The 15th Annual Summer Institute in Cognitive Neuroscience was held at Dartmouth College in Hanover, New Hampshire, from June 24 to July 5, 2002, and was directed by Elizabeth Phelps, Patricia Reuter-Lorenz, and Michael Gazzaniga. The Summer Institute was attended by over 70 researchers, including both pre- and postdoctoral researchers as well as junior faculty. This year’s course focused on issues and developments surrounding the cognitive neuroscience of memory, emotion, and aging. The 2-week course included a “core” of daily lectures, which were given by many distinguished faculty. A broad range of themes was covered by the lectures, which included cellular, animal, and clinical viewpoints. Although we can only highlight a few of the lectures, we attempt to convey some of the main themes covered.

The first week concentrated on emotion and memory. Howard Eichenbaum (Boston University) discussed the role of rodent models in cognitive neuroscience. He noted that olfactory studies were especially relevant to studies concerning memory, owing to the striking similarity in the olfactory–hippocampal connections between rodents and humans. Eichenbaum presented interesting results from olfactory memory tasks in rats, such as the odor memory span task and an odor discrimination task. Results were discussed in terms of a model of declarative memory known as the “relational memory network.” This model attempts to integrate the properties of declarative memory by suggesting that episodes are encoded as a sequence of events and are linked to allow inferences across them.

Larry Squire (University of California, San Diego) discussed the multiple memory systems of the human brain. Squire began with a summary of the functions of the medial temporal lobe as revealed by studies of patients with damage to this brain region. In his closing remarks, Squire made two main points: (1) the memory system that is engaged depends not so much on what task must be learned but on the strategy that is implemented during the task and (2) that neuroanatomy must be considered by cognitive scientists.

Marcia Johnson (Yale University) elaborated on the need to define cognitive processes when using functional brain imaging. Johnson presented a component process model of memory called the multiple-entry, modular memory (MEM). MEM, according to Johnson, recruits various combinations of perception and reflection (e.g., refreshing, rehearsing) that depend on task complexity. Along with fMRI, Johnson posits that MEM could help to disentangle the neural correlates of working and long-term memory and could provide a framework for the investigation of cognitive changes resulting from, for example, aging or brain injury.

The second week considered various aspects of cognitive aging. Carol Barnes (University of Arizona) reviewed the literature on animal models of cognitive aging and paid particular attention to the acquisition of spatial “maps.” She showed, using electrophysiological studies in animals, that the acquisition of new spatial maps may become unreliable in old age. For example, on repeated visits to a familiar environment, young rats showed the same pattern of neuronal firing each time, whereas old rats failed to show consistent patterns of neuronal firing. The cellular mechanism(s) involved in this phenomenon was suggested to include long-term potentiation. Barnes also illustrated a new technique in which the temporal activity of individual neurons could be tracked in vivo. This technique could provide a greater understanding of spatial maps in the future.

Randy Buckner (Washington University) discussed some of the difficulties associated with imaging studies in the aged population. He noted the decreased signal-to-noise ratio in the BOLD signal in the aged relative to younger subjects, which complicates the interpretation of results in...
the elderly. In addition, Buckner discussed the finding that elderly subjects often show bilateral recruitment of frontal brain regions in cognitive tasks in which younger subjects show unilateral frontal activation. This breakdown in selective recruitment in the elderly is observed even when elderly subjects are given extra support to ensure that they are using the same cognitive strategy as younger subjects. These results were suggested to reflect age-associated changes in white matter connectivity in frontal regions.

In addition to the multitude of lectures, attendees of the Summer Institute were also offered ample hands-on opportunities to experience various research techniques used in the cognitive neurosciences. For instance, attendees were given the opportunity to conduct an fMRI study using Dartmouth College’s 1.5-T MRI scanner. The attendees analyzed their own data using workstations in the Center for Cognitive Neurosciences and presented their findings on the last day of the course. Other activities included a brain dissection laboratory, which was organized and run by faculty members including Mark D’Esposito, John Glass, Scott Grafton, Ron Green, Dan Press, Robert Rafal, and Alan Rosenquist. A human fear conditioning experiment was conducted by Kevin LaBar. Finally, all attendees participated in highly enlightening debates on topics such as emotional memory and healthy aging.

Overall, the 2002 Summer Institute provided attendees with an extensive and critical review of contemporary cognitive neuroscience. The various lectures and laboratories presented a thorough and well-balanced range of topics in areas that were relevant to all attendees, regardless of background or level of expertise. In addition, the relaxed atmosphere of the Summer Institute and the extended question-and-answer sessions that followed each lecture allowed faculty to speculate on the significance of their work (much of which was unpublished) and to discuss the likely future directions of their field of research. In doing so, they gave attendees a fascinating insight into the current state of cognitive neuroscience.