

WINTER 2018

#CMUPsych

DEPARTMENT OF PSYCHOLOGY
DIETRICH COLLEGE
OF HUMANITIES AND SOCIAL SCIENCES

Carnegie Mellon University

Mindfulness Meditation

We now know more about how mindfulness meditation works to improve health, thanks to two studies from Associate Professor David Creswell's lab.

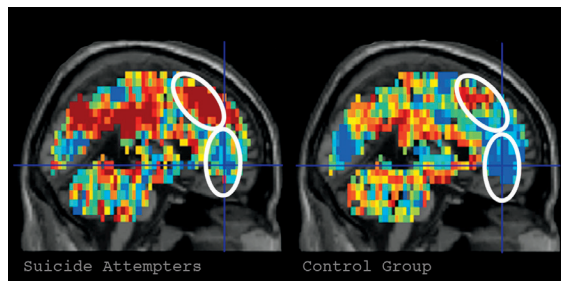
His team showed that mindfulness meditation training reduces Interleukin-6, and biological health-related benefits occur because the training alters brain network functional connectivity patterns. NBC Today Show correspondent Jenna Bush-Hager spent a day on campus going through an abbreviated program to demonstrate its effects.

Then, led by Emily Lindsay, who received her Ph.D. in May, they found that mindfulness meditation apps work to reduce stress if acceptance training components are included.



Children, Separated Parents and Health

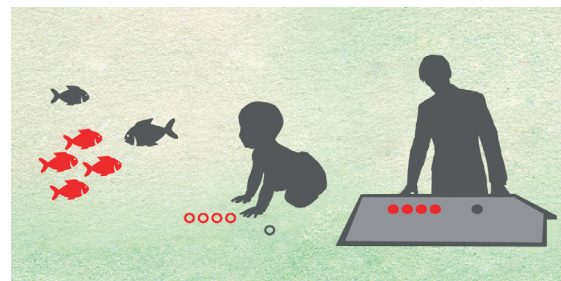
A team led by Sheldon Cohen, the Robert E. Doherty University Professor of Psychology, and Michael Murphy, a postdoctoral research associate, wanted to better understand if specific aspects of the family environment following a separation better predicted children's long-term health outcomes. Published in the Proceedings of the National Academy of Sciences (PNAS), they found that adults whose parents separated but did not speak to each other during individuals' childhoods were three times as likely to develop a cold when intentionally exposed to a common cold virus than adults whose parents had remained together or separated but continued to communicate.



Brain Imaging May Help Diagnosis

Researchers led by Marcel Just, the D. O. Hebb University Professor of Psychology, developed an innovative and promising approach to identify suicidal individuals by analyzing the alterations in how their brains represent certain concepts, such as death, cruelty and trouble.

"Our latest work is unique insofar as it identifies concept alterations that are associated with suicidal ideation and behavior, using machine-learning algorithms to assess the neural representation of specific concepts related to suicide. This gives us a window into the brain and mind, shedding light on how suicidal individuals think about suicide and emotion related concepts," said Just.



Subcortex Number Processing

Despite major brain differences, many species from spiders to humans can recognize and differentiate relative quantities. Adult primates, however, are the only ones with a sophisticated cortical brain system, meaning that the others rely on a subcortex or its evolutionary equivalent.

When it comes to number processing, Marlene Behrmann, the Cowan University Professor of Cognitive Neuroscience and Ph.D. student Elliot Collins found that the adult subcortex processes numbers at the same level as infants and perhaps other lower-order species. This study was published in PNAS.

FROM THE DEPT HEAD



The past year has been momentous in many ways. While we continue to focus on our core missions of education and research, we were also affected by events outside of academia. What inspires me is the degree to which our psychology community has responded in a variety of positive ways: our graduate students have developed an ongoing scientific outreach initiative for underserved middle and high school students, several of our faculty are working to deploy scientific analysis to congressional districting in Pennsylvania, others are learning to scientifically educate people about climate change and still others are working closely on a university-wide committee to improve and strengthen the CMU experience. Closer to home, we have formed a departmental diversity committee that is working to ensure that our department offers a diverse and equitable environment in which to pursue one's educational and scientific goals. It is vitally important that the atmosphere within Psychology is both welcoming and supportive for our entire community.

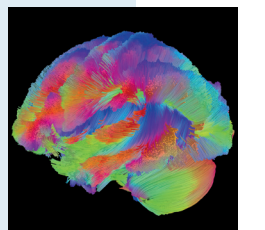
From an academic perspective, we are very proud of our students' successes, some of which you will read about in this issue of #CMUPsych. And our faculty continue to serve as leaders in the field with their numerous cutting-edge research accomplishments—many of which have been acknowledged by their election to honorary academies or elevation to fellow status in several different scientific societies. Across the department, discoveries have advanced our knowledge in a multitude of areas, including how we see, hear, think and act, how we socially relate to one another, how we maintain and improve mental and physical health, how we can more precisely measure brain function, how our brains recover from injury and how we learn as both children and adults. Our advances in basic science are also impactful in real-world application, for example, improving educational practice or helping to develop more intelligent computer vision systems.

The department is also changing and growing. As of this summer, distinguished long-term faculty members Ken Kotovsky and David Klahr will be moving to emeritus status, Sheldon Cohen will be moving to half-time status and Bob Siegler is accepting a faculty position at Teachers College at Columbia University. At the same time, we recently learned that Jessica Cantlon and Brad Mahon, currently at the University of Rochester, have accepted offers. Jessica and Brad are two of the top young scientists in their respective fields of developmental neuroscience and neuropsychology, and we very much look forward to their joining our faculty. We also welcomed back Charles Kemp, who spent the past year as a visiting faculty member in Australia. We are also actively seeking new assistant professors across every area of the department and will, hopefully, look forward to several additional new colleagues this fall.

Finally, I wish to thank our wonderful alumni and other friends of the department. Through their generosity we have been able to create several new sources of support for both education and research, including the annual Hebert A. Simon Innovation fund, the annual Chase Young Investigator Award and Lecture, the Centennial Fund for the support of graduate students and the Ireland Award in support of undergraduate research.

Michael J. Tarr
Head, Department of Psychology

FOR MORE INFORMATION:
<https://www.cmu.edu/dietrich/psychology>



ON THE COVER
Image of connections in the human brain. Courtesy of the Cognitive Axon Lab.



From Psychology Major to Data Scientist



In April 2015, Bauer was recognized at the Order of the May, a celebration which honors individuals who demonstrate an extraordinary degree of loyalty by giving to CMU each fiscal year.

Data scientists offer a blend of analytical and soft skills to make a huge impact. Beth Bauer (DC'89) said her unique combination of studies at Carnegie Mellon University could not have prepared her more for her 25-year career.

As a panelist for the Dietrich College of Humanities and Social Science's Under Construction event, Bauer told current sophomores that she used to describe her role as being a data detective before the term data scientist became common. Using a scientific method and figuratively taking a magnifying glass to organizational data, she is able to reveal the sources of opportunities and to measure the effectiveness of solutions.

CMU alumni events, like Under Construction, help Bauer revive an enthusiasm for learning, which she can remember well as a college student. A double major in psychology and professional writing, she minored in statistics and gained a passion for all things data from the late internationally acclaimed statistician Stephen E. Fienberg.

"My very first class in statistics was with Fienberg, who was like the Indiana Jones of statistics. He made data seem like it was an adventure, and I have not lost that feeling throughout my entire career," Bauer said.

Today, Bauer is director of advanced analytics at IQVIA and leads a team that analyzes health care data with a focus on pharmaceutical retailers with her manager Rich Loughery, director of delivery and services for IQVIA's U.S. supplier services.

"Beth is particularly well suited to this role through her background combining statistics and computing, an insatiable curiosity and an ability to communicate complex methods to any audience type. The key skill enabling her success is her ability to transfer insights from any variety of prior projects or news and use this information to feed future methods or avenues of data mining. What we've done in the past enhances, not limits, future analytics," Loughery said.

A focus of Bauer's current work is medication adherence therapy because data analytics identify this as a big problem for patients, who become sicker, and the health care industry, whose costs increase, when patients do not follow prescription instructions.

"Understanding the psychology of decision making is helpful when deep diving into the data to more fully understand why patients may not take their medications correctly. We analyze geographical, pay type and socio-demographic factors, then guide customer solutions by identifying the types of outreach programs that could either help patients adhere to their medications or at least better understand the trade-offs they are making," Bauer said.

As an undergraduate student in psychology, Bauer's education was well grounded in data analysis. While at CMU, she had to learn how to create metrics for conducting social psychology research and understand group and groupthink dynamics, along with decision science.

Trends show that organizational decision-making will become more heavily based on business intelligence from massive amounts of information acquired from a growing number of sources.

Data science translates into a fulfilling career for Bauer, who loves her job.

"With data on hand, I can almost always find something of value that can be improved in a business process," she said.

Listening Into 2030

Recent advances in hearing therapies and prosthetics are paving the way for new technologies in speech communication and the hearing sciences. And Carnegie Mellon University's Casey Roark is helping create a roadmap that will guide the next 14 years of development.

Roark studies ways to simplify learning challenges—like grasping the sounds of a new language—for listeners. Her strong research background is one reason she was selected as one of only eight early career researchers among 40 attendees at the recent Listening Into 2030 workshop in Berkeley, California.

"It feels amazing to have been given this opportunity and to have my voice counted among these senior researchers," said Roark, a graduate student in the Department of Psychology and the Center for the Neural Basis of Cognition (CNBC).

She added, "It is always important to keep our eyes on the future goals of the field as a whole."

At the workshop, researchers focused on ways to restore or improve hearing for those who are hearing impaired and planned strategies to enhance sound experience for normal-hearing individuals.

For instance, they asked big questions about the implications of personalized hearing aids and thought-controlled home appliances. Participants also discussed the potential for a device that can track what a listener is trying to pay attention to—for example, a friend's voice in a noisy bar—and increase the signal of the friend's voice while pushing sounds from the environment to the background.

CMU's Lori Holt, a well-known expert in auditory cognitive neuroscience,

noted that the goal of the event was to "imagine the unimaginable."

"Intensive, forward-thinking workshops like Listening Into 2030 are rare. But they are incredibly productive and impactful. They require bold, out-of-the-box thinking and a willingness to cross traditional disciplines. CMU fosters excellent students like Casey by creating an environment that values just this kind of approach," said Holt, professor of psychology and Roark's Ph.D. adviser.

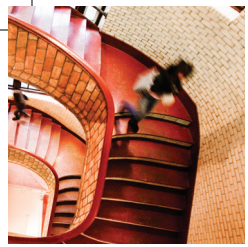
Roark believes her CMU education prepared her to hold her own with top scientists and Silicon Valley leaders who are innovating auditory technology.

"My experience at this workshop was absolutely consistent with my experience at CMU. Our professors are here for guidance and advice, but Ph.D. students are the main drivers of our own research and ideas," said Roark.



"My experience at this workshop was absolutely consistent with my experience at CMU. Our professors are here for guidance and advice, but Ph.D. students are the main drivers of our own research and ideas."

CASEY ROARK



UnderGrad Spotlights

“Hands-on research involvement is at the core of the CMU educational experience, and our undergraduate psychology program.”

Michael J. Tarr, head of the Psychology Department

Isabel Bleimeister

While she was in high school, neuroscience major Isabel Bleimeister discovered how much she enjoyed environments that foster creativity and innovation. Now a senior, Bleimeister is working with Marlene Behrmann, the Cowan University Professor of Cognitive Neuroscience, to learn more about subcortical visual processing.

She spent the summer getting a head start on her senior honors thesis in the Dietrich Honors Fellowship Program. Under Behrmann’s guidance, Bleimeister is trying to determine what subcortical structures are involved in processing primitive visual stimuli.

Behrmann previously uncovered a monocular advantage when presenting participants with images of dots varying in number and orientation and using a Wheatstone stereoscope to bisect their vision.

“The specific subcortical structures involved in this visual processing are not currently known, but it is likely that the superior colliculus is the portion of the brain involved,” Bleimeister said, adding that because it does not receive signals from short wavelength cones, purple stimuli are invisible to it.

For her project, she is presenting individuals with purple-tinted images of dots to determine whether these purple images are unable to uncover the same monocular advantage effect uncovered by greyscale images.



Zeyneb Majid

Zeyneb Majid, a psychology major with an independent drive, is spending her senior year trying to understand how resistance to communal coping impacts health outcomes for young adults with Type 1 diabetes.

Majid is specifically interested in why young adults with Type 1 diabetes in romantic relationships struggle to share the burden of their illness with their partners. Psychology Professor Vicki Helgeson is advising Majid for the Dietrich Honors Fellowship Program.

“I hope to identify variables that predict whether one copes communally, such as socioeconomic status and cultural background. And, I would like to examine the consequences of failing to adopt a communal coping perspective among those with Type 1 diabetes,” Majid said.

Majid believes that her findings could help healthcare professionals better disseminate information on optimal coping styles and ways that loved ones can provide support.



Lauren Yan

Senior Lauren Yan is taking advantage of CMU’s Children’s School, a laboratory school that focuses on hands-on learning for children between the ages of 3 and 5. Yan, a cognitive science major, is working with Sharon Carver, director of the Children’s School, to investigate whether independent learning or guided learning better helps to facilitate memory skills in preschool-aged children.

Yan’s project involves having children play a memory game and observing whether their performance improves in different conditions, with or without prompting. She’s also considering conducting the experiment at a preschool in South Korea.

“If the cross-cultural aspect of the project is successful, I will use the results to further develop hypotheses as to how culture affects the way children learn and develop,” said Yan. “The project combines two of my major interests, children and foreign cultures, which is why I find it exciting and interesting.”



Alyssa Aburachis

Aburachis, a science and humanities scholar who is majoring in neurobiology and psychology, is working in Erik Thiessen’s Infant Language and Learning Lab to investigate the effect being raised in a bilingual environment has on children’s attention spans. Specifically, she is trying to find out at what point during development that bilingual children between the ages of two and seven are able to control and sustain their attention better than their single language speaking peers.

“Attention and other ‘executive function’ abilities are tremendously important for learning, especially in school settings – for example, it’s hard to learn if you can’t pay attention or are easily distracted,” said Thiessen, associate professor of psychology. “If we can figure out when that difference emerges, we can start to figure out why it’s emerging - whether it’s about experience, linguistic competence, maturation or something else.”



"I love doing my research, but I also love working with such bright students, both graduate and undergraduate students, and training them in how to do good research."

BROOKE FEENEY

Psychology of the Heart

Like Andrew Carnegie, Psychology Professor Brooke Feeny's heart is in the work.

In Carnegie Mellon University's Relationships Lab, Feeny studies close relationships and how social interactions can affect the health and wellbeing of the people in the relationships and of the relationships themselves, both immediately and over time.

Her current work focuses on relationships in all stages of life, from a longitudinal study on newlyweds and the factors that predict their health and happiness to one that gives needed attention to retirement-age couples and how their relationships and social behaviors can impact health and life expectancy.

As an undergraduate, Feeny expected to pursue a career in counseling and treatment of psychological problems. However, after her first taste of research completing a thesis on how the presence of a loved one can buffer physiological reactivity in stressful situations, Feeny changed her path to follow her curiosity.

"That was when I discovered that I love research. I love the process of being able to ask interesting questions, develop methods for finding the answer, then analyze the data to discover and understand the answer," Feeny said. "The more research you do, the more interesting questions arise. Each study brings about additional questions to answer in order to understand a process completely."

The research is only part of what keeps Feeny excited about her work. The other half is the opportunity to mentor students.

"I love doing my research, but I also love working with such bright students, both graduate and undergraduate students, and training them in how to do good research. We usually have 15 to 20 undergraduates working in the lab each semester, and many go on to complete a thesis for

the Senior Honors Program and attend highly-ranked graduate programs. It's so wonderful to see them succeed," Feeny said.

Alumna Jaelyn Ross (DC '15), who is currently pursuing a graduate degree at University of California, Los Angeles, attested to Feeny's dedication as a mentor.

"As my honors thesis advisor, Brooke dedicated many hours to meeting with me to help refine my research questions, teaching me sophisticated statistical methodology, and helping to shape my academic writing," Ross said. "Working in Brooke's lab shapes students into theoretically grounded researchers with a strong appreciation for methodologically rigorous research, and these are qualities that really come in handy in graduate school."

Brittany Jakubiak, who just earned her Ph.D. studying under Feeny agreed, and said, "As a mentor, she is knowledgeable and a great academic resource as well as kind and encouraging. I have benefited immensely from this rare combination."

Supportive Relationships Linked to Willingness to Pursue Opportunities

Feeny's most recent study showed that people with supportive spouses were more likely to take on potentially rewarding challenges and that those who accepted the challenges experienced more personal growth, happiness, psychological well-being and better relationship functioning months later. Multiple media outlets covered this work, including five CNBC network articles.

Design Cognition's Dynamic Duo

Brainstorming ways to improve access for individuals with disabilities. Designing peanut-shelling devices for use in villages without electrical power. Building bridge trusses under challenging—and changing—conditions. These are just a few applications of design cognition, which taps into the thinking processes of designers as they approach difficult problems.

The field has been pioneered by two people: Carnegie Mellon University's Ken Kotovsky and Jon Cagan. Through their 24-year partnership, they have worked at the intersection of psychology and mechanical engineering, using their understanding of the cognitive processes involved in human problem solving to improve engineering design.

The two connected through their mutual admiration of the late Nobel and Turing Award laureate and CMU Professor Herbert A. Simon, who advised Kotovsky on his Ph.D. and inspired Cagan to view design as a problem solving technique. In fact, Simon is credited with introducing the notion of "design thinking" in his 1969 book, "The Sciences of the Artificial."

"We initially thought it would be fun to do something together as friends, but the collaboration turned out to be much more useful than we thought," said Kotovsky.

Over the past two decades, Kotovsky and Cagan, professor of mechanical engineering in the College of Engineering, have jointly advised seven Ph.D. students in both mechanical engineering and psychology.

Kate Fu credits Kotovsky and Cagan with helping to shape her holistic approach during her time as a graduate student in mechanical engineering at CMU, where she received her master's degree in 2009 and her Ph.D. in 2012.

"If you've spent your whole career only taking engineering classes, you tend to forget—or ignore—that engineers are humans," said Fu, assistant professor of mechanical engineering at Georgia Tech. "In working with psychology concepts, you realize that no matter what we invent, there will almost always be a human implementing, using, or experiencing that invention; that human aspect cannot be ignored."

The human element is what prompted Jarrod Moss to transfer from an engineering major at another university to study cognitive science at CMU. Moss worked alongside Kotovsky and Cagan as an undergraduate student through the completion of his Ph.D. and postdoctoral research.

"The approach to studying the human mind as a computational system is something I learned at CMU," said Moss, now an associate professor of psychology at Mississippi State University.

In addition to jointly advising graduate students, Kotovsky and Cagan have co-authored roughly two dozen papers.

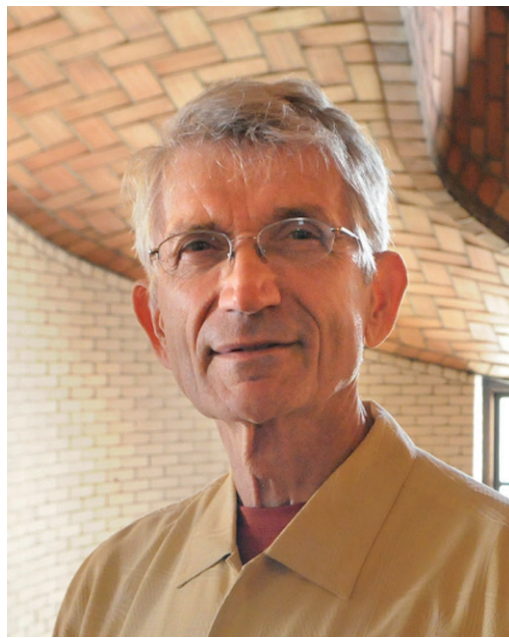
Five of their publications have earned Best Paper Awards at design conferences, including the International Conference on Design Computing and Cognition, where they were recently recognized for their contributions to Chris McComb's "Utilizing Markov Chains to Understand Operation Sequencing in Design Tasks."

In September, the Psychology Department threw Kotovsky a party to celebrate achieving emeritus status.



"We initially thought it would be fun to do something together as friends, but the collaboration turned out to be much more useful than we thought."

KEN KOTOVSKY



Revolutionizing the Study of Talk

The advent of systems such as Google, YouTube and Wikipedia has made it seem as if all types of information are accessible at all times. Yet, for people who study spoken language in realistic conversations, none of those resources really help.

To address this gap, Carnegie Mellon University Psychology Professor Brian MacWhinney has spent the past three decades constructing ways to study how we learn, use and understand spoken language. In the process, he has collaborated with researchers across the world and received continual funding from the National Science Foundation (NSF) and the National Institutes of Health (NIH), and with support from hundreds of researchers in 48 countries, he has built a system

called TalkBank, a network of databases that has revolutionized the study of human communication and advanced the development of standards and tools for researchers to use to create, share, search and comment on source materials.

“As possibly the most complex psychological process, conversation is fascinating in itself, but we also want to understand how we can use this understanding to help people with and without language disorders communicate more effectively,” said MacWhinney. “There are times when our communications are misunderstood, whether in the context of different cultures, genders or race or because of an injury or disorder. To understand the various ways in which conversation can break down and to address these problems, we need to understand the basics of talk itself.”

Most TalkBank transcripts are freely available to the public at <http://talkbank.org>.

The TalkBank system is being used by researchers in many disciplines—including linguistics, psychology, speech pathology, sociolinguistics, education and computer science. The clinical populations studied within TalkBank include aphasia, dementia, right hemisphere disorder, traumatic brain injury, autism and stuttering. Other populations and situations include classroom discourse, child-parent interactions in the home, second language learners, bilingual code-switching, U.S. Supreme Court oral arguments, lectures, dialogs in groups of friends, dialogs in work groups and many others.

All TalkBank data are transcribed in the same format for analysis with the same set of computer programs. “By putting everything into the same formal system, we have created a standard way to collect and analyze talk,” said MacWhinney.

The oldest of the 12 projects under the TalkBank umbrella is CHILDES, which began in 1984 and which provides transcript and media data for the study of child language development. CHILDES includes 59 million words of transcript data from children learning 24 languages. More than 8,000 articles have been published based on the use of CHILDES data and TalkBank programs. Most TalkBank transcripts are freely and openly available to the public and the audio and video to which they are linked at the utterance level can be directly replayed over the Internet through searches that can begin at <http://talkbank.org>.

These data are helpful to researchers on various levels, from micro-analysis that looks at less than one minute of conversation to macro-analysis of big data across thousands of transcripts. In the ideal case, researchers can hypothesize and spot interesting patterns through micro-analysis and then proceed to test the generality of these patterns through macro-analysis.

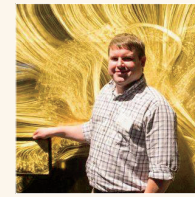
“For example, this interplay between micro- and macro-analysis can be especially useful when you want to explain why something happens in conversations, such as the male-female balance in conversation and who interrupts each other more, when, and why,” MacWhinney said.

Applications for TalkBank are still unfolding with several very new projects. One such project focuses on language in dementia. Recently, 24 tech groups from around the world, including Apple, IBM, and research groups in Israel, Singapore, Japan and elsewhere have requested access to DementiaBank data to train their computational algorithms to spot when people start to display the features of dementia.

“I never would have thought these data would be used for this, and I’m quite curious to see how well they will do,” said MacWhinney.

A second new project, called HomeBank, collects daylong audio records in the home to study how patterns of parent-child interaction vary between social groups, families, languages, and types of children. And FluencyBank examines why it is that the majority of children who are disfluent before age six end up normally fluent, whereas 25 percent of the children who are disfluent at this age end up with long-term patterns of disfluency and stuttering.

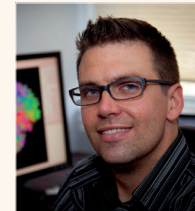
MacWhinney says that there are four basic principles that have been crucial to the success of TalkBank: the commitment of researchers to open sharing of the products of their research; an emphasis on the roles of multiple disciplines for fully understanding the emergent nature of language, talk, and conversations; the integration of the data from hundreds of projects into a single consistent format; and the responsiveness of TalkBank to the research practices and needs of particular research communities.



Research scientist **John Pyles** collaborated with artist **Greg Dunn** on “SELF REFLECTED,” A GILDED MICROETCHING OF A SAGITTAL SLICE OF THE HUMAN BRAIN that is now part of the permanent collection at the Franklin Institute in Philadelphia.



Marlene Behrmann received the LADIES HOSPITAL AID SOCIETY (LHAS) EXCELLENCE IN EDUCATION AWARD and was one of six internationally acclaimed women scientists whose accomplishments were celebrated at the Inspiring Women in Science event at Brown University.



Christian Lebiere, a research psychologist, is part of a team that has received a \$6.2 MILLION MULTIDISCIPLINARY UNIVERSITY RESEARCH INITIATIVE (MURI) GRANT from the Department of Defense to prevent cyber attacks.

Timothy Verstynen, associate professor of psychology, was named a 2017 YOUNG SCIENTIST FOR THE WORLD ECONOMIC FORUM.

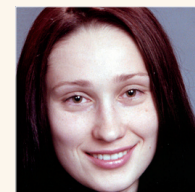


The Federation of Associations in Behavioral & Brain Sciences honored Psychology Professor **Brian MacWhinney** and **Robert Siegler**, the Teresa Heinz Professor of Cognitive Psychology, AS SCIENTISTS WHO HAVE MADE IMPORTANT AND LASTING CONTRIBUTIONS TO THE SCIENCES OF MIND, BRAIN AND BEHAVIOR.

Vicki Helgeson, professor of psychology, was named a FELLOW OF THE SOCIETY FOR PERSONALITY AND SOCIAL PSYCHOLOGY.



Roberta Klatzky, the Charles J. Queenan Professor of Psychology, was elected into the AMERICAN ACADEMY OF ARTS AND SCIENCES AND AS A FELLOW OF IEEE.



Michael J. Tarr was selected as a FELLOW OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The National Institutes of Health (NIH) has RENEWED B-SQUARED, A PREDOCTORAL TRAINING PROGRAM IN BEHAVIORAL AND BRAIN RESEARCH that is co-directed by Psychology Professor **Lori Holt**.

Anna Fisher, associate professor of psychology, received a FOUR-YEAR, \$751,000 NATIONAL SCIENCE FOUNDATION SCIENCE OF LEARNING GRANT to study the effect of pictures in books for beginning readers.

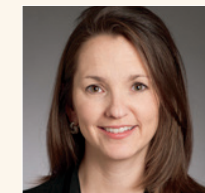
Kasey Creswell, assistant professor of psychology, received a FIVE-YEAR, \$1.9 MILLION GRANT FROM THE NIH’S NATIONAL INSTITUTE ON ALCOHOL ABUSE AND ALCOHOLISM to study the effects of alcohol in young adults.

Herbert A. Simon Innovation Fund in Psychology

Thanks to the generosity of an anonymous donor, a new endowed fund has been established to enable high-risk pilot research, support workshops that introduce new ideas and ensure the availability of novel research tools.



The American Psychosomatic Society selected **David Creswell** as the recipient of its 2017 HERBERT WEINER EARLY CAREER AWARD.



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Community Outreach



Recently, CMU Psychology graduate students hosted and presented workshops designed to engage middle and high school students from educationally underserved Pittsburgh communities.

The students participated in activities based on social, developmental and cognitive psychology research and learned about psychology degrees and potential career paths.