One fall day in 1996, in Hagerstown, Md., a stroke patient being treated at Washington County Hospital looked up from his bed as a tall, young man with a friendly, angular face came into the room and said, “Hi, I’m Scott.”

Scott Frey was then an assistant professor at Gettysburgh College and was trying to make sense of some observations he had happened to make of his mother, who was partially paralyzed as a result of multiple sclerosis. He realized on one of his visits with her that, despite her inability to move, she retained an accurate sense of what objects might have been within reach, had she not been paralyzed. She was “holding up better than I would have thought,” he said to me one afternoon over coffee, which led him to wonder about how the brain represented reaching and other movements in “peripersonal space,” the region around the body that is within reach.

Scott had surmised that if, as then-recent studies suggested, mental imagery relies on many of the same parts of the brain that are used when actually experiencing a sensation or performing a movement, and if some parts of the brain were no longer getting their usual input from the parts of the body that had been injured, then the ability to perform mental imagery related to those parts of the body might be impaired.

His mother’s case seemed to falsify that notion, but Scott’s observations with her had been informal—a more systematic study would be required to gather solid evidence. That’s how Scott found himself at the rehabilitation hospital. He’d approached a physician there about working with some of the stroke patients. The physician responded by saying, “Sure, here are the charts.” (That happened in the time before HIPAA and increased concerns about patient privacy.) So Scott went to work.

To test what motor imagery abilities might be spared after a stroke, Scott developed a simple task that asked patients to judge how they would grasp an object that was presented to them in different orientations. To get a sense of this task, imagine that someone is handing you a short, one-foot-long length of pipe, and that you will take the pipe with your right hand. Which way will your thumb point if the pipe is oriented vertically? Or horizontally? Scott tested people with the pipe oriented in several different directions. Of course, different people may respond differently for some orientations, but Scott found that for a given person, the response they gave for one hand would be consistent with the response they would give for the other hand, except that right- and left-hand responses would be 180° out of sync.

Scott found that even when making judgments for the hand on their paralyzed side, stroke patients were accurate in predicting how they would grasp the object (compared to the hand on their uninjured side, or to healthy control subjects), an indication that though the

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Scott Frey
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...case of a man who had been missing a hand for 26 years. And from studies of the phantom-limb experience (one of the hand-transplant patients says he can still feel the hand he lost, de- spite receiving the transplant; he says it feels like a glove stretched over his new hand) to research on how chimpanzees use tools, Scott continues to explore the much larger question of how the brain represents and controls movement.

In summer 2011, Professor Frey joined the Department of Psychological Sciences at Mizzou as the Miller Family Endowed Chair in Neuroscience. This new faculty position gives Mizzou a leg up in the competition for the best neuroscience faculty, and it allows Scott to bring his research to the next level. With the help of his team, Scott has been able to make significant contributions to the field of neuroscience, particularly in the areas of cognitive neuroscience and human-computer interaction. His research continues to push the boundaries of our understanding of how the brain works and how it adapts to new information.

Spring 2012

Presenting the Frey Lab

Marc Hansen styles manual actions and rehabilitation. His primary interest is neuroergonomics, the intersection of neuropsychology and human factors, which considers how the brain adapts when one learns to use different tools and effectors other than one’s hands. He currently uses functional magnetic resonance imaging (fMRI) but is very excited to be starting a new project using electro-encephalography to develop a system for studying neurological changes associated with using a brain-controlled interface to control a robotic arm.

Hansen loves the outdoors, and he and his family have been having a wonderful time exploring the many hiking trails Columbia has to offer. Noah Marchal is an interdisciplinary scientist and artist with an MFA from Rensselaer Polytechnic Institute and a BFA from the School of the Art Institute of Chicago. His research interests blur the lines traditional-ly held between science and the arts. Marchal works as a research techni-cien and is studying as a post-bacca-laureate student in the School of Engi-neering at MU.

He has research interests in the field of neuroscience—planning and execution of motor control, fMRI rapid-event related design and analysis, electrocorticography, hemiplegia and plasticity—and in the fields of bio-technology and human-computer-environmental interaction. He has personal interests in print-and-play open-source board games, VR knowing, animal behavior, inform-ony, independent cinema, and cloud computing. You may find more about Marchal’s research and activities on the Web at http://lits.ics.org.

Benjamin Philip is a postdoctoral fellow in the Frey lab, studying the neural mechanisms of movement control. Healthy individuals make reach and grasping movements count-less times every day, but amputees or stroke patients may become unable to perform such fundamental actions with one hand. His primary interests lie in determining how patients’ brains change in response to illness, applying that knowledge to improve prosthetic use and rehabili-tation, and using that knowledge to improve our understanding of cortical motor control. Specifically, he uses behavioral, in vivo electrophysiological, and functional imaging (fMRI) techniques to investigate the neural mechanisms underlying hand movement.

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...by the Frey lab, presenting the latest advancements in the field of neuroprosthetics. The lab’s research focuses on developing new technologies to help individuals with limb loss or paralysis to improve their quality of life. Through a combination of neuroscience, engineering, and technology, the lab is working to create new solutions for patients in need.

Among the lab’s current projects is the development of a brain-computer interface (BCI) that allows people to control prosthetic limbs using their thoughts. This technology has the potential to dramatically improve the lives of individuals with amputations, providing them with greater independence and control.

Another area of research is the development of prosthetic hands that can be controlled by the user’s own nerves. This technology could provide a more natural and intuitive way for people with amputations to interact with their environment.

The lab is also working on improving the rehabilitation process for individuals with brain injuries. Through the use of neuroimaging techniques and functional brain stimulation, the lab aims to help patients regain motor and cognitive function.

In addition to its research efforts, the Frey lab is committed to education and outreach. The lab hosts regular seminars and workshops on the latest developments in neuroprosthetics, and it collaborates with local schools and universities to promote interest in the field of neuroscience.

With its cutting-edge research and innovative approaches, the Frey lab is making significant contributions to the field of neuroprosthetics and is helping to shape the future of rehabilitation technology.
MU. She earned her master’s degree in urban affairs from Washington University, which led to a career in urban planning with the St. Louis County government, where she ultimately served as director prior to her current position. Living in the St. Louis area with her husband and three children, she has also been an active volunteer in the community. She serves as vice president of the St. Louis County Economic Council; a board member of the St. Louis Science Center, Associated Industries of Missouri, and Citizens for Modern Transit; a member of UMB Bank’s St. Louis advisory board, and is on the board of trustees of Westminster College, in addition to teaching Sunday school classes and volunteering in her local church. This past February, the College of Arts and Science honored Fowler with its Distinguished Alumni Award. Myer was a student of psychology at the University of Memphis where she conducted research on family socialization and the associated emotional health of children and adolescents, with nearly 30 publications in this field. He teaches undergraduate and graduate-level courses in abnormal psychology, child psychopathology, clinical assessment and supervision, and his favorite topic, data analysis. His fondest memories of his training at MU involve “data meetings” with Professors Shier, Wood, Jackson, and Krull and his training in multisystemic therapy with Professor Bor- duin. He is especially grateful to Professors Shier, Bording, and Dubois for “training him incredibly well” and he looks forward to being able to pass on his knowledge and experience to his own students. Given the Outstanding Mentor Award he received from the University of Memphis in 2008; it appears he is well on his way!

Gilbert Ray Parra, PhD ’04 clinical psychology

Parra is a newly appointed associate professor of clinical, child, and family psychology at the University of Memphis where he conducts research on family socialization and the associated emotional health of children and adolescents, with nearly 30 publications in this field. He teaches undergraduate and graduate-level courses in abnormal psychology, child psychopathology, clinical assessment and supervision, and his favorite topic, data analysis. His fondest memories of his training at MU involve “data meetings” with Professors Shier, Wood, Jackson, and Krull and his training in multisystemic therapy with Professor Bording. He is especially grateful to Professors Shier, Bording, and Dubois for “training him incredibly well” and he looks forward to being able to pass on his knowledge and experience to his own students. Given the Outstanding Mentor Award he received from the University of Memphis in 2008; it appears he is well on his way!

By Kryst vanHecke

Psychology is a broad field, and students come from a wide range of interests and career aspirations. So, what can undergraduates who are interested in psychology do to find out more about the field? One option is to join Psi Chi/ Psychology Club. Founded in 1929, Psi Chi is an international honor society with over 500,000 members in more than 1,000 chapters. It is now one of the world’s largest honor societies, with almost 20,000 new members joining annually over the last decade. Its status as an honor society, as opposed to an honorary society, means that members must meet certain minimum qualifications in order to gain entry, including maintaining an overall GPA that is in the top 35 percent of one’s class, and a psychology GPA of at least 3.0 on a four-point scale. (The full list of requirements can be found at http://www.pscih.org/aboutus/merit/.)

“in the past we have had professors from the fields of personally, alcohol and cognition, cognitive psychology, research methods, and others. We have also had fun speakers like a hypno- naut this past semester,” says Tanika Williams, chapter president. In addition to speakers who are actively working in the field, a panel of graduate students is featured once a year to answer questions and discuss their experiences applying for and going to graduate school. Historically, guest speakers have been an integral part of the Psi Chi experience. Getting to learn about different career paths and working in related fields, such as forensic psychology: “in the past we have had professors from the fields of personally, alcohol and cognition, cognitive psychology, research methods, and others. We have also had fun speakers like a hypnotist this past semester,” says Tanika Williams, chapter president.

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Gizer Studies Genetic Influences on Behavior

By Denis McCarthy
Do genes determine your personal- ity? What about behavioral problems, such as addiction or attention-deficit hyperactivity disorder (ADHD)? While most people consider genes to be an important part of what makes us who we are, the science of genetic influ- ences on behavior has been far from clear cut. The work of Assistant Pro- fessor Ian Gizer focuses on using in- novative research designs and cutting- edge genetic techniques to help us understand how genes influence com- plex behaviors and disorders.

Gizer, a clinical psychologist, joined the faculty at MU in 2010. As an un- dergraduate at University of California, Berkeley, he used traditional psycholo- gical methods to examine factors that lead to externalizing problems, such as conduct disorder, ADHD, and addiction. As a doctoral student at Emory University, he became in- terested in understanding the role of genetics in the development of these disorders. For his dissertation, he used what is called a candidate gene approach, where specific genes are identified as having the potential to increase risk for specific problems. He examined two genes that affect the neurotransmitter dopamine: the dopa- mine transporter gene (DAT1) and the dopamine D4 receptor gene (DRD4).

His work combined information about these genes with more traditional psy- chological data, such as parent/teach- er report of behavioral problems and neuropsychological testing, to identify whether these genetic differences were associated with neurological or behavioral differences that might increase risk for ADHD. What he found was that parents and teachers not only provided unique information about behavioral problems, but com- bining information from both sources provided a clearer picture of what genes were associated with ADHD.

Gizer became so interested in the importance of genetic influences on disorder that after completing his doc- torate, he took his career in an unusu- al direction for a psychologist—he did post-doctoral work in genetics rather than psychology. Working with Profes- sor Kirk Wilhelmsen in the genetics department at the University of North Carolina at Chapel Hill, Gizer was able to combine the behavioral approaches he learned as a psychologist with the most sophisticated approaches to ge- netics, such as genome-wide linkage analyses. For example, in one study, rather than examining alcohol depen- dence as a single phenomenon, he instead examined different clusters of alcohol dependence symptoms. His results suggested that those with unique clinical presentation of alcohol dependence may also differ in their genetic risk profile.

Since coming to MU, Gizer has continued his cutting-edge work on genetics of mental disorders. He is a prin- cipal investigator on a multi-site study that uses whole genome se- quencing to improving understand- ing of risk for stimulant and cannabis dependence. He also brings unique expertise to the department. He teaches a graduate course in molecu- lar genetics and is enthusiastic about collaborating with other department members looking to incorporate ge- netic approaches into the study of psychological phenomena.
Daniel Kivlahan, MA ’79, PhD ’83, clinical psychology, will be the keynote speaker at Psychology Day. He is the director of the Center of Excellence in Substance Abuse Treatment and Education at the V.A. Puget Sound Health Care System.

Kivlahan’s presentation is titled “Progress and Challenges in Implementing Evidence-based Policy and Practice for Helping Veterans with Substance Use Conditions in V.A.: Lessons from the Nation’s Largest Integrated Health-care System.”

During the day, undergraduate honors students and graduate students will present findings from their research. The day will end with the traditional reception in the cast gallery at the Museum of Art and Archaeology in Pickard Hall on campus.

All alumni are invited to attend Psychology Day. For more information, or to let the department know you are coming, contact Kelly Davis at 573-884-6277 or daviskel@missouri.edu.

Want to know more? Please visit the department’s Web site at psychology.missouri.edu.

MU’s Professor Ken Sher and Daniel Kivlahan at the Washington, D.C., APA meetings in 2010.