



An EMBO Workshop on *Emerging Concepts of the Neuronal Cytoskeleton*: A Unique Venue to Discuss Recent Advances in Cellular and Molecular Aspects of Cytoskeleton Function in Nerve Cells

Last year around one hundred researchers from Europe, Asia and the Americas met on the pristine shores of Llanquihue Lake in Puerto Varas, Chile, with the snow-capped peak of the Osorno volcano in the background to discuss the latest advances in the neuronal cytoskeleton field. The venue was an EMBO Workshop on *Emerging Concepts of the Neuronal Cytoskeleton*, the third in an international biennial workshop series, first held in 2011, that is now arguably the premier gathering for neuronal cytoskeleton researchers in the world. The Workshop brought together senior and junior investigators, post-docs and students from more than 12 different countries in a friendly and collegial atmosphere to explore the profound importance of the cytoskeleton for nerve cell development and function in both health and disease. The meeting was opened with a Keynote Lecture by Richard Vallee of Columbia University on the role of microtubule motors in the early phases of brain development, highlighting the critical importance of cytoskeletal dynamics for fundamental developmental events such as neurogenesis and neuronal migration. Over the next three days, the meeting was organized into seven vibrant sessions exploring novel and largely unpublished findings on Neuronal Polarity, Transport and Trafficking, the Cytoskeleton in Disease and Injury, the Cytoskeleton in Synapses and Spines, RNA Trafficking and Protein Synthesis, Actin Dynamics, and Microtubules and Motors. Two poster sessions allowed graduate students and early career researchers to share their latest results in a highly interactive and motivating environment.

This Special Issue of *Cytoskeleton*, divided into two parts, features short and timely review articles by some of the speakers at the 2015 workshop, highlighting some of the recent advances, unsolved questions and emerging concepts in this field. In Part I, in Leita et al (2016), Monica Sousa and colleagues review the exciting discovery of periodically arranged actin ring structures beneath the plasma membrane of axons and dendrites and discuss the contribution of actin-binding proteins as key regulators of these structures. Actin filaments are also essential to support dendritic spines and synaptic plasticity. In Hlushchenko et al (2016), Pirta Hotulainen and colleagues review the dynamic

changes in actin organization during spine maturation and in long-term potentiation (LTP) and depression (LTD), emphasizing the regulatory roles of neurotransmitter receptors, actin regulators and calcium signaling. The Workshop also featured numerous presentations on microtubule dynamics and functions in neurons. In Baas et al (2016), Peter Baas and colleagues present a conceptual framework for understanding microtubule stability and discuss how microtubules might contain contiguous domains that differ in their stability, leading to differential transient interactions with microtubule-interacting proteins that modulate the organization and function of these polymers. In Cammarata et al (2016), Laura Anne Lowery and colleagues address the dynamic interaction between actin filaments and microtubules during axonal guidance and discuss the role of +TIP proteins in coordinating this interaction. In Bamburg and Bernstein (2016), James Bamburg and colleague review recent advances in our understanding of the mechanism and importance of cofilin-actin rod formation in Alzheimer's disease; and how these intriguing cytoskeletal assemblies may be instrumental to triggering synaptic loss. In Villarroel-Campos et al (2016), Christian Gonzalez-Billault and colleagues discuss the cross-talk and connections between membrane trafficking and cytoskeleton dynamics, reviewing the multiple roles of Rab GTPases in neuronal differentiation, development and axonal outgrowth. Finally, in Feng and Arnold (2016), Don Arnold and colleague round out this collection with a review of technical approaches for the study of protein trafficking in neurons.

Part II of this Special Issue starts with a current update of the tubulin code contributed by Soumyananda et al (2016), in which Judy Liu, Carsten Janke and colleagues review the impact of tubulin isoforms and post-translational modifications on microtubule function, including a discussion of the large number of neurodegenerative and neurodevelopmental disorders now known to be caused by tubulin mutations. Several presentations during the Workshop focused on the importance of protein synthesis in somatic, axonal and dendritic compartments of neurons, both in health and disease. In Bellato and Hajj (2016), Glaucia Hajj and colleague discuss the role of eIF2 α phosphorylation in nervous system development, memory consolidation and stress responses in normal physiology and pathology. In Dantas

Published online in Wiley Online Library (wileyonlinelibrary.com).

et al (2016), Richard Vallee and colleagues summarize the significant progress made in the last 20 years towards our understanding of the important role of motor proteins in stem cell proliferation and neuronal migration during brain development. In Wilson et al (2016), Jonathan Terman, Christian Gonzalez-Billault and colleagues review our emerging understanding of the importance of redox signaling in the regulation of actin microfilaments, with a particular focus on role of NADPH oxidase and the flavoprotein monooxygenase MICAL in neuronal development, physiology and pathology. In Marchisella et al (2016), Eleanor Coffey and colleagues give microtubule dynamics a twist, and address the role of deregulated post-translational modifications affecting microtubule-associated protein (MAP) functions, including a discussion of potential therapeutic interventions for psychiatric disorders that target microtubules. In Gonzalez et al (2016), Francisca Bronfman and colleagues present a comprehensive review of the roles of brain derived neurotrophic factor (BDNF)-dependent signaling in neuronal differentiation. Finally, in Lopez-Leal et al (2016), Felipe Court and colleagues re-visit the origin of axonal proteins, describing evidence in support of a role for Schwann cell-derived exosomes as sources of axonal components involved in local protein synthesis within axons in the peripheral nervous system.

Collectively, we hope that these peer-reviewed articles provide an informative snapshot of the exciting and vibrant scientific program of this workshop in Chile and highlight some of the emerging concepts that were featured. We want to acknowledge the European Molecular Biology Organization (EMBO), the International Union of Biochemistry and

Molecular Biology (IUBMB), the International Society for Neurochemistry (ISN), Zeiss, the Comisión Nacional de Investigación Científica y Tecnológica (CONICYT) of Chile, the International Brain Research Organization (IBRO), the International Brain Research Organization's Latin America Regional Committee (IBRO-LARC), the Pan-American Association for Biochemistry and Molecular Biology (PABMB), The Company of Biologists, Cytoskeleton, Inc., Nikon, W. Reichmann Scientific Instruments, Cytoskeleton (CSK), GrupoBios, Biosonda Biotechnology, GeneXpress (Chile), and the Universidad de Chile for their generous support that made the Workshop possible, as well as the enthusiastic participation of so many speakers and attendees from around the world. Finally, the Guest Editors for this Special Issue owe a very special thank you to Michael Wise, Managing Editor of *Cytoskeleton*, for his expert and superlative editorial assistance. We hope the readers of *Cytoskeleton* enjoy this collection of articles and feel motivated to attend the next *Emerging Concepts of the Neuronal Cytoskeleton* workshop that will be held again in Puerto Varas, Chile, in April 2017.

The Special Issue Guest Editors

Peter W. Baas

Drexel College of Medicine, USA

James R. Bamberg

Colorado State University, USA

Anthony Brown

Ohio State University, USA

Christian Gonzalez-Billault

Universidad de Chile, Chile