BIOLOGICAL HIERARCHY AND THE ORIGIN OF THE NEOCORTEX

S. D. Briscoe[1]
[1]. Max Planck Institute of Molecular Cell Biology and Genetics, Dresden, Germany

A six-layered neocortex is found in the pallium of all extant mammals but is absent from the brains of our closest nonmammalian relatives, the birds and non-avian reptiles. The question of how the neocortex arose in stem mammals is among the most contentious and long-standing problems in comparative neuroscience. To resolve questions of evolutionary novelty requires a hierarchical view of biological organization, one that permits the recognition of homologies at multiple levels beyond neuroanatomical structure. Recent comparative molecular data, together with classical neuroanatomical tracing studies, have contributed to a model in which the core excitatory neuronal cell types of neocortical circuitry are shared across mammals, reptiles, and birds. Lineage-specific developmental mechanisms may differentially arrange these conserved cell types into the derived structural architectures of the six-layered mammalian neocortex, the three-layered reptile dorsal cortex, the avian Wulst, and the many nuclei of the dorsal ventricular ridge.