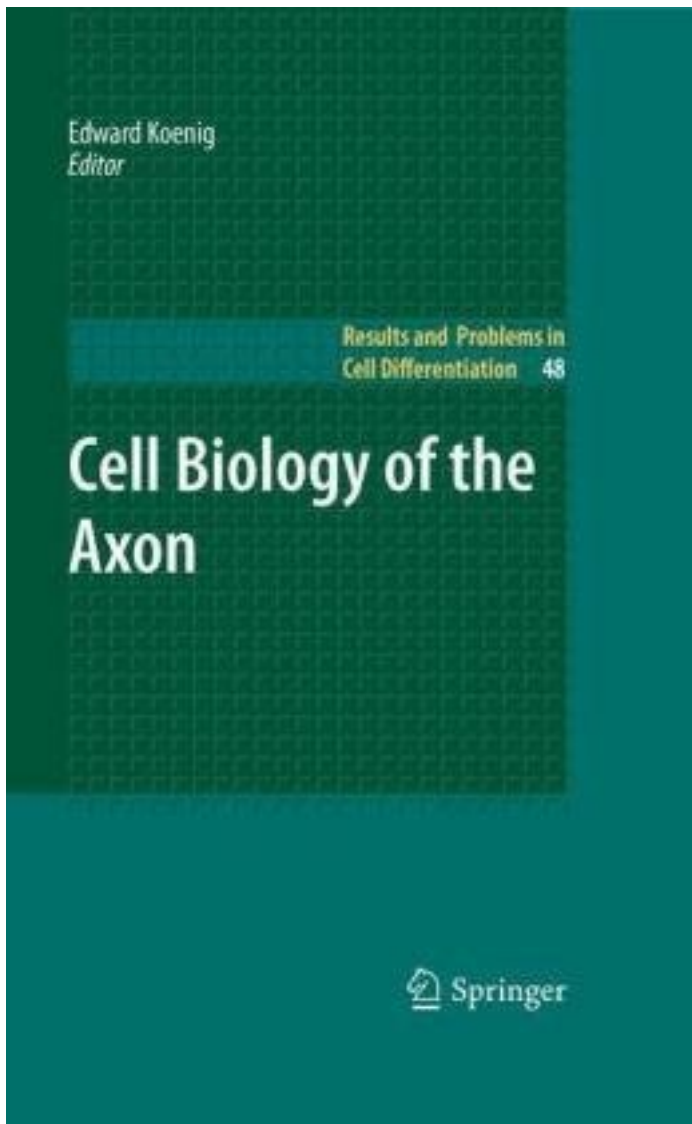


Cell Biology of the Axon



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Recent years have witnessed striking advances in research on axons at a cellular level that substantially impact our current understanding of axonal biology. Newer findings and their ramifications are critically reviewed in the 16 chapters of this volume by authors highly qualified by virtue of their scientific contributions to research areas they know and write about. Five basic areas (I to V) germane to axonal biology are highlighted, beginning with (I) signaling interactions mediating myelination, and differentiation of axonal membrane domains; (IIa) issues surrounding organization and transport dynamics of neurofilaments in axons, (IIb) mechanisms regulating microtubule organization and dynamics, misregulation of which causes axonal degeneration, and (IIc) the roles actin binding proteins play in regulating organization and functions of the actin filament system in mature and growing axons; (IIIa) myosin motor proteins and cargoes intrinsic to the axon compartment, (IIIb) mitochondrial transport motors, and imperatives governing transport dynamics and directional delivery, (IIIc) mechanisms mediating retrograde signaling associated with NGF α (TM)s role in trophic-dependent neuronal survival, and (IIId) potential for impaired subcellular targeting of α -synuclein as a mechanism for accumulation of Lewy body inclusions in synucleinopathies; (IVa) occurrence and organization of discrete ribosome-containing domains in axons, (IVb) endogenous mRNAs, classes of proteins translated locally, and RNP trafficking in axons, (IVc) importance of locally synthesized nuclear encoded mitochondrial proteins for maintenance, function and survival of axons, (IVd) occurrence of RNA trafficking from glial cells to axons, and significance glial RNA transcripts may play in expression in axons and axon terminals, (IVe) RNA trafficking and localization of RNA transcripts in axonal growth cones, and signaling pathways that modulate local protein synthesis for directional elongation, and (IVf) genetic and molecular defects underlying spinal muscular atrophy, and roles that SMN gene product plays as a molecular chaperone in mRNA transport and translation; (Va) injury-induced local synthesis of a protein forming a retrograde signaling complex in axons to stimulate regeneration, and (Vb) endogenous and exogenous factors that condition axonal regenerative capacity in PNS and CNS, including injury-induced activation of specific genes governing regeneration. Emergent complexities revealed in this volume compel a major revision in the traditional conceptual model of the axon (TM)s intrinsic makeup and capacities.

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