THE NEOCORTEX BECAME THE MAJOR COORDINATING CENTER FOR SENSORY AND MOTOR FUNCTIONS

Even in ancestral mammals the neocortex had expanded to form a surface layer covering most of the forebrain. This does not mean that the old cortex of the ancestral brain has been reduced; it has simply been pushed to an internal position by the growth of the neocortex. Throughout mammalian evolution there has been a steady increase in the relative size of the neocortex. In advanced mammals it dominates the entire cerebrum and becomes the major coordinating center for sensory and motor functions involving all senses and all parts of the body, and is the site of analysis, memory, and integration. In humans and other primates the neocortex has grown to such immense size that it has been folded into convolutions, thereby increasing the total volume of gray matter.

As the neocortex continued to expand in size, it became more and more dominant over the other parts of the brain. The midbrain had been the chief control center in the earliest vertebrates. Then the thalamus portion of the forebrain became a major coordinating center, first sharing this function with the midbrain, then becoming dominant. Finally, with the rise of the neocortex and its preempting of many control functions from both the midbrain and the thalamus, the midbrain was left as a small connecting link between the hindbrain and the forebrain. In humans it still controls a few local reflex mechanisms, some of the simpler visual functions, and is involved in the control of emotions.

This increase in brain size and complexity from fish – the vertebrates with the simplest brains and smallest cerebrums – through amphibians and reptiles to mammals, suggests the likely evolution of the vertebrate brain. But this evolutionary pathway does not mean that the brain of each type of organism has now ceased to evolve. On the contrary, the fish brain has continued to evolve since the rise of amphibians, and the amphibian central nervous system has likewise continued to evolve since reptiles diverged into their own evolutionary line. Though the most ancestral vertebrate brains are by and large found in fish, the brains of some species of modern fish are relatively large and complex. The size and complexity of the brains of present-day vertebrate species are determined both by the evolutionary history and the selective pressures that they face in their varying environments.