



Spring 2015

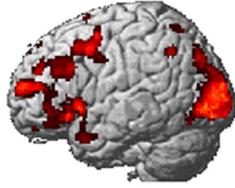
#CMUPsych

DEPARTMENT OF PSYCHOLOGY
DIETRICH COLLEGE
OF HUMANITIES AND SOCIAL SCIENCES

Carnegie Mellon University



HAPPY



SAD

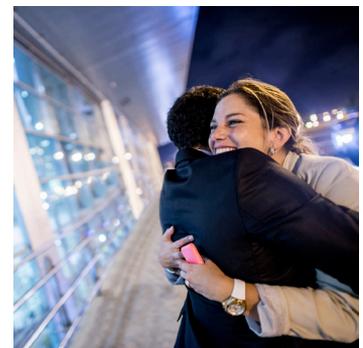
Identifying Emotions > *Discover* magazine, *CBS News*, *NBC News*, *USA Today* and many other news outlets covered Professor Marcel Just's research that identified which emotion a person is experiencing based on brain activity. Just collaborated with Social and Decision Sciences Professors Karim Kassam and George Loewenstein to extend his neural-decoding research from concrete objects to feelings by applying machine learning techniques to fMRI data.

The New York Times featured Associate Professor Anna Fisher's research that showed how heavily decorated classrooms can disrupt attention and learning in young children.



CMU in DC > Last fall, the White House Office of Technology Policy recognized CMU's investments in its new BrainHub initiative, an effort to link brain structure and function to behavior via application of computational and engineering approaches. Pictured above are Psychology Professor Marlene Behrmann, Department Head Michael J. Tarr and Interim Provost Nathan Urban at the event. Earlier this year, Professor John R. Anderson attended a White House workshop on bridging neuroscience and learning. For more on BrainHub, visit www.cmu.edu/research/brain/.

Hug-a-day keeps stress away > Recent articles in *Scientific American*, *Salon* and the *Pittsburgh Post-Gazette* profiled Professor Sheldon Cohen's decades-long work about how stress and social support affect health. Cohen's most recent discovery — that hugs protect against stress and infection — appeared in more than 200 news publications, including the *Washington Post*, *PBS NewsHour* and *Popular Science*.



FROM THE DEPT HEAD



Welcome to the inaugural issue of #CMUPsych (read as “Hashtag CMU Psych”) — a name that reflects both the department’s rich intellectual history over the past century and our forward-thinking outlook for the coming century. In these pages we are pleased to introduce you to some of our current crop of stellar students, teachers and researchers. We also hear from distinguished alumnus, Patrick Cavanagh, who received a Ph.D. in cognitive psychology in 1972 and whose thoughts inspired the cover image.

In the slightly-more-than one year I have been honored to serve as head of the department, I have been struck by how much all of our members are constantly updating themselves — continuing the department’s long tradition of intellectual leadership. The number of new discoveries emerging from our research is truly breathtaking. Moreover, our faculty are committed to conveying their cutting-edge science to each new generation, and it is gratifying to see how many of our students receive hands-on experiences both in the classroom and the laboratory.

We are also working to extend our impact by partnering with many other units on campus in university-wide initiatives. Under the leadership of President Subra Suresh, two new strategic initiatives include participation of many of our faculty and reflect the department’s primary research interests. First, the **Simon Initiative** is focused on educational innovation based on core principles of learning advanced by many of our faculty, as well as being inspired by the work of the late Herbert A. Simon. Second, the **BrainHubSM Initiative** is focused on bringing together faculty from across the university and across the world to advance research in the neural and psychological sciences and to have real-world impact in addressing the ever-increasing challenge of brain and behavioral disorders. Within CMU, BrainHub is creating opportunities for our psychologists, cognitive scientists and neuroscientists to work together with our world-class computation, artificial intelligence and engineering faculty.

I am also pleased to note that, as reviewed at the end of this issue, our faculty continue to receive tangible acknowledgement of their high-quality science, with many of our colleagues receiving major new awards or honors. And Professor Tim Verstynen and I have taken our first steps toward Hollywood stardom, appearing in the documentary film *Fastball*, which recently premiered at the Tribeca Film Festival.

Finally, the department is gearing up to celebrate its 100th (!) anniversary. Throughout the 2015-2016 academic year we are planning a variety of events, including an anniversary-themed speaker series featuring former students and friends of the department. We are also planning a two-day celebration in the spring of 2016. If you are interested in attending or learning more about other planned events, please visit www.psy.cmu.edu/100years for more information. I am very much looking forward to meeting many of you over the coming year.

Sincerely,

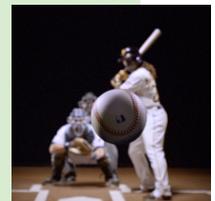
Michael J. Tarr
Head, Department of Psychology

FOR MORE INFORMATION:

BrainHub - www.cmu.edu/research/brain/

Simon Initiative - www.cmu.edu/simon/

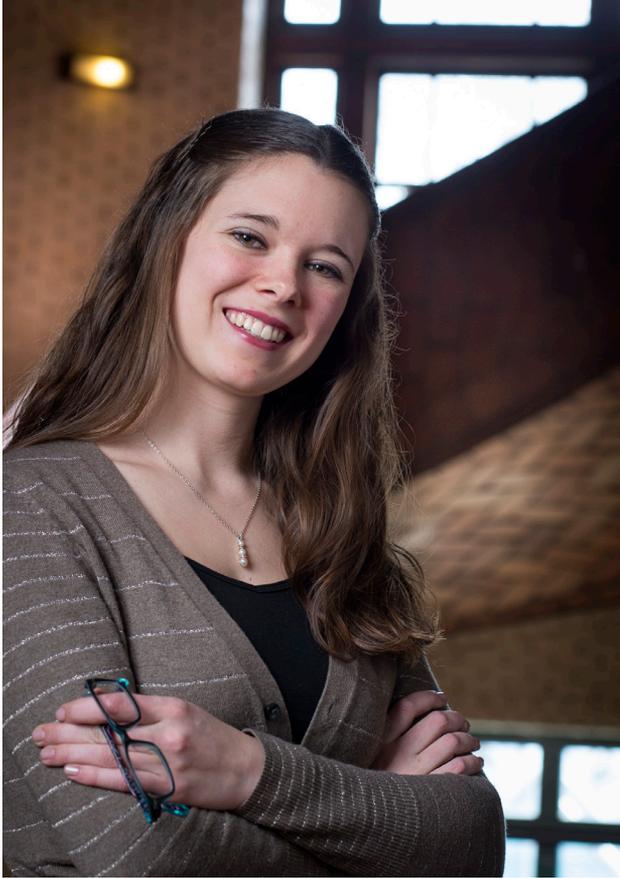
Fastball - www.cmu.edu/news/stories/archives/2015/april/scientists-in-fastball.html



ON THE COVER

Alumnus Patrick Cavanagh compares how the visual brain works to artists, saying they “become neuroscientists, discovering how to foil the visual brain, for their own purposes, thought.”

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Aspiring and Ambitious

BY CARILLON SKRZYNSKI

Anna Vande Velde is one driven young lady. Hailing from Cassadaga, N.Y., a farm-town of only 600 people, she came to Carnegie Mellon University for its highly-rated psychology program in order to work in the field of child development. This is an aim she's had in one manner or another since a young age.

"I've always loved working with children," Vande Velde reflected. "I took the babysitting course at 11, the youngest age that was allowed. My experiences really inspired me to gain knowledge of what is the best care for children and how to disseminate that knowledge to the world."

Aspiring to become a clinical psychologist and work with children who have been diagnosed with Autism Spectrum Disorder, Vande Velde has continually strived in her education as a psychology major to reach this objective. She has pursued this through the classes required for her psychology major as well as through her not one, but two senior theses, the combination of which is a feat in itself.

"It is extremely rare for a student to take on two year-long thesis projects simultaneously. I actually cannot recall

when — or if — a senior has taken on this kind of challenge before," said Joseph E. Devine, associate dean of the Dietrich College of Humanities and Social Sciences.

The first of Vande Velde's two projects is within the Psychology Department under David Plaut, professor of psychology and computer science. It explores the "chunking hypothesis" that the brain stores information in chunks and forms a hierarchy of these chunks as it processes inputs. Vande Velde is developing a more parsimonious account that uses general learning principles in an artificial neural network to learn to be sensitive to the hierarchical structure in visual displays in the same way that human learners are.

In contrast, Vande Velde's second thesis — through the Dietrich College's Senior Honors Program — is the result of collaborations with Craig Liden from the Being Well Center in Gibsonia, Pa. and Psychology Professors Anna Fisher and Erik Thiessen. This project is designed to develop and assess a new diagnostic tool for attention deficit hyperactivity disorder (ADHD). To help validate the tool, she

first used it to assess 40 CMU undergraduates who have not been diagnosed with ADHD. She then analyzed the results and compared them with results from people who have an ADHD diagnosis.

Preliminary results indicate that the test does reveal significant differences between the groups — however, further evaluation is necessary to assess the test's direct usefulness in ADHD diagnosis.

Vande Velde's ambitious pursuits have only increased with her time at Carnegie Mellon, but her passion for psychology suggests she will meet her lofty career goals.

"Anna is one of the most dedicated and energetic students I've ever worked with, and no matter how complicated the request or how difficult the task, she's always 100 percent committed to it, and she always perseveres," said Thiessen, associate professor of psychology and director of the department's undergraduate program.

Inaugural Ireland Undergrad Research Awards

Senior **Anna Vande Velde** and Sophomore **Adam Dickter** have been selected as the Psychology Department's inaugural recipients of the Ireland Undergraduate Research Awards.

The awards, funded by an endowment from the George and Elizabeth Ireland family, were established to support high-quality undergraduate research projects. Vande Velde and Dickter will each receive \$1,500 to support their work.

Vande Velde's award will support her senior honor thesis with Professors Anna Fisher and Eric Thiessen on developing a new ADHD diagnostic tool. Dickter is working with Professor Marlene Behrmann to test brain areas involved in facial recognition to understand how the two halves the brain cooperate in processing visual input.



Graduate Student Spotlight: Emily Lindsay

BY LAURA PACILIO

When fourth year Ph.D. student Emily Lindsay began practicing yoga in college, it completely changed her life. After just a few weeks, she was less stressed, sleeping better and more productive in her classes. She became fascinated by the mind-body connection and has spent much of her time at Carnegie Mellon University investigating how people can manage their thoughts and feelings to improve their health.

Lindsay is currently studying mindfulness meditation, a practice that helps people cultivate both awareness and acceptance of their present moment experiences. Many researchers, including her advisor Associate Professor of Psychology J. David Creswell, have repeatedly shown that mindfulness can improve both mental and physical health. Now, Lindsay is attempting to determine how.

Over the past year, she worked with world-renowned mindfulness instructor, Shinzen Young, to create three training programs that separate mindfulness' acceptance and awareness components. For her dissertation, Lindsay will test which — acceptance only, acceptance and awareness, or a control — is most effective at helping older adults manage their stress.

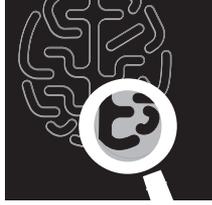
“By separating mindfulness into its components, we can get a better understanding of how and why it works,” explains Lindsay. “We think acceptance is the critical piece, so we’re expecting the program that teaches both awareness and acceptance to reduce stress the most.”

She added that, “The programs are delivered through a smartphone app, which is exciting because if the mindfulness program is effective for reducing stress, it can be distributed widely to make mindfulness training more accessible.”

After graduation, Lindsay wants to continue studying mind-body interventions, perhaps in the health care system as a form of preventative medicine and says that CMU is preparing her well for this kind of career.

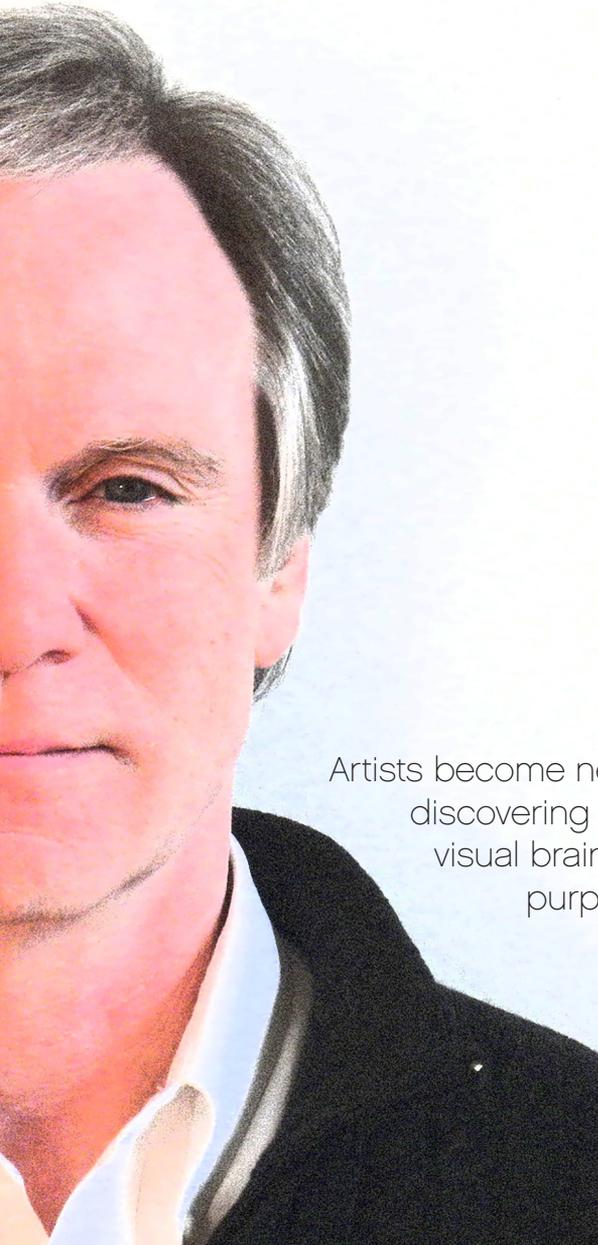
“Pittsburgh is a health psychology hub, and I’ve been given a lot of opportunities at CMU that I think are setting me up well for the future,” she said.





Alumni Q&A with Patrick Cavanagh

BY SHILO REA



Artists become neuroscientists, discovering how to foil the visual brain, for their own purposes, thought.

Patrick Cavanagh (DC'72) started out as a computer and electrical engineer, but an interest in artificial intelligence led him to Carnegie Mellon University where he could study "the really big computer." Since receiving his Ph.D. in cognitive psychology from CMU, Cavanagh worked on aspects of memory and now focuses on how the visual perception system constructs our three-dimensional world. He is currently on the faculty at Harvard University and Université Paris Descartes.

Cavanagh calls vision research "an adventure of discovery, full of surprises and challenges, with the ever-pleasant company of hardy, ingenious colleagues and students." He recently answered questions for #CMUPsych on his career, the future of brain research and his time at CMU.

In a 2005 *Nature* paper, you compared how the visual brain works to how an artist's work reflects how we see, saying that they "act as research neuroscientists." Could you elaborate?

Artists discovered how to make us "see" things that of course aren't really there: objects in paintings and drawings, light, shadow, space. All of this is usually accomplished on flat surfaces with variation in pigment and line. Some of this magic occurs simply because the pattern of pigments on the painting mimics the pattern of light we would see if we looked at the actual object.

However, many aspects of art deviate from this simple copying and still work. That's where artists become neuroscientists, discovering how to foil the visual brain, for their own purposes, thought. They are only inadvertent neuroscientists. For example, line drawings, one of the first styles of art from cave walls, can capture the sense of a scene and the interposition of objects. But there is no way for this meaning of taking lines as boundaries to evolve in nature: There are no lines around objects in the real world.

This style works because the edge detectors of the visual system are designed to pick up light/dark edges that mark the normal boundaries of objects. By chance, they also respond to lines and so give meaning to drawings that could never occur naturally. Artists discovered that their line sketches could capture the sense of object shape and in doing so revealed to us, much later on, an important property of visual neuroscience.

Similarly, painters will often bend the rules of physics in paintings by including impossible shadows, shapes or reflections, all to make the composition more effective. Importantly, many of these deviations go unnoticed by viewers — these undetected errors are the ones that tell us which rules of physics actually count for visual perception and which are ignored by the brain. After all, the brain cannot check all rules of physics, all possible clues about where the light is coming from or what should actually be in a reflection. There isn't time. As artists find the rules they can break without penalty, they act as research neuroscientists, and we have only to look at their paintings to uncover the short cuts used by our brains in responding rapidly to the scenes around us.

A SCREEN CAPTURE FROM A DEMONSTRATION ON CAVANAGH'S WEBSITE THAT SHOWS WHY OUTLINES ARE INSUFFICIENT TO CARRY SHADOW BORDER INFORMATION.



With both the U.S. and Europe declaring brain research as a priority, what do you think are the most needed and realistically possible outcomes?

The U.S. BRAIN Initiative at \$4.5B over 12 years and the now controversial European Human Brain Project at \$1.6B over 10 years are encouraging steps but are not yet a signal that neuroscience is a priority among other sciences. These new initiatives are much deserved for a rapidly advancing field that is overcoming pathologies, improving quality of life and extending neuroscience into new areas of applications.

But in fact, this amount will not get us far. Let's put it into perspective. Last year all of U.S. neuroscience received only \$5.5B, about 15% of the NIH budget, divided among 16,000 projects (so about \$0.3M each). These new brain-oriented programs will not add much to that (maybe 10% increase).

Let's look at the individual science projects that get real money: the Large Hadron Collider, \$9B, the ITER fusion reactor, \$7B, the Cassini-Huygens satellite \$3.3B, and development for just one drug, Lipitor, \$4B. And these are dwarfed by the \$100B it took to land on the moon.

For the moment, there is nowhere near this level of funding to, how should we say it, land science on the brain. So these new initiatives are encouraging, but neuroscience is still, inexplicably, a small player in science funding. It deserves real priority with top-level funding.

What is the most exciting thing about your job as a faculty member and researcher?

The most exciting thing is opening students' eyes to the wonders of the brain. Showing them that these wonders can be accessed and some even understood. I am always thrilled to work with colleagues, students and faculty on new ideas where off-the-wall suggestions are followed up and tracked down. Seeing students develop their own passion for science is an enormous reward and of course the only real downside is that they then move on to work elsewhere. I watch them as they form their own groups and scientific goals and hope their journey is as adventurous and fulfilling as mine.

Did you have a favorite professor, mentor or class at CMU that helped shape your career?

Well, first, I would have to thank Dean Swank, dean of Student Affairs at the

time, for guiding a lot of us through troubled but exciting times. His patience in dealing with our high crimes and misdemeanors was epic.

But that just allowed me to have a career, it was my advisor Bill Chase who really changed my understanding of science and gave me a sense of pure joy in using experiments to answer questions. Bill unfortunately died only a few years after I left, and while he was still very young. He is remembered in many ways around the CMU campus but I will always remember him for his gruff laugh and endless bravado in the face of any experimental problem. The real outcome was always in reach, every obstacle was merely a sign that we were getting closer, and the final result when we got it was cause for big smiles and celebration. I have never been more inspired.



PATRICK CAVANAGH



In & Out of the Classroom With Vicki Helgeson

BY LAURA PACILIO

In 1990, Vicki Helgeson applied for her first job — a junior faculty position in the Psychology Department at Carnegie Mellon University. Helgeson, now a professor of psychology, has been here ever since, teaching and building an impressive program of health psychology research.

Helgeson explores how people adjust to chronic illnesses. She has studied individuals with breast cancer, prostate cancer, heart disease and diabetes. A current project involves following children with and without Type 1 diabetes for more than 10 years so that she can compare each group on factors like life satisfaction, school achievement and health.

She also recently received funding from the National Institutes of Health to study couples in which one person has Type 1 diabetes. This project is in its beginning stages, but Helgeson plans to investigate whether the partner with diabetes is healthier when the couple engages in “communal coping,” meaning that they choose to view the diabetes as a shared problem.

“I always tell people that Carnegie Mellon is my first job, and it will be my last job because I love it here.”

A major goal of both studies is to help people better manage their illnesses.

“There are things people with diabetes can do that really affect their health, so health psychologists have a lot of opportunities to intervene,” Helgeson explained. “But, if we don’t figure out what’s influencing how people take care of themselves, their illness is going to be more burdensome.”

In addition to conducting research, Helgeson has taught two courses — Social Psychology and Psychology of Gender — almost every year since she arrived at CMU. She says she thoroughly enjoys both, but that Social Psychology is especially exciting for her because many students in the course are not psychology majors.

“I feel like I can really make a difference in their lives,” she said. “Whether they become bankers, business people or biologists, it will help them to know how the situation influences their thoughts, feelings and behavior.”

For Psychology of Gender, Helgeson wrote her own textbook that combines cutting-edge research on both men and women’s psychology. She says that the course is unique from similar classes at other universities because her students spend a full third of the semester exploring how men and women’s psychology is connected to health.

Teaching these courses is just one of the many things that Helgeson enjoys about working at CMU. “It’s a great place to teach, it’s the perfect environment to conduct health psychology research, the staff is fantastic and I enjoy involving bright, hard-working undergraduates in my research,” she said. “I always tell people that Carnegie Mellon is my first job, and it will be my last job because I love it here.”

Nature + Nurture

BY: SHILO REA

If you see a snake or spider, chances are it will scare you. Is your fear inherent or learned?

David Rakison believes it is both and that nature and nurture work together to help you develop fear for potentially threatening recurrent evolutionary threats. Rakison, associate professor of psychology, studies how infants learn about the world around them.

“Understanding how knowledge emerges and the mechanisms involved provides us with insight into the structure and function of the mind,” he said.

Rakison found that 5-month-old babies prefer to look at prototypical schematic images of snakes and spiders — rather than scrambled version of those things — but did not do so for rats or sharks.

“It reflects infants’ evolved mechanism to detect threats that were consistent throughout evolution,” Rakison explained. “Snakes and spiders are, and always have been, a potentially immediate lethal threat to infants, while the threat of rats is less direct. And, throughout evolution, humans spent little time in the ocean.”

His work has also shown that 11-month-old girls — but not boys — quickly learn to associate pictures of snakes and

“Understanding how knowledge emerges and the mechanisms involved provides us with insight into the structure and function of the mind.”

spiders with fearful faces. He believes this is because, throughout our evolutionary history, selective advantages arose for women who were more sensitive to potential danger and from men who were fearful.

On the other side, Rakison is currently using a National Science Foundation grant to research if and when babies can do deductive-like reasoning. He is finding that infants do not need to be shown information at the same time to understand that two things belong together — that is, they can remember things they have seen previously and come to associate them.

“It has always been assumed that infants can only learn associations that they experience directly,” he said. “However, my current research suggests that infants are clever enough to combine current and past experiences as they learn about the world.”

Rakison believes that getting to the heart of how nature and nurture affect learning is crucial for understanding both typical development, and for the early identification of atypical development.

DAVID RAKISON POSES WITH SPIDER-LIKE TOYS HE USES IN HIS INFANT COGNITION LAB.





The CoAx Lab

BY CARILLON SKRZYNSKI

In the Cognitive Axon Lab, or “CoAx lab” for short, Timothy Verstynen and his lab members study the structural and functional aspects of the brain — why the brain is wired the way it is and how this wiring is related to cognition. Specifically, the lab investigates the brain systems involved in selecting motor actions and how these actions are integrated to form a complex skill.

Verstynen, assistant professor of psychology, explained, “It’s like playing the piano. Each key press is an individual action, but how does the brain learn to smoothly bind them into a sonata?”

The lab members pursuing this interesting question consist of one lab coordinator, three undergraduate students, three graduate students (two from the University of Pittsburgh) and one post-doctoral scholar. It’s a “familial lab” setting in which undergraduates are mentored by a senior lab member. Through one-on-one meetings, they learn the necessary methods for their projects and are guided in a mix of re-

search and education creating an open dialogue between lab members.

“What I love most about my experience in the CoAx Lab is the diversity of expertise among our members in neuroimaging, computational modeling, and of course, cognitive neuroscience and psychology. It creates an invigorating intellectual atmosphere where unique perspectives converge to provide new solutions to the research questions we all share,” said Kevin Jarbo, a second year graduate student.

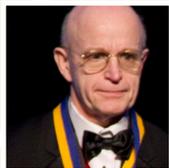
The mix of research and education within the lab is not unlike a new research methods class that Verstynen designed. The course fulfills a requirement in the recently launched neuroscience undergraduate major, a joint endeavor between the Dietrich College of Humanities and Social Sciences and Mellon College of Science. Through this hands-on laboratory class, students work with tools such as functional Magnetic Resonance Imaging to learn about the brain mechanisms that underlie intelligent behavior.

Beyond neuroimaging, the CoAx lab also uses computational models — building on Carnegie Mellon’s unique strengths — to better understand the data they collect using both structural and functional imaging. Verstynen’s collaboration with computational colleagues is something he loves about the university and his research. For example, he has recently submitted a research proposal with faculty from machine learning and from cosmology to explore the similar statistical structures of brain networks and galactic clusters.

“CMU is the only place I know of that this would be possible,” Verstynen commented, “and I feel like the proverbial kid in a candy store working here.”

FROM L-R: PATRICK BEUKEMA, A CENTER FOR THE NEURAL BASIS OF COGNITION GRADUATE STUDENT, TIMOTHY VERSTYENEN AND KEVIN JARBO

Faculty Honors



The legendary **John R. Anderson**, whose human thought and cognition research has revolutionized how we learn, was named a **FRANKLIN INSTITUTE LAUREATE** and earned the highest honor from the Association for Psychological Science.

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Health Psychologist **Sheldon Cohen** received the elite distinction of **UNIVERSITY PROFESSOR**, the highest academic accolade a faculty member can achieve at Carnegie Mellon. Cohen, a member of the Institute of Medicine, National Academy of Sciences, investigates the effects of behavioral factors in immunity and physical disease.

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For his work in health psychology, **J. David Creswell** received the **AMERICAN PSYCHOLOGICAL ASSOCIATION EARLY CAREER AWARD**.

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The James S. McDonnell Foundation gave the **21ST CENTURY SCIENCE INITIATIVE IN UNDERSTANDING HUMAN COGNITION SCHOLAR AWARD** to **Anna Fisher** to provide an alternative theoretical account for advanced cognitive development.

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For advancing the understanding of the sensory and cognitive processes that are fundamental to the perception of speech, **Lori Holt** won the **NATIONAL SCIENCE FOUNDATION TROLAND RESEARCH AWARD**. Holt joins David Plaut and Michael J. Tarr as three Psychology Department faculty who have won the prestigious award.

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Marcel Just — who focuses on how language comprehension and problem-solving emerges from brain processes — received the **SOCIETY FOR TEXT AND DISCOURSE DISTINGUISHED SCIENTIFIC CONTRIBUTION AWARD**. Just also became a University Professor.

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Timothy Verstynen earned a **NATIONAL SCIENCE FOUNDATION CAREER AWARD** to study how the brain learns complex sequence skills.

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Fang-Cheng “Frank” Yeh has been chosen as a **JUNIOR FELLOW** in the International Society for Magnetic Resonance in Medicine.

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Marlene Behrmann was elected to the **NATIONAL ACADEMY OF SCIENCES**, becoming the first female scientist from CMU to receive this honor. Behrmann is widely considered to be one of the foremost experts in the cognitive neuroscience of visual perception. Dietrich College of Humanities and Social Sciences Dean Richard Scheines said, “Very few researchers make a clear and vivid connection between the brain and the mind. Marlene is one of them. Her pioneering work on how the brains of normal and autistic subjects differ has changed our view of the disease. This is a well deserved honor for Marlene — we are extremely fortunate to have her on our faculty.”



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Carnegie Mellon University publishes an annual campus security and fire safety report describing the university's security, alcohol and drug, sexual assault, and fire safety policies and containing statistics about the number and type of crimes committed on the campus and the number and cause of fires in campus residence facilities during the preceding three years. You can obtain a copy by contacting the Carnegie Mellon Police Department at 412-268-2323. The annual security and fire safety report is also available online at www.cmu.edu/police/annualreports.

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Save the Dates



100 1915-2015 PSYCHOLOGY

The Psychology Department was founded in 1915 with a focus on applied psychology. Over the past century, it has become a major force in cognitive science, cognitive neuroscience, computational modeling, developmental psychology, social/health psychology, and the science of learning.

Join us as we celebrate our past, present and future:

ANNIVERSARY COLLOQUIUM SERIES: AUGUST 2015 - MAY 2016

CÈILIDH EVENT: OCTOBER 2015

CENTENNIAL SYMPOSIUM & REUNION: SPRING 2016

For more information and to share your CMU Psychology memories:

www.psy.cmu.edu/100years