An Architectural Tour of the Mind

February 27, 2011

Dario Maestripieri

The “The Architecture of the Mind” theme program exemplified the overall theme of this year’s convention, “Crossing Boundaries: Becoming a Cumulative Science.” This unique program brought together six speakers from psychology, neuroscience, anthropology, and biology to discuss recent findings about how the mind allows us to, among other things, interact with others, understand emotions, and communicate with language. Topics included how behaviors are influenced by genes and environment, how the architecture of the mind is formed, and the ways in which behavior can shape the mind. The program drove home the idea that the architecture of the mind is not built from the ground up like a building. Rather, the mind is the result of a combination of top-down as well as bottom-up construction — although genetics and biology play an important role in shaping our brains and influencing behavior, our environment and our interactions with it also prove to be essential building blocks for assembling our mind.

Speaking in front of a packed house, Dario Maestripieri (University of Chicago) showed compelling evidence that physical abuse runs in families. Maestripieri implicates genetic factors in this process — studies have shown that abusive mothers are likely to carry the short allele of the serotonin transporter gene. In addition, results of cross-fostering studies in rhesus monkeys reveal that “early experience plays an important role in the transmission of abusive parenting and rejection behavior from mothers to daughters,” showing powerful interaction between genetics and early experience in the development of abuse.

Daniel M.T. Fessler (University of California, Los Angeles), who shares an uncanny resemblance with Maestripieri, began his lecture by noting that “despite the phenotypic similarity of me to Dario, now it’s time for something completely different.” He went on to describe his work on disgust and its evolution from keeping us from ingesting toxins to playing a role in reproduction. Results from research conducted with Diana Fleischman suggest that, because of the hormone progesterone, the way women respond to disgusting pictures varies across the menstrual cycle. In addition, Fessler showed data suggesting that women are more disgusted by certain sexual behaviors when they are most likely to conceive.

APS Fellow Akira Miyake (University of Colorado at Boulder) started his lecture entitled “Differences in Executive Functions” by showing a fortune cookie he received that read, appropriately enough, “You have executive ability.” Miyake discussed executive functions (the processes that regulate cognition and action) and how individual differences in executive functions are related to different facets of self-regulation. He presented the results of twin studies that suggest a strong link between behavioral problems in childhood and successful executive function abilities in adulthood. As part of his presentation, Miyake showed a video from an experiment looking at self-restraint in young children. In the video, an impossibly adorable toddler was shown a fancy toy, then told not to touch it. It didn’t take

very long for him to start playing with it, eliciting big laughs from the audience. Miyake's conclusion: If you have good executive functioning (unlike the poor tempted toddler), you are better able to regulate your behavior and hence more likely to succeed with your goals.

Ellen M. Markman

APS Fellow Ellen M. Markman (Stanford University) discussed her recent work examining how children learn categories and how acquiring category labels can be seen as a form of cultural learning. She described one experiment conducted with Andrei Cimpian studying how young children deal with generic sentences (where a particular trait is given to an entire category, such as "dogs bark") versus nongeneric sentences (where a trait is given to a member of the category, such as "that dog barked"). When questioned about concepts, the types of explanations the children provided depended on the type of sentence they heard: The children who heard that butterflies have dust on their wings explained that the reason was to protect their wings or help them fly. But the children who heard that a particular butterfly had dust on its wings proposed that the butterfly flew through a cloud of dust. These findings suggest that language has a powerful effect both on how we learn categories and how we conceptualize information about category members.

APS Fellow and Charter Member James L. McClelland (Stanford University) also spoke about categorical learning. When we are young, we differentiate items into broad categories (plants or animals), but eventually we are able to differentiate between two very similar items (canary or robin). McClelland presented results from modeling experiments which show how, with experience, we begin to apply many attributes to items (such as color and ways of movement) that allow for more specific distinctions. McClelland concluded his talk by discussing what happens when that knowledge fades, a condition known as semantic dementia and characterized by loss of the ability to differentiate names. For example, a patient who, when shown different animals, has difficulty naming them and tends to call the larger ones "horse" and the smaller ones "cat." Just as it is important to understand how we learn categories, it is also important to understand the loss of that ability.

APS Fellow and Charter Member Arthur M. Glenberg (Arizona State University) concluded the series of talks with a "whirlwind tour through psychology," describing experiments which suggest that even the most abstract cognitive processes have their roots in bodily processes of perception and action.. Glenberg discussed how the concept of embodiment (how our interactions with the physical and social world influence our mind) can be applied to a number of areas of psychology, including cognitive development, language and memory, emotion, psychological disorders, and education. Because "brains and bodies have co-evolved and co-developed for effective physical and social interactions with the world, recognizing these facts provides a perspective that can unify neuroscience, cognitive science, and the rest of psychology too."