

Contents

Editors-in-Chief v

Contributors ix

Introduction to Comprehensive Developmental Neuroscience xi

I

FORMATION OF AXONS AND DENDRITES

1. Development of Neuronal Polarity *In Vivo* 3
F. POLLEUX
2. Role of the Cytoskeleton and Membrane Trafficking in Axon–Dendrite Morphogenesis 19
K.C. FLYNN, M. STIESS AND F. BRADKE
3. Axon Growth and Branching 51
L. MA AND D.A. GIBSON
4. Axon Guidance: Semaphorin/Neuropilin/Plexin Signaling 69
J. FALK AND V. CASTELLANI
5. Roles of Eph–Ephrin Signaling in Axon Guidance 89
A.D. CHISHOLM AND D.A. FELDHEIM
6. Axon Guidance: Slit–Robo Signaling 105
F. BEAUBIEN, J.E.A. PRINCE AND J.-F. CLOUTIER
7. Nonconventional Axon Guidance Cues 127
L. IZZI AND F. CHARRON
8. Axon Regeneration 151
T.L. DICKENDESHER, Y. DUAN AND R.J. GIGER
9. Axon Maintenance and Degeneration 177
F. WANG AND Z. HE
10. Dendrite Development: Invertebrates 191
W.B. GRUEBER
11. Dendritic Development: Vertebrates 213
C. LOHMANN

II

MIGRATION

12. Cell Polarity and Initiation of Migration 231
K. SEKINE, H. TABATA AND K. NAKAJIMA
13. Leading Process Dynamics During Neuronal Migration 245
M. VALDEOLMILLOS AND F. MOYA
14. Nucleokinesis 261
O. REINER AND G. GERLITZ

15. Migration in the Cerebellum 281
Y. KOMURO, T. KUMADA, N. OHNO, K.D. FOOTE AND H. KOMURO
16. Radial Migration in the Developing Cerebral Cortex 299
S.C. NOCTOR, C.L. CUNNINGHAM AND A.R. KRIEGSTEIN
17. Radial Migration of Neurons in the Cerebral Cortex 317
A. STANCO AND E.S. ANTON
18. Migration in the Hippocampus 331
G. LI AND S.J. PLEASURE
19. Hindbrain Tangential Migration 345
C. SOTELO AND A. CHEDOTAL
20. Tangential Migration: The Forebrain 363
T.J. PETROS AND S.A. ANDERSON
21. Transcriptional Regulation of Tangential Neuronal Migration in the Vertebrate Hindbrain 377
T. DI MEGLIO AND F.M. RIJLI
22. Postnatal Neurogenesis of the Forebrain 405
R. BELVINDRAH AND P.-M. LLEDO
23. Migration of Myelin-Forming Cells in the CNS 417
F. DE CASTRO AND B. ZALC
24. Neuronal Migration and Brain Patterning 431
A. GRIVEAU, U. BORELLO AND A. PIERANI
25. Neuronal Migration of Guidepost Cells 457
F. BIELLE AND S. GAREL
26. Neuronal Migration Disorders 481
J.J. LOTURCO AND A.B. BOOKER

III

SYNAPTOGENESIS

27. Molecular Composition of Developing Glutamatergic Synapses 497
S.L. BARROW AND A.K. MCALLISTER
28. *In Vivo* Imaging of Synaptogenesis 521
M. MUNZ AND E.S. RUTHAZER
29. Genetic Analysis of Synaptogenesis 537
C.S. LU AND D. VAN VACTOR
30. Activity-Regulated Genes and Synaptic Plasticity 579
J.H. LESLIE AND E. NEDIVI
31. New Imaging Tools to Study Synaptogenesis 599
S.J. LE MARCHAND AND M.B. DALVA
32. Wnt Signaling 623
P.C. SALINAS
33. Neurotrophins and Synaptogenesis 639
F. JEANNETEAU AND M.V. CHAO

34. Ephrins and Eph Receptors – Synaptogenesis and Synaptic Function 659
A. FILOSA AND R. KLEIN
35. Neuroligins and Neurexins 671
D. SCHREINER AND P. SCHEIFFELE
36. Circuit Assembly in the Developing Vertebrate Retina 687
T. YOSHIMATSU, S.C. SUZUKI AND R.O.L. WONG
37. Synaptogenesis in the Adult CNS – Neocortical Plasticity 713
R. EAVRI AND E. NEDIVI
38. Synaptogenesis in the Adult CNS – Hippocampus 723
C. ZHAO, N. TONI AND F.H. GAGE
39. Synaptogenesis in the Adult CNS–Olfactory System 739
A. MIZRAHI
40. Synaptogenesis and Recovery from Cortical Trauma 757
R.J. NUZO AND D. MCNEAL
46. Chloride Homeodynamics Underlying Pathogenic Modal Shifts of GABA Actions 857
A. FUKUDA
47. GABAergic Signaling at Newborn Mossy Fiber–CA3 Synapses: Short- and Long-Term Activity-Dependent Plasticity Processes 879
E. CHERUBINI
48. BDNF and the Plasticity of Brain Networks During Maturation 895
J.-L. GAIARSA
49. Retinal Waves: Underlying Cellular Mechanisms and Theoretical Considerations 909
E. SERNAGOR AND M.H. HENNIG
50. Multimodal GABA_A Receptor Functions on Cell Development 921
A. FUKUDA, Y. NAKANISHI, T. KUMADA AND T. FURUKAWA
51. Retinal Waves and their Role in Visual System Development 941
M.B. FELLER AND D. KERSCHENSTEINER
52. The Maturation of Firing Properties of Forebrain GABAergic Interneurons 955
B.W. OKATY AND S.B. NELSON
53. Multiple Roles of KCC2 in the Developing Brain 975
P. UVAROV, O. LLANO, A. LUDWIG, M.S. AIRAKSINEN AND C. RIVERA
54. NKCC1 and Brain Maturation 999
C.K. PFEFFER AND C.A. HÜBNER
55. Maturation of Inhibitory Synaptic Transmission in the Spinal Cord: Role of the Brain Stem and Contribution to the Development of Motor Patterns 1009
L. VINAY
56. Calcium Signals Regulate Neurotransmitter Phenotype 1019
M. DEMARQUE AND N.C. SPITZER

IV**DEVELOPMENTAL SEQUENCES IN THE MATURATION OF INTRINSIC AND SYNAPSE DRIVEN PATTERNS**

41. GABA: A Multifacet Device that Exerts a Crucial Role in Brain Development 773
Y. BEN-ARI
42. Lessons from Zebrafish: Ion Channels Guide Neuronal Development 791
T.C. MARTIN AND A.B. RIBERA
43. Regulation of AMPA-Type Glutamate Receptor Trafficking 811
K. BOEKHOORN AND C.C. HOOGENRAAD
44. Pre- and Postsynaptic Assembly and Maturation: Principal Mechanisms and Coordination 823
S.J. SIGRIST AND C. WICHMANN
45. Cajal–Retzius and Subplate Cells: Transient Cortical Neurons and Circuits 843
H.J. LUHMANN

Index 1035