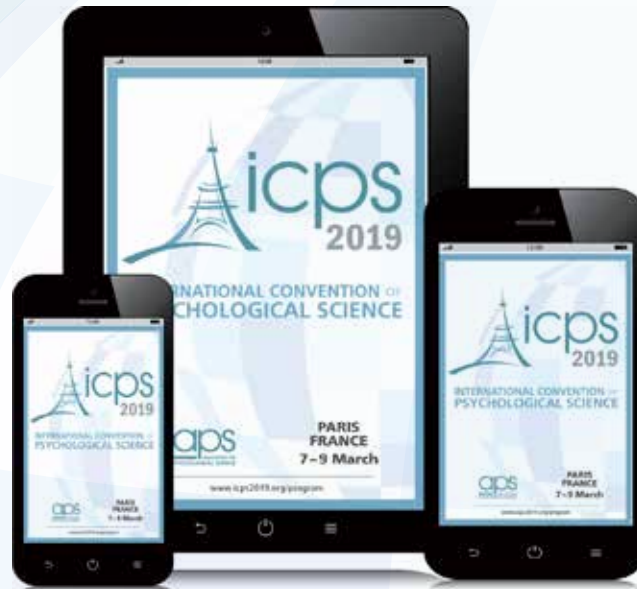
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Teresa Amabile, Harvard University, *The New York Times*, December 4, 2018: How to Accept a Compliment — Even if It's From Yourself.

John Bargh, Yale University, *Scientific American*, December 19, 2018: The Brain's Autopilot Mechanism Steers Consciousness.

iCPS **Lisa Feldman Barrett**, Northeastern University, *Quartz*, December 14, 2018: Here's Why Elizabeth Koch, the Daughter of a GOP Megadonor, Chose Science Over Politics.

Roy Baumeister, Florida State University, *The Atlantic*, December 14, 2018: Why People Wait 10 Days to Do Something That Takes 10 Minutes.

How Clutter Closes In

Clutter is more than an abundance of possessions. According to APS Fellow **Joseph Ferrari** and **Darby Saxbe**, it can also be a source of chronic stress, but only if you've been conditioned to notice it. The mental load isn't always distributed equally, says Saxbe, and working women who take on the possessive share of the housework are often hit hardest.

The New York Times

January 3, 2019

Sian Beilock, Barnard College, *The New York Times*, December 4, 2018: How to Accept a Compliment — Even if It's From Yourself.

Alia Crum, Stanford University, *The Atlantic*, December 13, 2018: What Happens When You're Convinced You Have Bad Genes; *Science*, December 10, 2018: Just Thinking You Have Poor Endurance Genes Changes Your Body.

Joseph Ferrari, DePaul University, *The Atlantic*, December 14, 2018: Why People Wait 10 Days to Do Something That Takes 10 Minutes.

Adam Grant, The Wharton School of the University of Pennsylvania, *The New York Times*, December 8, 2018: What Straight-A Students Get Wrong.

🎧 **Jonathan Haidt**, New York University, *The Guardian*, December 14, 2018: Oh My: A Psychological Approach to Awe.

🎧 **Rachel Herz**, Brown University, NPR, December 13, 2018: Yum and Yuck: The Psychology Of What We Eat...And What We Spit Out.

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aps **Julianne Holt-Lunstad**, Brigham Young University, *US News & World Report*, December 18, 2018: 3 in 4 Americans Struggle With Loneliness.

Daniel Kahneman, Princeton University, *Scientific American*, December 19, 2018: The Brain's Autopilot Mechanism Steers Consciousness.

Alan Kazdin, Yale University, *TIME*, December 6, 2018: So Your Child Has Failed. Here's What to Do Next.

🎧 **Dacher Keltner**, University of California, Berkeley, *The Guardian*, December 14, 2018: Oh My: A Psychological Approach to Awe.

🎧 **Sonja Lyubomirsky**, University of California, Riverside, NPR, December 24, 2018: If You Feel Thankful, Write It Down. It's Good For Your Health.

aps **Richard E. Nisbett**, University of Michigan, *The Wall Street Journal*, December 24, 2018: The Science Behind Making Your Child Smarter.

Susan Persky, National Human Genome Research Institute, *Science*, December 10, 2018: Just Thinking You Have Poor Endurance Genes Changes Your Body.

🎧 **Scott Plous**, Wesleyan University, NPR, December 24, 2018: The Science of Compassion.

🎧 **Paul Rozin**, University of Pennsylvania, NPR, December 13, 2018: Yum and Yuck: The Psychology Of What We Eat...And What We Spit Out.

🎧 **Laurie Santos**, Yale University, NPR, December 24, 2018: If You Feel Thankful, Write It Down. It's Good For Your Health.

Barry Schwartz, University of California, Berkeley, *Vox*, December 12, 2018: The Best Doesn't Exist. A Psychologist Explains Why We Can't Stop Searching.

aps **Elliot Tucker-Drob**, University of Texas at Austin, *The Wall Street Journal*, December 24, 2018: The Science Behind Making Your Child Smarter.

Bradley Turnwald, Stanford University, *The Atlantic*, December 13, 2018: What Happens When You're Convinced You Have Bad Genes; *Science*, December 10, 2018: Just Thinking You Have Poor Endurance Genes Changes Your Body.

aps **Adrian Ward**, The University of Texas at Austin, *The New York Times*, December 2, 2018: Hide Your Phone When You're Trying to Work. Seriously.

Daniel T. Willingham, University of Virginia, *The New York Times*, December 8, 2018: Is Listening to a Book the Same Thing as Reading It?

Timothy Wilson, University of Virginia, *Scientific American*, December 19, 2018: The Brain's Autopilot Mechanism Steers Consciousness.

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aps **Coverage of research from an APS journal**

iCPS **ICPS Speaker**

🎧 **Podcast included in coverage**

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 institutes include 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 Dan Benjamin at rsf.genomics.school@gmail.com or Chris Bail at rsfcompsocsci@gmail.com.

Call for Psychonomic Society Journal Editors

Nominations are being sought for the position of Editor of three Psychonomic Society journals: Behavior Research Methods, Memory & Cognition, and Psychonomic Bulletin & Review. Nominations are due by February 15, 2019. New Editors will begin accepting manuscripts on January 1, 2020

For more information, please visit the Psychonomic Society's website at https://www.psychonomic.org/.

According to NSF, proposals might address topics in psychological

2019 RAND Summer Institute

The 26th Annual RAND Summer Institute (RSI) will take place July 8-11, 2019, in Santa Monica, CA. The application deadline is March 15, 2019.

The RSI will consist of two conferences addressing critical issues facing our aging population: the Mini-Medical School for Social Scientists on July 8-9 and the Demography, Economics, Psychology, and Epidemiology of Aging conference on July 10-11.

Interested researchers can apply for financial support covering travel and accommodations.

Visit RAND's website for more information and the application form at http://www.rand.org/labor/aging/rsi.html.

9th Annual Varda Shoham Clinical Scientist Training Initiative Grant Applications Open

The Society for a Science of Clinical Psychology (SSCP) has announced the 9th annual Varda Shoham Clinical Scientist Training Initiative grant program.

Applications are invited for small (up to $1500), non-renewable grants for training programs at the predoctoral, internship, or postdoctoral levels to launch new projects or support ongoing initiatives that are designed to more effectively integrate science and practice into their training program

We offer three different tracks for applicants: 1) conducting science in/on applied settings, 2) innovation in clinical science training or resources, or 3) value-added to the program. These tracks are aimed at maximizing the diversity of applications and awards given.

Applications are due by March 31, 2019, and funds will be distributed during the summer of 2019.

Application instructions are available at: http://www.sscpweb.org/page-18087.

NIH HEAL Initiative

The National Institutes of Health (NIH) has released a series of new funding opportunity announcements focused on the opioid crisis which may be of interest to the psychological science community. These opportunities, which are connected to the NIH HEAL (Helping to End Addiction Long-term) Initiative, will fund projects aimed at preventing opioid use disorder, improving opioid use disorder care, determining treatment for opioid use disorder, and helping determine how to manage opioid use disorder.

"NIH leadership from across the agency has been working diligently over the past several months to identify areas of greatest opportunity for research to address the national opioid crisis. The result is more than 30 new funding opportunity announcements … to solicit the best and brightest research ideas," said NIH Director Francis S. Collins, announcing the opportunities.

NIH has set aside over $850 million in 2019 to fund scientists studying opioid use disorder. To see the funding opportunity—many of which have deadlines in February 2019, visit www.nih.gov/research-training/medical-research-initiatives/heal-initiative/funding-opportunities.

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

A RURAL REACH FOR **STEM** EDUCATION

Martha Escobar

*Psychological scientist **Martha Escobar** of Oakland University's Cognitive and Behavioral Lab investigates the use of evidence-based approaches to promote scientific learning in low-income rural areas.*

What is the aim or rationale behind your National Science Foundation backed research project?

Our overall goal is to reach populations typically underrepresented in science, technology, engineering, and mathematics (STEM) to increase their interest and persistence in scientific careers. Our participants want to explore science, but lack the access and resources to attend available educational programs. Our programs use evidence-based educational approaches to allow students to understand the relevance and utility of science, and connect science to their own life experiences. Our research explores the elements of our approaches that promote success, which helps develop models for future interventions.

What types of student activities are you testing or studying?

We focus on investigating the impact of culturally-relevant, project-based learning to students' interest, motivation, persistence, and self-efficacy in STEM learning. For example, in some interventions, our students identify problems that affect *their* communities and work in teams to develop solutions for those problems. Considering that most of our students are from rural and low-income communities, we ask that their solutions are inexpensive, portable, and built with materials that are readily available. The solutions may be an actual device, an app, or an innovative way to use existing resources. Our programs provide extensive peer, near-peer, and vertical mentoring, along with a community of individuals with similar backgrounds and interests. We've found that even students who have high academic self-efficacy doubt their potential in STEM or the extent to which STEM would be useful for their future. The project-based approach allows them to better understand how science is made and who gets to do it. Many of our students will be first-generation high school graduates, and don't believe they can become scientists. We provide them with the opportunity to experience science not as another marginalizing barrier, but as inclusive.

Why the focus specifically on rural school districts?

Students who are in "at risk" groups (e.g. being from a racial/ethnic minority group, low income) and those who live in rural areas lag behind in meeting STEM benchmarks. In some areas of our country, those two factors intersect and their effect is multiplicative. Our initial efforts have focused on the "Black Belt" of the state of Alabama, an area that extends from East to West in the state and which encompasses 17 counties and 19 school districts. The area is not only marked by the high number of minority individuals that inhabit it, but also by high levels of poverty and low educational achievement (the Black Belt is often considered "the third world" of the United States). It also has some of the most devoted teachers and school officials, who are willing to invest time and resources to increase educational achievement in their schools.

What was your own experience with STEM education like?

My family moved to South America when I was little, and my K-12 education occurred in a place where math was considered the backbone of education, and access to computers and coding classes was provided even before computer education was widespread. My parents are engineers, and highly valued educational opportunities for their children. I had the incredible opportunity of becoming an undergraduate research assistant early in my college education, which allowed me to see first-hand how theoretical principles actually work, and how questions are answered through experimentation. That is the experience that I would like my students to have. ◉

See the full text of this interview online at www.psychologicalscience.org/ruralreach.

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