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CHANNELS IN THE BRAIN: Segregation of information transmission and its relation to brain size.

The corpus callosum is the largest fiber tract in the nervous system of placental mammals, and has remained quite conserved in phylogeny. However, there is yet no clear explanation for its function. One possibility is that it originally developed as a "developmental accident" that established a corridor for axonal growth across the hemispheres, and then served to integrate some brain functions, particularly synchronizing oscillatory activity in association areas, and midline fusion in sensory and motor areas. Oscillatory activity occurs at a variety of frequencies, from less than 3 Hz to some 600 Hz, which can be considered as different channels of information transfer. Nonetheless, there may be severe timing constraints to establish high frequency interhemispheric synchrony or midline fusion mechanisms, as brains grow larger and increase interhemispheric transmission delays. One possible way out of this problem is amplifying variability of fiber sizes, establishing a small population of large-diameter, fast conducting myelinated fibers whose conduction velocity follows increases in brain size. However, calculations imply that this increase may not be sufficient to preserve high frequency synchronic ensembles, which may provide a substrate for the development of brain lateralization in species with large brains.