Annual Convention Previews

May 19, 2004

Two researchers preview their 2004 Annual Convention invited presentations.

Amy T. Galloway

The First Day of Class: Getting off to a Great Start

By Amy T. Galloway

During my first year at Furman University, I realized that majoring in cello performance was not in my future. I decided to stay in the orchestra, but to pursue something equally practical – a career studying animal behavior. I obtained a BA in psychology from Furman, completed a master's degree in animal behavior at Bucknell University, and then received a PhD from the University of Georgia, where I studied feeding behavior in tufted capuchins monkeys. In particular, my mentor, Dorothy Fragaszy, and I examined how infant capuchin monkeys learn about food from their mothers and other group members. Toward the end of my graduate career, we investigated and compared the motor skills of children and capuchin monkeys. After working with young children on this project, I became interested in studying feeding behavior in children, but by that point I was wrapping up my dissertation work.

Around the same time that I became interested in the development of feeding behavior in children, I also realized that teaching was incredibly exciting, challenging, and fulfilling work. Being able to teach a variety of courses as a graduate student allowed me to gain competency in another area besides research, and it enabled me to learn about an aspect of academic life that some graduate students do not experience until they are in the midst of their first academic position. After teaching a few courses I was eligible to be involved with the wonderful interdisciplinary teaching assistant mentor program at Georgia. In addition to strengthening my teaching skills, this year-long course also helped me develop professional and interpersonal skills. These experiences with teaching led me to pursue a career at an institution that values both teaching and research. Immediately after finishing my dissertation, I began teaching as a "teaching postdoc" at Northern Michigan University. Because my research focus was expanding into the area of developmental psychology, my plan was to gain experiences needed to be eligible for a developmental position in a psychology department. While at Northern Michigan University, I taught various developmental courses and wrote a proposal for an NIH training grant to learn the research methods needed to study feeding behavior in children. When my grant was approved, I began a postdoctoral fellowship at the Pennsylvania State University working with Leann Birch, who is well respected for her work in the area of children's feeding preferences. While at there I examined the development of "picky eating" behavior in children. The area of research I chose to focus on turned out to be a good fit for me. It leaned toward the applied side of basic science enabled me to employ research methods that were feasible at a smaller institution, and allowed me to work in both the biopsychological and developmental sides of psychology. In addition, this type of research is ideal for interdisciplinary collaboration, which I find extremely rewarding and productive.

Having completed my postdoctoral stint at Penn State, I recently began working at Appalachian State University. It became clear during my interview that this was my dream position. The department valued just the right mix of teaching and research, as evidenced by a strong teaching mentoring program for the master's level students and by faculty interested in both the scholarship of teaching and traditional research. During my first semester I began to assist with the mentoring program that trains our graduate students to teach, and I have continued to pursue my research on the development feeding and food preferences in children. To this end, I am developing a research program that will enable me to mentor students while collecting data in my primary area of interest. My research and teaching overlap in several ways. Because I teach human development and the psychology of parenting, I have many opportunities to discuss my research findings. I use these times to gather anecdotal information from students that might inspire further study. Also, I often find that students' understanding, or rather misunderstanding, about concepts related to my research informs my writing. Finally, I think including teaching and research in my professional life suits my personality, because I am motivated by change and new experiences. Teaching tends to provide more short-term, daily fulfillment, while research tends to offer more intermittent rewards. These complementary activities together provide powerful fulfillment.

Of Mice and Men: Exploring the Neurobiology of Human Spatial Navigation

By Michael J. Kahana

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As a cognitive psychologist, my principal interest is in building and testing theories of human behavior, and in particular theories of human memory and learning. Such work typically involves experimental studies of college undergraduates who sit in front of a computer and attempt to learn and later remember information presented to them under highly controlled conditions. Data from such experiments can often reveal striking facts about the way people learn and remember information – those facts can take the form of precise relations between manipulated variables and memory performance. These memory phenomena help to test existing theories and guide their revision or their outright rejection.

With the recent advances in human neuorimaging techniques we can now augment our measures of behavior – typically, the speed and accuracy of participants' responses – with measures of brain activity, such as changes in blood flow during different kinds of behavior or changes in the pattern of electrical or magnetic fields recorded at the scalp. These techniques have led to significant advances in our understanding of human cognition and have produced a revolution in the way cognitive research is being done around the world.

Despite these recent advances, an important gap exists between our understanding of the neurobiology of certain behaviors in animals, and our understanding of the mechanisms underlying analogous behaviors in humans. A striking example can be seen in our understanding of the physiological basis of spatial cognition in rodents. In the rat we know a great deal about how individual nerve cells represent information about the environment, and in particular how cells in the hippocampus rewire to store information about new experiences. When a rat explores a new environment, cells in the hippocampus start to respond in a location-dependent manner, with individual cells becoming active when the animal passes through specific regions of a maze or track. At the same time as these cells are firing, the electrical field recorded in the hippocampus exhibits a strong rhythmic pattern, with waves of electrical activity rising and falling approximately six times per second. These cells are called “place cells,” and the rhythmic activity is called the “Theta Rhythm.” Place cells in the rat hippocampus are context sensitive, remapping when an animal moves from one environment into another, and then returning to the original map when the animal returns to the original environment. Given that a place can be traversed in many ways and can be associated with different visual scenes, an important and surprising feature of these cells is that they often fire in a manner that is invariant to the direction of movement or the objects being viewed from a particular location. That is, they respond to a given region of space irrespective of route or view.

A major current debate within cognitive psychology is whether humans possess a view- and direction-independent code of spatial location, or whether spatial location is inferred from a combination of view and path information (Wang & Spelke, 2002). Proponents of spatial map theories typically assume that both types of information are important, but viewpoint-based theories often assume that all representations are viewpoint dependent and that no pure-place codes exist. Indeed, the presence of place cells in the rat does not imply the existence of similar coding mechanisms in the human brain.

One way to potentially resolve this debate is by examining direct recordings of single neurons in the human brain. Such recordings can be ethically obtained in certain cases of pharmacologically resistant epilepsy, where patients require depth electrodes to be implanted for a period of five to 10 days, during which time seizure activity is monitored. By having patients play a taxi driver videogame while obtaining extracellular recordings in the human hippocampus and parahippocampal region, we confirmed the presence of place cells in the human hippocampus (Ekstrom, et al., 2003). Moreover, the results also show the existence of two other cell types: “view cells” in the human parahippocampal region, and “goal cells” in the medial temporal and frontal lobe regions. The former respond to what the navigator sees, the latter to what the navigator searches for. These findings implicate a neuronal network encoding place, view, and goal in human spatial navigation (Burgess et al., 2002). They also demonstrate an interaction between view and place representations, with some cells exhibiting non-directional and view-independent place responses, but other cells responding to place in a direction and/or view dependent manner. Adding further support for the relevance of basic rodent physiology for human navigation, we showed that the theta rhythm during spatial navigation was especially strong during movement and search (Caplan et al., 2003).

Despite the striking differences between species, our knowledge concerning the physiology of cognition in lower animals can sometimes inform our understanding of human cognition. Confirmation of these parallels can be achieved through collaborations between cognitive psychologists, neurosurgeons, and neurologists, and in the process may also advance treatments of neurological conditions, such as epilepsy, by identifying brain regions that are crucial for certain aspects of cognitive function.