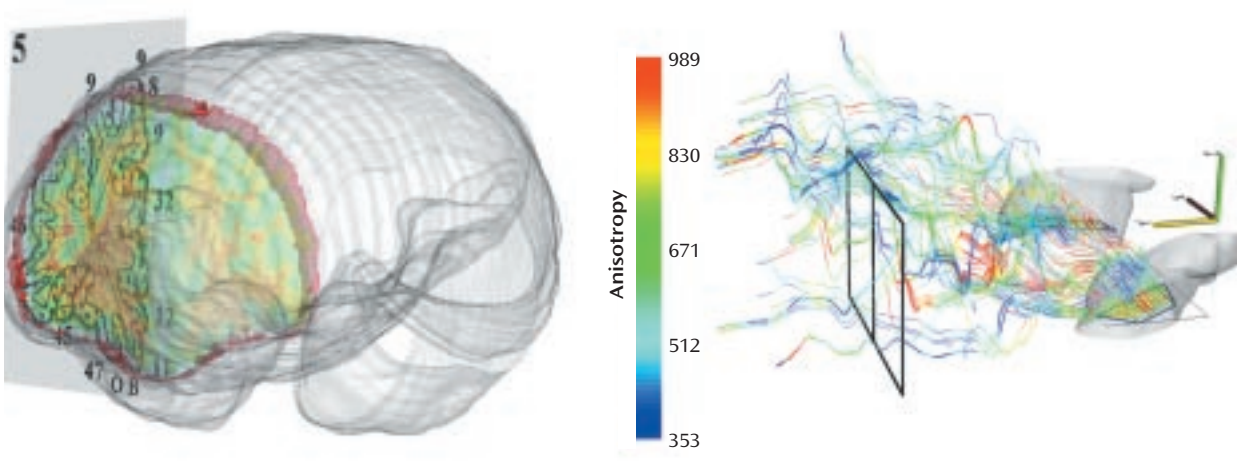
Frontal Cortex Function



The frontal lobe in humans and other primates is the largest of the brain's lobes and comprises a great number of cytoarchitectonic areas. The frontal cortex, along with the other associational cortical areas, performs diverse functions loosely called cognition. Neocortical associational areas facilitate attention to incoming stimuli from the primary sensory regions, recognition of related features of stimuli, identification of relevant features of each stimulus, and planning of appropriate cognitive and motor responses. In particular, the frontal cortex is especially important for planning appropriate behavioral responses to external and internal stimuli. It functions in close association with other regions of the brain that make up cerebral systems specifically designed for individual mental tasks. It participates with other brain regions in aspects of learning and memory, attention, and motivation, in part through its central role in working memory. The frontal cortex integrates complex perceptual information from sensory and motor cortices as well as from the parietal and temporal association cortices to perform these cognitive tasks. Injury to the frontal cortex or deficits in its function are associated with impairment in planning (executive function), altered initiative, "personality" change, and reduced creativity. Several psychiatric diagnoses have been associated with alterations in frontal cortical function, such as schizophrenia, depression, and obsessive-compulsive disorder. Neural inputs to the frontal cortex come from the sensory and motor cortices, other regions of the cortex, the thalamus, and the brainstem; outputs are directed to the hippocampus, basal ganglia, cerebellum, thalamus, and other associational cortices. The illustrations depict the frontal cortex from MRI tracings shown within the brain structure, with Brodmann's areas identified (left). The other figure demonstrates connections between the frontal cortex and thalamus by way of the internal capsule developed from diffusion tensor imaging (right). It is these newest kind of brain imaging technologies that enable the acquisition of structural, functional, and chemical imaging from the human brain in vivo.

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