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Writing/Editing: Liz Rosdeitcher and IU Communications
Design/Layout: Jenn Robison
Photos: Jenn Robison, iStockPhoto, and Maximillian Tortoriello
Cover Photo: A “Nano Art” exhibit at the WonderLab Museum in Bloomington through September 7 includes five photographs by PBS research scientist Alex Straiker. Pictured here, “Cultured hippocampal neurons on a bed of astrocytes.” The neurons (stained in green) have been grown on a layer of astrocytes, the internal filaments of which are shown in red. Cell nuclei are shown in light blue.
As this newsletter issue came together, we realized we had three profiles, all of women, who are current or former students in the IU Department of Psychological and Brain Sciences. Each is at a different stage in their career, working in different areas of this broad field: Meredith Boyd, a recent recipient of the College’s Intensive Writing Essay Prize, and a senior this upcoming year, majoring in psychological and brain sciences with a certificate in neuroscience, has a strong interest in clinical and implementation science. Lindsay Arcurio completed her PhD in June and left Bloomington for a postdoctoral fellowship at the National Institute of Health in a lab that studies pharmacological treatments for alcoholism. Floh Thiels received a PhD from the department in 1987 and is currently on the faculty in neurobiology at the University of Pittsburgh Medical School. She also now serves as program director at the National Science Foundation.

We’ve decided to put these profiles together to give a kind of panoramic view of the PBS community which also, we hope, holds the fascination of each individual’s life story.

DEVELOPMENTAL GAINS—AND A CAREER—IN FOCUS
Meredith Boyd, current PBS major

This April PBS major Meredith Boyd won an Intensive Writing Essay Prize from the College of Arts and Sciences. No stranger to academic honors, Boyd is also a student in the Honors College, the recipient of several College scholarships and a Hutton grant that supports her summer position in the lab of PBS clinical science professor Cara Lewis. Next year she plans to complete an honors thesis in Lewis’ lab and graduate with a BA in psychology and a certificate in neuroscience.

Her prize-winning essay, “Visual Experience Generated by Parents and Infants during Play,” was a study of the play between ten 7-12 month-old infants and their adult caregivers, using visual material from head cameras worn by each pair during their daily routines at home. She completed the study for an advanced laboratory course in developmental psychology taught by PBS Distinguished Professor and Chancellor’s Professor Linda Smith, which also meets the College’s intensive writing requirement.

The study looked at the larger-than-life visual pantomimes, exaggerated gestures and gesticulations, which adults perform in their encounters with infants of this age, often to draw attention to a particular toy or object. The interactions both convey visual information about these objects and set the stage for more sophisticated forms of communication and for language.

You do not need a head camera to see the outlines of another stage of early development—that of a promising career—coming into sharper focus. In Boyd’s experience you can see taking shape both the knowledge of psychological science and the ability to communicate it in her writing.

As a judge observed of her winning essay: “What made her paper stand out was the clarity and insight with which she posed a productive research question and integrated scholarship from the field into her own prose.”

Likewise in Smith’s advanced lab course, lab work and writing mutually reinforced each other to become a stepping stone to a new level of disciplinary knowledge and communication. As Boyd herself observed, the course as a whole gave her a better grasp of such elusive aspects of writing as “the tone of scientific writing” and a better sense of the validity of certain concepts. (In the ‘questionable’ category, for example, words like ‘intuitive’ and ‘innate’ come to mind.) Then there are her teachers . . . (continued on P3)
When she reflects on what has made it possible for her to gain her footing in psychological and brain sciences, Boyd’s answer is clear: “I don’t think I would be at this level,” she says, “if it weren’t for my professors. They are not just great at what they do, they are also extremely helpful.”

“Instrumental to my progress,” Boyd explains, was Cynthia Patton, a PBS senior lecturer, with whom she took a “Careers in Psychology” course. Patton, says Boyd, is “a walking human wealth of information,” who “continues to be an amazing resource.” She also directed Boyd to Lewis’s lab, where Boyd has worked for a year and a half, discovering the field of implementation science in which she now envisions her career.

In Smith’s course Boyd found further opportunities for development (her own and others’), increasing her fluency in both science and writing. As Smith explains, Boyd sought out these opportunities with particular skill:

“She was a talented writer to begin with, but she took this intensive writing class with the goal of becoming better. She took every writing exercise and every criticism as an opportunity to learn, not just to do what she thought I wanted, but to try it out, to understand how to make hard ideas clear and engaging. She took criticism well, was not easily flustered, was a good problem solver, and pleasant to work with. It was a joy to teach her.”

As a high school student in Carmel, Indiana, Boyd knew that she wanted to study psychology and took an AP psychology course. But when she came to IU, she enrolled in a variety of courses in different fields to explore other interests. And though she hasn’t closed the door on other options, she “feels conviction about going into the field of implementation science” at the same time that she is still figuring out, she explains, “where I would be most effective within it.”

Yet, having arrived at this stage, Boyd has a sense of having gained something that has been there from the start.

“I now can’t believe I didn’t always want to do this.”

AGAINST THE ODDS

Lindsay Arcurio (PhD 2014)

When Coco and Eloise are old enough to understand, they will no doubt want to hear the story of their birth—what it was like for their mother, Lindsay Arcurio (PhD 2014) to be pursuing a PhD in the IU psychological and brain sciences department when they first arrived. Chances are they already know something about it, since their mother is so passionately engaged with her research on patterns of brain activity in alcohol-dependent women, that it would be hard not to pick up on it. She seems to live and breathe science.

From the outside it might look like Arcurio simply had superhuman powers. Eight months pregnant with Eloise, she was writing her dissertation, only stopping to interview around the country for post-doctoral positions. One week after giving birth to Eloise (by C-section, no less), and still working on her dissertation, she was receiving calls from the media to talk through her recently published study in the journal of Addiction Biology.

This June she wrapped up her dissertation to meet another deadline: a post-doctoral position at the National Institute of Health that began July 1, which required that she finish. The post-doc is one of the most prestigious in her field and its research could not be more perfectly aligned with her future goals and aspirations.

But in truth, none of this would have been possible, she insists, without the enormous support of people around her. The system, as she discovered, is not set up to take the life circumstances of pregnancy and childbirth into account, especially not for women. In fact, she notes, “Nobody in their right mind would plan to have children during grad school.”

It was particularly difficult when she had her first child. A single parent at the time, she was extremely ill during her pregnancy, which made it necessary to take a leave of absence. After she had the baby (by an emergency C-section), she had to go back to school to teach and take classes nine days after she left the hospital, because she had taken all the allotted sick leave. There is currently no maternity leave for graduate students.

However, her “extraordinary and outstanding” faculty advisor and mentor, Tom James, stood by her with support through each milestone, even if that meant putting the baby to sleep at the lab himself. She also had a committee of “amazingly super-supportive faculty,” made up of James, Sharlene Newman, Peter Finn, and Brian O’Donnell; and the great support of all the members of her lab. “I couldn’t have asked for better people to work with,” she explains. (James has since won a university-wide teaching award as a result of his dedication to his students’ success. See page 14.)

Because of her family history, Arcurio has always been interested in alcoholism. Her father was an alcoholic and she remembers vividly what it was like to be around him as a child. He was often depressed and when she was nine years old, the cycle of alcoholism and depression became so severe that he committed suicide. His brother died of alcohol-related liver disease.

She always hated alcohol as a result and swore she’d never drink. But as an adolescent, she discovered that she shared her father’s propensity. “I know what it is like to want to stop drinking, when you can’t. Especially if you’re in circumstances in which you don’t have a lot of control, you know that drinking will change your mood and put you in a different place.”

Like many others, who age out of this phase when they simply can’t afford to drink, Arcurio says she stopped drinking as soon as she knew she was pregnant with her first child. She could not inflict on her own children what she had been forced to suffer. “I remember everything about how my dad was and I knew I could never, ever, ever do any of that to my children. Having children is what saved me in so many ways, saved my life, my career.”

(continued on P4)
Now enthralled by the science and psychology of addiction, she is urged on by the possibility of helping those struggling with addiction. “I want to understand it on every level. And if this research can lead to helping those people who desperately want to stop drinking, that would be incredible.”

The NIH lab she’ll be working in specializes in novel pharmacological treatments for alcohol-dependence. While her current work uses neuroimaging techniques to look at reward-seeking and inhibitory neural systems, (see press release, p --), the research she is about to undertake has a more molecular/cellular focus. Fascinating to her is the way this new research encompasses the body, “the dynamic interaction between environment, our body, and our brain, that ultimately explains human behavior.”

By examining the intimate communication between gut and brain which occurs when such hormones as ghrelin and insulin are released, causing us to feel hunger among other things, the research aims to determine the role these hormones might play in alcohol consumption. It also seeks to discern the way changes in levels of these hormones, might reduce cravings and motivation to seek out alcohol.

“I’m really excited that this lab gets me closer to brain-body interaction,” she explains. “Psychology focuses mostly on the brain and behavior. But we cannot act without a body.”

The research takes Arcurio into the world of pharmacological research, which she believes might hold out the prospect of a fulfilling scientific career, especially coming from a field in which, she says, “PhD’s have an 8% chance of landing a tenure-track job.

“I cannot wait to start this new research. It is exactly where I want to be and exactly what I want to be doing. I can’t believe I’ll have this opportunity.

“I could never have done it without Tom—or,” she adds, “without my husband Josh,” a project manager, who moved to Bloomington from Miami and now works remotely with De La Guardia Victoria Architects, a Florida firm.

And in more ways than she can count, she couldn’t have done it without Coco and Eloise either.

THE ACCIDENTAL NEUROSCIENTIST

Floh Thiels (PhD 1987)

It was not at all what she wanted to do.

As an undergraduate at the University of Toronto, Edda “Floh” Thiels (PhD 1987) was finishing up her degree and getting ready to apply to medical school in Canada. She had a major in psychology, but never found the long lecture courses very satisfying, though she was drawn to clinical psychology since childhood as a profession set up to help people with their struggles.

Among the remaining requirements for her degree was a lab course in experimental psychology and because of her interests, she chose the clinical lab working with children, rather than the animal behavior lab. Instead, against her wishes and even stronger fears, she was placed in the animal behavior lab. Beset by anxiety and overtaken by recurring nightmares of gigantic rats, she nonetheless dutifully enrolled in the course . . .

. . . only to discover that the work there was absolutely riveting.

"I took the course and never looked back. It was cause and effect for me, not just for the animals. It was not like learning from a textbook. You could generate and test a hypothesis and get an answer that was meaningful. And it confirmed what I truly believed: You can really see how the environment shapes the animal's behavior."

Though she knew she also ultimately wanted to learn more about the brain, she first wanted to better understand behavior, so she decided she would pursue graduate studies in animal behavior. “I didn’t want to start looking under the microscope before I understood a phenomenon that really interested me. I still to this day think that the brain is a tool to accomplish behavior, a critical interface, which absorbs information from the environment and translates this into behavior. To better understand the brain, it was necessary to understand behavior.”

A professor suggested that she apply to IU, where she pursued research in the labs of Eliot Hearst and Jeff Alberts, working with Alberts on the role of learning in the weaning process. She studied neuroscience as a post-doctoral student at University of Pittsburgh, developing expertise in electrophysiology, biochemistry, and neurobiology and building a prolific career of research, scholarship, and teaching. Soon after, the dean of the medical school at Pittsburgh, having heard rumors of her experience in behavioral research, asked her to establish a core facility in rodent behavior analysis, which has become an extremely successful operation.

An associate professor of neurobiology at the University of Pittsburgh, School of Medicine, and chair of the neuroscience outreach program, she is currently on leave to serve as a program director at the National Science Foundation. She is also a member of the PBS advisory board.

From her new offices in Arlington, Virginia, Thiels marvels at the unexpected twists and turns her life has taken. Like her lucky placement in the animal behavior lab, her new role as program director at the NSF seems to her like one of those fortuitous twists of fate. She is delighted at the chance she has to contribute to an agency with a philosophy she so strongly shares: to expand public participation in science, particularly with respect to women, minorities, and other under-represented groups, and to support work that has a broad social impact.

The journey for Thiels began in Frankfurt, Germany. The third child of two psychiatrists who were passionate about their profession and took a great interest in their patients, she held them up as a model, she says, of what it meant to have useful and fulfilling work.

Yet, as someone who has been preoccupied with questions of learning, whether in the behavioral or political arena, her life as a learner did not get off to a very auspicious start.

(continued on P5)
“I was not a very good student,” she will tell you up front. The youngest in her class, she was cognitively behind and physically small for her age, a circumstance that earned her the nickname ‘Floh,’ the German word for ‘flea.’ (The name has stuck, though it no longer suits the tall, lanky neuroscientist, either in her stature or the wide-ranging scope of her vision.)

In a school system that emphasized spelling and neatness, she was adept at neither, and consequently disliked academics through most of her childhood. “My parents were very worried,” she admits, “though to their credit they were mostly concerned that I find a happy course of life.”

Then in her final year of high school, she took a three-week trip to the US, which set her on a new path. Staying on the East Coast with friends of her family, she remembers being struck by how “light-hearted and easy-going people were here.” She remembers in particular watching Hogan’s Heroes, the TV sitcom, which takes place in a German POW camp during WWII, and being absolutely stunned. “You could make fun of WWII? I couldn’t believe it. I couldn’t believe that anybody would do that. It was off the wall.”

“But at some level,” she says, “it was like a weight was taken off my shoulders.” And from then on she was intent on returning to the US. “That was it.”

“Life is a big journey,” she insists, “and I don’t always know where it’s going. Some people seem to know what they want in life and just go after it. For me there is always a great new thing around the corner.”

The journey has taken her from Germany to Canada to the US to France and back to the US. It has taken her from behavior to biology and back. Most recently it has taken her into addiction research, which she says integrates the two in a way that only a few other areas of neuroscience do.

And despite her wish to escape the paralyzing seriousness of her German roots, and her experience in post-WWII Germany, the journey has perhaps brought her back there, too, as she considers the social issues at stake in the work of scientists and the difference this work can make in people lives. ♦

PBS Students Recognized

Outstanding undergraduate students honored at annual reception

On April 25, the department’s annual J.R. Kantor Undergraduate Honors Banquet was held at the Indiana Memorial Union. The celebration, which was preceded by a poster session, recognized the 22 undergraduate honors students, as well as the recipients of research and teaching assistant awards.

The honors students recognized were Ellis Bernstein, Lauren Bramson, Alexis Carpenter, Michelle Chung, Daisy Day, Sarah Fischer, Kaitlin Fondren, Haley Gedek, Gabriel Hardy, Evan Jameyfield, Sangeeth Jeevan, Hope Kerkhoff, James Lee, Brigid Marriott, Jose Mitjavila, Rachel Ogle, Kamilya Salibayeva, Wade Simpson, C.J. Skok, Derrick Walters, Evan Winiger, and Nelson Zounlome.

Recipients of department awards were Lauren Bramson, Alexander Bratch, Courtney Burroughs, Alexis Carpenter, Olivia Cole, Kaitlin Fondren, Arianna Gutierrez, and Brigid Marriott. ♦
Class Acts

On May 16, PBS celebrated the long, illustrious careers of two beloved professors—Susan Jones and James Craig

“She’s a class act,” said longtime lab manager for Susan Jones, JeanneMarie Heeb, as the program honoring Jones and James Craig on their retirement came to a close.

Memorable for her ‘take no prisoners’ style and the debunking of infant imitation theories, her dedication to teaching, dry wit, intellectual rigor—and quite simply, her sheer brilliance, Linda Smith said it all in a simple graphic displaying that as her own proximity to Jones increased, so did her intelligence. “And if you see a decline in my own mental powers in the coming weeks, you can attribute this to my relative distance from Susan Jones.”

As for Craig, Preston Garraghty summed it up in a paradoxical nutshell: Decidedly NOT a “touchy-feely” kind of guy, he nonetheless held everybody’s hand, and in his work understood touching and feeling better than anyone.

As the mike got passed around, tributes to Jones and Craig from longtime colleagues further attested to the department’s loss and the honor of having been the place where they lived out their two long, productive careers at PBS.

As department chair Bill Hetrick noted, “PBS has been lucky to have benefited both directly and indirectly from the distinguished careers of Susan Jones and Jim Craig and from their dedication to their work, to teaching and to the general well-being of the department.”
How Can We Best Serve Our Undergraduates?

Faculty retreat shines critical spotlight on the aims and expectations of our undergraduate program

On Saturday April 12 over 40 full-time PBS faculty members settled into the newly remodeled library in Woodburn Hall to set their collective sights on how to best educate and serve PBS undergraduate students. The day was made up of two sessions in which the faculty divided up into small groups, first to discuss general program goals, then the goals of particular areas and courses (introductory courses, career planning, statistics, developmental, cognitive, social, neuroscience, advanced or capstone courses). After each session the groups reunited to report back and engage in a general discussion of their ideas.

While existing goals remain relevant, the discussions provided the chance to bring some newer issues into the foreground. Among these were three particularly salient ones. First, the faculty identified a greater need to further address professional and career development at all stages of the curriculum, to create, as professor David Landy put it, “a culture of career development” that is in place at each step. Second, they saw a need for greater awareness of ethics and social responsibility in the context of the lab, the classroom, and the profession. And finally, another recurring theme of the discussion was the increasing need to promote quantitative literacy and a basic understanding of statistics early on in the program, so that students are better able to critically consume both popular and scholarly psychological and scientific information.

A number of other intriguing points came up for consideration: instruction on using the internet to collect data for psychological research, developing an awareness of diversity, understanding the uses and misuses of “big data,” and an emphasis on improving concrete technical skills that are useful for psychological and brain sciences research, but also broadly applicable to many kinds of work.

At the end of the day PBS chair Bill Hetrick was extremely gratified by what the group was able to achieve. “The retreat was focused and productive. It gave us the chance as a department to explore the expectations we have for our students, as well as hone in on our pedagogical goals and determine how they can best be met. It was readily apparent that our faculty care deeply about undergraduate education and worked effectively to identify innovative program goals and desired student outcomes. I’m excited to work on implementation strategies in the coming academic year.”

At a Glance

2014 NSF graduate fellowship recipients

Congratulations to this year’s recipients of the National Science Foundation graduate fellowships! Here’s a quick glance at their research.

Could a toddler’s early chronic sleep deficits affect his or her later ability to function in school? Caroline Hoyniak investigates the developmental chain from sleep to self-regulating ability to school readiness using EEG data collected from children at 30, 36, and 42 months, as well as teacher reports.

Ashley Schnakenberg takes a novel approach to the question of how perceptual features are integrated into coherent representations. Using time frequency analysis of EEG activity and graph theoretical analysis, the study will examine normal instances of perceptual binding as well as the dysfunctional instances that occur in autism, bipolar disorder, and schizophrenia.

The “spectrum” of Autism Spectrum Disorder extends beyond those with the disorder itself. Jennifer Bush examines the continuum of traits associated with social cognition, degrees of social difficulties and differences in social skills through the study of gaze patterns and the analysis of the way people interpret social information.
In ‘I Spy’
Words Help the Eye

**PBS cognitive scientists use ‘I spy’ to show spoken language helps direct children’s eyes**

In a new study, PBS cognitive scientists Catarina Vales and Linda Smith demonstrate that children spot objects more quickly when prompted by words than if they are only prompted by images.

Language, the study suggests, is transformative: More so than images, spoken language taps into children’s cognitive system, enhancing their ability to learn and to navigate cluttered environments. As such the study, published in the journal Developmental Science, opens up new avenues for research into the way language might shape the course of developmental disabilities such as ADHD, difficulties with school, and other attention-related problems.

In the experiment, children played a series of “I spy” games, widely used to study attention and memory in adults. Asked to look for one image in a crowded scene on a computer screen, the children were shown a picture of the object they needed to find—a bed, for example, hidden in a group of couches.

“If the name of the target object was also said, the children were much faster at finding it and less distracted by the other objects in the scene,” said Vales, a graduate student in PBS.

“What we’ve shown is that in 3-year-old children, words activate memories that then rapidly deploy attention and lead children to find the relevant object in a cluttered array,” said Smith, Chancellor’s Professor in PBS. “Words call up an idea that is more robust than an image and to which we more rapidly respond. Words have a way of calling up what you know that filters the environment for you.”

The study, she said, “is the first clear demonstration of the impact of words on the way children navigate the visual world and is a first step toward understanding the way language influences visual attention, raising new testable hypotheses about the process.”

Vales said the use of language can change how people inspect the world around them.

“Children learn in the real world, and the real world is a cluttered place... if you don’t know where to look, chances are you don’t learn anything.”

**LINDA SMITH**

“We also know that language will change the way people perform in a lot of different laboratory tasks,” she said. “And if you have a child with ADHD who has a hard time focusing, one of the things parents are told to do is to use words to walk the child through what she needs to do. So there is this notion that words change cognition. The question is ‘how?’”

Vales said their research results “begin to tell us precisely how words help, the kinds of cognitive processes words tap into to change how children behave. For instance, the difference between search times, with and without naming the target object, indicate a key role for a kind of brief visual memory known as working memory, that helps us remember what we just saw as we look to something new. Words put ideas in working memory faster than images.”

For this reason, language may play an important role in a number of developmental disabilities.

“Limitations in working memory have been implicated in almost every developmental disability, especially those concerned with language, reading and negative outcomes in school,” Smith said. “These results also suggest the culprit for these difficulties may be language in addition to working memory.

“This study changes the causal arrow a little bit. People have thought that children have difficulty with language because they don’t have enough working memory to learn language. This turns it around because it suggests that language may also make working memory more effective.”

How does this matter to child development?

“Children learn in the real world, and the real world is a cluttered place,” Smith said. “If you don’t know where to look, chances are you don’t learn anything. The words you know are a driving force behind attention. People have not thought about it as important or pervasive, but once children acquire language, it changes everything about their cognitive system.”

“Our results suggest that language has huge effects, not just on talking, but on attention—which can determine how children learn, how much they learn and how well they learn,” Vales said.

A copy of the paper, “Words, shape, visual search and visual working memory in 3-year-old children,” is available online.
A recent PBS study that examines the brain activity of alcohol-dependent women compared to women who were not addicted found stark and surprising differences, leading to intriguing questions about brain network functions of addicted women as they make risky decisions about when and what to drink.

The study used functional magnetic resonance imaging, or fMRI, to study differences between patterns of brain network activation in the two groups of women. The findings indicate that the anterior insular region of the brain may be implicated in the process, suggesting a possible new target of treatment for alcohol-dependent women.

“We see that the network dynamics of alcohol-dependent women may be really different from that of healthy controls in a drinking-related task,” said Lindsay Arcurio, who has since completed her graduate work in the Department of Psychological and Brain Sciences. “We have evidence to suggest alcohol-dependent women have trouble switching between networks of the brain.”

The research is part of a larger new effort to understand the differences between men and women with respect to alcohol. Arcurio said most of the research on alcohol dependence has been conducted with men or groups of men and women. Yet several factors make looking at women “really important.”

One such factor is that the physiological effects of drinking alcohol, which include liver damage, heart disease or breast cancer, set in much earlier in women than in men. For this reason, the suggested limit on the number of drinks per week that women can safely consume is eight, whereas for men, it is 14. Secondly, binge-drinking in women is on the rise. One in five adolescent girls is binge-drinking three times a month. In women between the ages of 18 and 54, that number is one in eight.

Research on decision-making mechanisms in alcohol-dependent individuals typically involves a general risk-taking situation in which money or points are at stake. In this study, participants were placed in the fMRI brain scanner and asked to consider low-risk and high-risk situations specifically related to alcohol—what the researchers describe as “ecological” tasks.

The findings, however, reflect a sharp contrast in differences between the brain network activation in alcohol-dependent women versus the controls.

For the control group, high-risk decisions to drink led to the deactivation of regions associated with “approach behavior,” deciding to take the drink in a risky situation. Conversely, women in the control group activate regions associated with the default mode network, a region traditionally thought to involve resting-state behavior or inactive or relaxed mental state, but which some now speculate plays a role in conceptualizing one’s future.

“It gets really interesting,” Arcurio said, “comparing this pattern of activation to those in alcohol-dependent women, who behaviorally say they’re more likely to take the high-risk drink compared to the controls. They don’t deactivate anything. In contrast to the controls, alcohol-dependent women activate all three regions in question. They activate regions associated with reward (which release dopamine). They also activate frontal control regions involved in cognitive control and regions associated with the default mode network, involved in resting-state behavior. They are activating everything.”

The investigators infer from these findings that alcohol-dependent women have trouble switching between networks. Being unable to activate one region and deactivate another in response to an alcohol-related situation means they are unable to use one strategy over another.

The researchers are now running analyses to test the hypothesis that the insula helps in this process, which could offer new possibilities for intervention, with both behavioral therapy and medication.

The study, “Neural mechanisms of high-risk decisions-to-drink in alcohol-dependent women,” appears in the Dec. 23 issue of Addiction Biology.

Other investigators include professors Thomas James, director of the Perception and Neuroimaging Lab, and Peter Finn, director of the Behavioral Alcohol Research Laboratory.

**Risk-Taking and Addiction in Women**

Study uncovers surprising differences in brain activity of alcohol-dependent women

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Blurred Lines?

**PBS study closes the gap between human and nonhuman animal memory and opens prospects of new treatments for memory impairment in Alzheimer's, Parkinson's, PTSD, depression**

PBS neuroscientists Jonathon Crystal and Wesley Alford are zeroing in with increasing certainty on the notion that nonhuman animals have a particular type of memory known as “source memory,” long seen as exclusively human.

In a new study, discussed in the journal Biology Letters, they were also surprised to discover that this type of memory in their animal subjects, in this case rats, also lasted much longer than memories have been known to last in any nonprimate.

The study could ultimately help us understand the biological underpinnings of source-memory impairment in humans and make possible new interventions for memory failure in such conditions as Alzheimer’s, Huntington’s, Parkinson’s, schizophrenia, PTSD and depression. It also implies that source memory is evolutionarily quite old insofar as it exists in nonhuman animals.

Source memory, Crystal said, refers to the memory of how, where or by what means we acquired a piece of information. For instance, people typically want to remember who told them a certain joke, so they do not retell it to that same person. Or when entering a voting booth, voters may want to remember the source from which they heard a negative story about a candidate, a trusted newspaper or Comedy Central.

Source memory is a key component of the episodic memory that enables us to recall the discrete events, moments, and situations that make up the life story we recognize as our own and that connects us to family, friends, community and the larger world. For this reason it is a kind of “holy grail” for researchers looking to pave the way for treating the diseases or disorders that afflict human memory, Crystal said.

“The main objective of this research is to prove that we are tapping into the kind of memory system that really matters to people affected by Alzheimer’s disease,” he said. “Otherwise we ultimately risk spending billions of dollars on a drug that will help you remember where you last put your reading glasses rather than one which enables you to remember your granddaughter’s last visit and the news she shared with you, among other aspects of your life.”

The key, Crystal said, is to lay out an experiment in which the rats cannot perform the specific task (of determining which arm in an eight-arm radial maze will replenish with chocolate pellets) without relying on source memory. In doing so, the study also showed that the memory they were measuring in the rat lasted much longer than anyone expected, up to seven days.

Crystal is the director of the Program in Neuroscience and the Comparative Cognition Lab. Alford recently left his position as a Visiting Scholar in the department and is currently a graduate student in neuroscience at Brandeis University.

The study, “Validation of a Rodent Model of Source Memory,” appeared in the March 2014 issue of Biology Letters. The research was supported with grants from the National Institute of Mental Health.

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The Neuroscience of Gesture

**PBS cognitive neuroscientist awarded NSF grant to study the role of gesture in teaching**

Karin Harman James, in collaboration with University of Chicago researchers Susan Goldin-Meadow and Elizabeth Wakefield-Connell, was awarded $560,000 by the National Science Foundation for a three-year project to study the role of gesture as a tool for teaching and learning in children.

Gesture, the researchers suggest, has the potential to play a unique role in learning both in the classroom and in one-on-one situations. Its potential can be more fully exploited once we know exactly how and why it works to facilitate learning. Through both a behavioral approach and the use of neuroimaging, the study will compare the effectiveness of learning through gesture vs. action, both by observing gesture and action or producing them.

“Gesture,” says James, “is a potentially powerful tool. As movements of the hand that accompany speech, gestures are both like action on one hand and language (or representation) on the other. As such it may serve as a useful stepping-stone in the transition from concrete action to abstract thought.”

The goals of the study are to compare the differences between learning a word through action and learning it through gesture, determine how well words are generalized and retained over time, and to explore the brain functions that are activated with each learning experience. Previous studies have shown that children process letters and words differently, depending on whether they produced action associated with the word when they learned it, but not if they simply observed the actions.

In addition to providing a general model for gesture as a tool for teaching, the study may be especially helpful for teaching students who have difficulties in the traditional classroom. For example, the use of gesture by teachers in the classroom might be particularly beneficial for children from lower socio-economic homes, who tend to produce fewer spontaneous gestures than children from higher socio-economic homes. Likewise for children who have impairments in language and often use gesture to compensate for their disabilities, harnessing gesture may also be beneficial.
Deafness and Cognitive Delays

PBS and IU Med School researchers identify cognitive risks in children with cochlear implants

Researchers in the IU Medical School and PBS identify patterns of cognitive risks in some children with cochlear implants.

Children with profound deafness who receive a cochlear implant had as much as five times the risk of having delays in areas of working memory, controlled attention, planning and conceptual learning as children with normal hearing, according to research published May 22 in the Journal of the American Medical Association Otolaryngology–Head and Neck Surgery.

The authors evaluated 73 children implanted before age 7 and 78 children with normal hearing to determine the risk of deficits in executive functioning behaviors in everyday life.

Executive functioning, a set of mental processes involved in regulating and directing thinking and behavior, is important for focusing and attaining goals in daily life. All children in the study had average to above-average IQ scores. The results, reported in “Neurocognitive Risk in Children with Cochlear Implants,” are the first from a large-scale study to compare real-world executive functioning behavior in children with cochlear implants and those with normal hearing.

First author William Kronenberger, professor of clinical psychology in psychiatry at the IU School of Medicine, adjunct professor in PBS, and a specialist in neurocognitive and executive function testing, said that delays in executive functioning have been commonly reported by parents and others who work with children with cochlear implants. Based on these observations, his group sought to evaluate whether elevated risks of delays in executive functioning in children with cochlear implants exist, and what components of executive functioning were affected.

“In this study, about one-third to one-half of children with cochlear implants were found to be at-risk for delays in areas of parent-rated executive functioning such as concept formation, memory, controlled attention and planning. This rate was 2 to 5 times greater than that seen in normal-hearing children,” reported Kronenberger, who also is co-chief of the ADHD-Disruptive Behavior Disorders Clinic and directs the psychology testing clinic at Riley Hospital for Children at IU Health.

“This is really innovative work,” said co-author David B. Pisoni, Chancellor’s Professor in PBS and director of the Speech Research Laboratory in PBS. “Almost no one has looked at these issues in these children. Most audiologists, neuro-otologists, surgeons and speech-language pathologists—the people who work in this field—focus on the hearing deficit as a medical condition and have been less focused on the important discoveries in developmental science and cognitive neuroscience.”

Richard Miyamoto, chair of the IU School of Medicine Department of Otolaryngology–Head and Neck Surgery and a pioneer in the field of cochlear implantation in children and adults, said this finding augments other research on interventions to help children with cochlear implants perform at a level similar to children without hearing deficits.

One possible answer may lie in earlier implantation, Miyamoto said. The age at which children are implanted has been steadily decreasing, which has produced significant improvement in spoken language outcomes.

Preschoolers in the IU study were implanted at an average age of 18 months, and they had fewer executive function delays than school-age children who were implanted 10 months later, at an average age of 28 months. Kronenberger said the research also shows that many children develop average or better executive functioning skills after cochlear implantation.

“These results show that half or more of our group with cochlear implants did not have significant delays in executive functioning,” Kronenberger said. “Cochlear implants produce remarkable gains in spoken language and other neurocognitive skills, but there is a certain amount of learning and catch-up that needs to take place with children who have experienced a hearing loss prior to cochlear implantation.”

“We are now looking for early markers in children who are at risk before they get implants,” Pisoni said. “It will be beneficial to identify as early as possible which children might be at risk for poor outcomes, and we need to understand the variability in the outcome and what can be done about it.”

The research was funded by a R01 DC009581 grant from the National Institute on Deafness and Other Communication Disorders.
Translational Work in Progress

PBS faculty awarded CTSI grants

Nearly two dozen Indiana University Bloomington scientists have been awarded grants through the Indiana Clinical and Translational Sciences Institute throughout 2013 and the first part of 2014. The awards are given to facilitate and accelerate research discoveries that may improve the health of people in Indiana and beyond.

Among the 2013 and 2014 CTSI grant recipients and research projects are the following PBS faculty:

**Core Pilot funding**
- William Hetrick, Department of Psychological and Brain Sciences, cerebellar dysfunction in autism.
- Andrea Hohmann, Department of Psychological and Brain Sciences, Purdue Biophysical Analysis Lab, and Joint Support for the 2013 GRC-GRS on Cannabinoid Function in the CNS.
- Sharlene Newman, Department of Psychological and Brain Sciences, neural and behavioral correlates of anoma treatment in acquired neurogenic disorders.

**Project Development Teams pilot funding**
- Robert Nosofsky, Department of Psychological and Brain Sciences, using a formal cognitive model to assess visual working memory deficits in patients with schizophrenia.
- Brian D’Onofrio, Department of Psychological and Brain Sciences, understanding the complex causes of suicidal behavior: a population-based study using quasi-experimental approaches.
- Richard Shiffrin, Department of Psychological and Brain Sciences, development of new and sophisticated empirical paradigms and theoretical analyses that will enable determination of the mechanisms of attention, including the causes of lapses and particularly the way that multiple competing demands for attention are adjudicated.

The Indiana CTSI is a statewide collaboration of Indiana University, Purdue University and the University of Notre Dame focused on the conversion of scientific discoveries in the lab into new patient treatments. It was established in 2008 with a Clinical and Translational Science Award of $25 million from the National Institutes of Health and additional support from the state, member universities, and public and private partners. The institute received a five-year renewal grant of $30 million from the NIH in late 2013.

“Development of Indiana CTSI activities on the IU Bloomington campus is a key research priority for this campus,” said Sarita Soni, vice provost for research at IU Bloomington. “We are committed to investing in new areas of innovation that build on our research strengths such as systems biology, -omics, virology, bio-statistics and network sciences. This investment in Indiana CTSI initiatives at IU Bloomington aligns with the campus strategic plan, and over the next five years we will engage more faculty in these efforts.”

In Memoriam

**Gabriel Frommer (1936-2014)**

The department loses a beloved colleague

This past spring the department mourned the loss of a beloved, long-time colleague Emeritus professor Gabriel Frommer was a continual presence in the department from 1964, when he arrived, until just before his death. He completed his BA at Oberlin College in 1957, a PhD at Brown University in 1961, postdoctoral fellowships at the NIH and Yale University. He continued to teach courses in PBS long after his retirement. During his career, he pursued research on electrophysiology, hemispheric specialization, and brainstem influences on sensori-motor function, among other topics.

Frommer was born in Budapest, Hungary, the son of Joseph and Magda (Lovas) Frommer. He died in his sleep March 22, 2014, at Hospice House, of pancreatic cancer.

The Frommers left Hungary in 1939 and came to America in 1941, where they settled in Cincinnati. Gabriel met his spouse, Sara Hoskinson Frommer, while they were students at Oberlin College. They married in 1958 and had two sons, Charles Paul, of Tillson, N.Y., and Joseph Arthur, of Bloomington.

Survivors include Sara, Charles, Joe, a niece and three nephews and their children, and two cousins and their children. He was preceded in death by his parents, his older brother, Peter, two uncles, two aunts, and a cousin.

A member of the faculty of the Department of Psychological and Brain Sciences since 1964, he was thankful for the privilege of being associated with a remarkable group of people and a remarkable institution. He especially appreciated live performances at the School of Music, and he enjoyed being part of the whole community of Bloomington.
Cognitive Excellence

Peter Todd named Provost Professor

U Bloomington recently named three Provost Professors. Among them was PBS and cognitive science professor Peter Todd. The others are Bogdan Dragnea, professor in the Department of Chemistry; and Barbara Klinger, professor in the Department of Communication and Culture.

As the College of Arts and Sciences reported, faculty who are designated Provost Professors have achieved local, national, and international distinction in both teaching and research. The position was created in 1995 and was originally called Chancellor’s Professor. The name changed in 2009.

“Professors Dragnea, Klinger and Todd have combined highly original research and scholarship with outstanding teaching of both graduate students and undergraduates,” said Provost and Executive Vice President Lauren Robel. “I am delighted to recognize their dedicated efforts to advance the university, its students and their faculty colleagues.”

“These faculty members exemplify the outstanding teaching, research and scholarship that make Indiana University Bloomington a truly special place,” added Thomas Gieryn, IU Bloomington vice provost for faculty and academic affairs. “It’s a great pleasure to recognize their achievements, which demonstrate that pioneering research goes hand-in-hand with inspirational teaching.”

Todd’s research deals with heuristics, simple rules for making decisions in a wide range of contexts from choosing dinner to searching for parking. He explores cognitive mechanisms used to generate adaptive behavior, how such mechanisms evolve, and the ways in which evolution, cognition and other adaptive processes can interact.

His book *Simple Heuristics that Make Us Smart*, co-authored with Gerd Gigerenzer of the Max Planck Institute in Berlin, has been cited thousands of times. Its 2012 sequel, *Ecological Rationality*, is already widely cited. Todd has published on topics as varied as musical cognition, food choice, human mate choice, the evolution of parental behavior, artificial neural networks, and artificial life.

A highly regarded teacher of both large undergraduate lecture courses and graduate seminars, he is director of graduate studies for the Cognitive Science Program and is part of the Center for the Integrative Study of Animal Behavior, the Food Studies Program, and the Center for Complex Networks and Systems Research. He co-authored winning proposals for College of Arts and Sciences Themesters on “Good Behavior, Bad Behavior” in 2012 and “Eat, Drink, Think: Food from Art to Science” in 2014.

Provost Professors receive an annual award of $2,500 for three years and a $5,000 grant for a project that demonstrates how teaching and research are mutually reinforcing. A reception to honor the three faculty members will be scheduled in the fall 2014 semester.

Raising the Bar on Teaching

PBS faculty recognized for outstanding teaching

PBS faculty members are highly represented among those honored for excellence in teaching. This spring three faculty members received Trustee Teaching Awards from the College: Richard Hullinger, Benjamin Motz, and Irene Vlachos-Weber. Senior lecturers in the department, all three are masterful teachers dedicated to undergraduate education.

The awards were established to recognize and enhance excellent teaching at Indiana University, especially at the undergraduate level. The $2,500 award is given to tenured or tenure-track faculty, or full-time lecturers or clinical faculty whose primary duty is teaching, and who have demonstrated that they are the best teachers.

The IUB Office of the Vice Provost for Faculty and Academic Affairs is responsible for procedures determining the award recipients. Selections are made by faculty committee.

In another quarter the IU Center of Excellence for Women in Technology (CEWiT) invited Indiana University students to nominate faculty who made a difference to them and served as advocates for women students for the 2014 Outstanding Faculty Mentor Award. PBS professor Thomas James was one of two recipients of the award, nominated by then-graduate student Lindsay Arcurio, who has since completed her PhD.

“Dr. Thomas James has gone over and beyond what most advisors would do or have done for their graduate students,” Arcurio wrote in her nomination letter. “I have been his graduate student for six years, and he has seen me through two pregnancies with unwavering support. He has continually encouraged me in both my research and family matters. He believes that having women in science is critical to advancement in the field and wants to do everything in his power to support them. Yet, he not only says he supports women in science, he puts his words to action.”

James was honored on March 28 at the opening banquet of the 2014 CEWiT conference.
Congratulations to Our GrADUATES!

This spring, over 330 PBS majors graduated from the IU Bloomington campus. We extend to them our congratulations and best wishes for a bright future!

Save the Date! Our 2014 Alumni Recognition Awards Banquet will be held on Friday, October 17. The day will include symposia, a poster session, dinner, and recognition of outstanding alumni achievements. Watch your mailbox for further details. We hope you will join us for this celebration!

PBS IN THE NEWS

Click on links for the stories

- The New York Times article, “What’s Lost as Handwriting Fades,” featured the research of Karin James on the benefits of handwriting.


- The Herald-Times covered the visit to PBS of middle students participating in Linda Sinex’ service-learning course on the psychology of adolescent girls. The story was picked up by the Associated Press and appeared widely.

- An article in Scientific American and Quanta, “Sand Pile Model of the Mind Grows in Popularity,” cites Olaf Sporns, as does an article in New Scientist on the first detailed map of any mammal’s neural network.

- Linda Smith and Catarina Vales’ study of the way words direct children’s visual attention was featured in PsyPost.org, Science Daily, Latinos Health, and Inside IUB, among other news sources.

- David Pisoni was interviewed on WFIU, and stories about his recent collaborative JAMA study appeared in TechTimes.com, HealthDay.com, and NeuroScientistNews.com, among many other sources.

- Lindsay Arcurio’s study on alcohol-dependent women was featured in NeuroscienceNews.com, the Herald-Times, the Indiana Daily Student, Science Daily, and other sources.

- The BBC recently aired an interview with Josh Brown in Milan following his presentation at the FENS Forum on Neuroscience.

Learn more about how you can help support PBS!