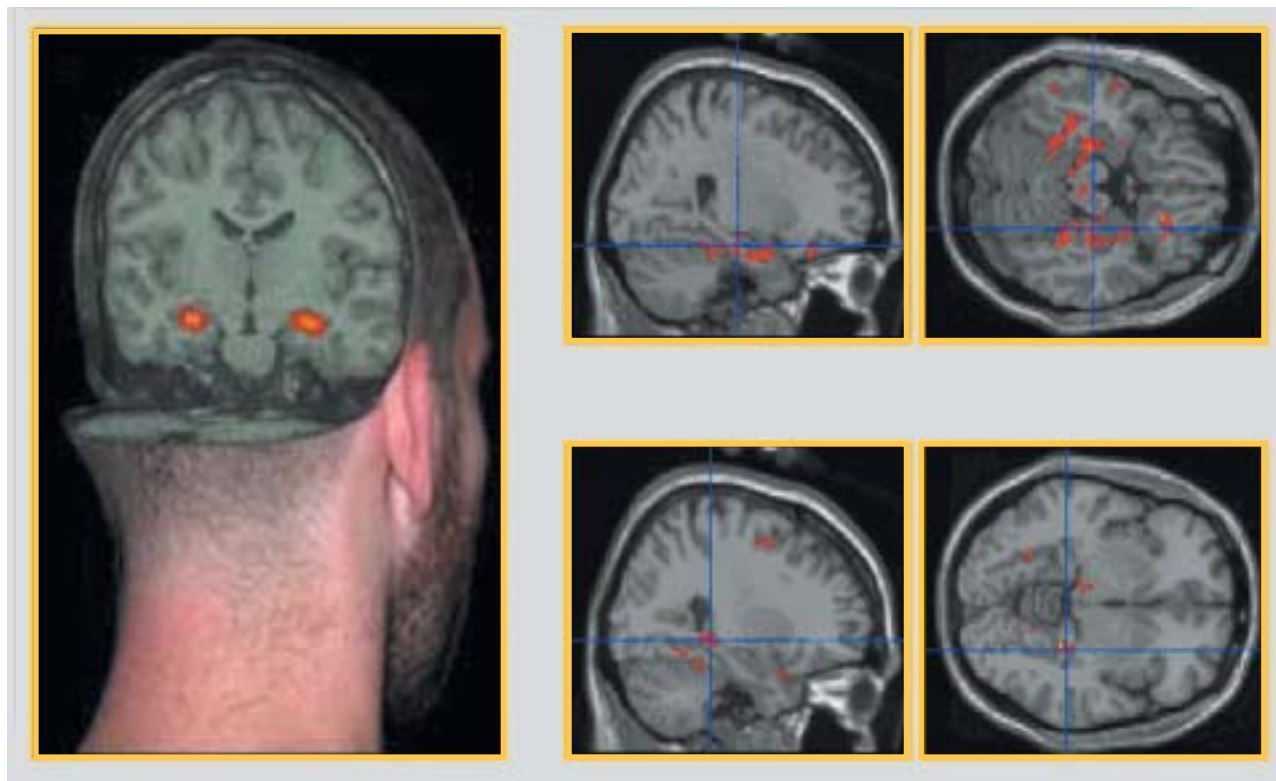


The Hippocampus



The left figure indicates the location of the hippocampus in coronal plane within the head. The four figures on the right show hippocampal activation in sagittal and a transaxial projection images during a novelty detection task, with the top images from a block design and the lower images from an event-related design.

The hippocampus is an allocortical structure with three layers (molecular, pyramidal, and polymorphic) located on the medial surface of the temporal lobe. It is entwined with the dentate gyrus, and both receive inputs from the surrounding parahippocampal regions. Virtually every area of the cortex (sensory and associational) sends inputs to specific regions of the parahippocampal gyrus; these are then processed and funneled into the dentate gyrus and hippocampus proper. All inputs to the hippocampus are processed through a characteristic pathway within its different subfields; outputs leave the hippocampus for the anterior cingulate cortex, frontal cortex, basal ganglia, and back through the parahippocampal structures to the neocortex. The critical functions of the hippocampus were first encountered with the famous neurosurgical case of H.M., in which a 27-year-old patient with intractable epilepsy had a bilateral temporal lobectomy to treat his seizures. H.M.'s seizures were cured, but he was left without any capacity to form new memories. Decades of research have now given us a much broader idea of the structure, cellular function, and circuitry of the hippocampus to help explain the processes of memory. This understanding is the basis

for our emerging understanding of how the hippocampus participates in human memory and how its dysfunctions contribute to diseases of the brain. For example, the hippocampus is one of the first brain regions affected in Alzheimer's disease. The structure also participates in seizure generation in some forms of epilepsy. Furthermore, it has been implicated in psychosis, depression, and some forms of mental retardation. Because the structure is one of the more simple cortical regions in the brain and the study of its functions has been intense, this may be one of the first regions of the cortex whose role in learning and episodic memory may be fully described. The figure illustrates where the hippocampus is located in brain. While the hippocampus is a relatively small cortical structure, it performs a critical role in information processing in humans. And, since the structure is well conserved throughout all species, studies in animals have been critically informative about human hippocampal functions.

CAROL A. TAMMINGA, M.D.
Dallas, Texas

Address reprint requests to Dr. Tamminga, UT Southwestern Medical Center, Department of Psychiatry, 5323 Harry Hines Blvd., #NC5.914, Dallas, TX 75390-9070; Carol.Tamminga@UTSouthwestern.edu (e-mail).