
List of Contents

1	Introduction	1
2	Evolution of the Vertebrate Nervous System and Telencephalon	7
2.1	Animal Phylogenetic Relationships	7
2.1.1	Origin and Diversification of Metazoans	7
2.1.2	Phylogenetic Origins of the Nervous System	8
2.1.3	Summary	14
2.2	The Origin of Vertebrates	15
2.2.1	Early Theories and Fossil Evidence	15
2.2.2	The Neural Crest and Placodes in Vertebrate Origins	16
2.2.3	Olfactory Placode and Epithelium: Association with Adenohypophysis	19
2.2.4	Origin of the Telencephalon	21
2.2.5	Summary	22
2.3	Evolution of the Telencephalon in Vertebrates	24
2.3.1	Taxonomical Relationships Among Vertebrates and Their Early Evolution	24
2.3.2	Evolution of the Cerebral Hemispheres: Ventral Telencephalon	28
2.3.3	The Brain of Jawless Fishes and the Organization of the Ancestral Dorsal Telencephalon	29
2.3.4	The Pallium in Jawed Vertebrates	31
2.3.5	Summary	33
3	Origin of the Mammalian Brain	34
3.1	The First Mammals	35
3.1.1	Fossil Mammals and Their Brains	35
3.1.2	Summary	38
3.2	Origin of the Mammalian Neocortex: Hypotheses on Homology	38
3.2.1	Mammalian Brain Expansion and the Origin of the Neocortex	38
3.2.2	Hypotheses for Neocortical Origins	39
3.2.3	The Recapitulation Hypothesis: Connectional Evidence	40
3.2.4	The Dorsal Cortex of Reptiles: Subicular and Neocortical Characteristics	41
3.2.5	Differences in Connectivity Between the DVR and the Neocortex	43
3.2.6	Summary	46
3.3	Embryological Evidence	47
3.3.1	Developmental Criteria for Homology	47
3.3.2	Dorsoventral Gradients and Expansion of the Dorsal Pallium	52
3.3.3	Summary	53
3.4	The Olfactory–Hippocampal Hypothesis	54

3.4.1	A Functional Interpretation of Dorsal Pallial Expansion in Mammalian Origins	54
3.4.2	Summary	58
3.5	Origin of Neocortical Lamination	59
3.5.1	Laminar Organization of the Neocortex	59
3.5.2	Comparison of Mammalian Neocortex and Reptilian Cortex: Layer Homologies	60
3.5.3	Is There a Preplate in Reptiles?	62
3.5.4	Origin of the Inside-out Developmental Gradient	64
3.5.5	Pioneer Neurons and the Transition from a Tangential to a Radial Synaptic Organization in the Neocortex	66
3.5.6	Summary	67
3.6	Expansion of the Neocortex	68
3.6.1	Multiplication of Cortical Areas	68
3.6.2	Summary	71
4	Discussion	71
4.1	An Overview	71
4.1.1	Early Neuronal Differentiation	71
4.1.2	Patterning	72
4.1.3	Diversification of the Hemispheres and Neocortical Origins	74
4.1.4	Olfaction, the Hippocampus and the Amygdala	75
4.1.5	Cortical Lamination	75
4.1.6	Tangential Expansion and the Origin of New Areas	77
4.2	Issues with Evolutionary Theory	77
4.2.1	Genetic Conservatism Versus Morphological Diversity	77
4.2.2	Development as a Clue to Evolution	78
4.2.3	Developmental Processes and Homology Criteria	79
4.2.4	Development, Adaptation, and Behavior	81
4.3	Final Comments	83
	References	85
	Subject Index	113

Origin and Evolution of the Vertebrate Telencephalon,
with Special Reference to the Mammalian Neocortex

Aboitiz, F.; Montiel, J.

2007, VII, 121 p., Softcover

ISBN: 978-3-540-49760-8