Preface

Peroxisomes are essential for life and mutations in genes coding for biogenesis factors are often associated with lethal disorders. Proteins required for the biogenesis of this organelle typically assemble in large molecular complexes, which participate in membrane formation, protein transport, peroxisome duplication, and inheritance during cell division. With their species-specific pathways such as the synthesis of ether lipid in mammals or the glyoxylate cycle in plants and yeasts, peroxisomes are multitasking organelles. The establishment of experimental strategies using several yeast species as model organisms allowed most breakthroughs in the field of peroxisome research.

Ever since their discovery by Rhodin in 1954 peroxisomes have been perceived and presented as little sisters of mitochondria. Certainly their characteristics are reminiscent of the rebellious nature of a younger sibling often despised. On the one hand, peroxisomes employ of a great variety of natural protein complexes also present in mitochondria. On the other hand, peroxisomes have evolved their own processes to cope with specific challenges. Protein import across the peroxisomal membrane now represents the epitome for trafficking of fully folded proteins through membranes. This groundbreaking discovery profoundly changed the mindset on protein translocation. Protein monoubiquitylation as initial step in the recycle mechanism for membrane proteins was a hallmark discovery for studies focused protein translocation across membranes. Peroxisomes like mitochondria are prone to self-renewal. Simultaneously, however, peroxisomes necessitate the membrane generating system of the endoplasmic reticulum. Both processes were long thought to be mutually exclusive and discrimination was made between autonomous organelles and those belonging to the endomembrane system. That organelle abundance results from a competition between proliferation, regeneration and inheritance vs. degradation was discovered for the first time in peroxisomes. The novelty of several recent findings stimulated us to edit a book on the molecular machines functioning in peroxisome biogenesis and maintenance highlighting the relevance of organelle number and morphology for health and disease.

The reports presented herein highlight state-of-the-art technologies to study organelle maintenance and function including quantitative proteomics and live-cell imaging to analyze the molecular networks involved in the regulation of peroxisome formation. The findings of many studies point to the mode of action of several important factors and illustrate crosstalk with other organelles including

protein interface between peroxisomes and the endoplasmic reticulum. In addition, this book presents future possibilities for peroxisomal research and highlights the relevance of this field for the development of biotechnology as well as therapeutic strategies.

This book would not have been possible without the generous help of many people. Authors devoted time and efforts to present their newest ideas and data, and comments of many reviewers have been invaluable to improve of the whole manuscript.

Mauerbach, Austria — Cécile Brocard
Vienna, Austria — Andreas Hartig

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Brocard, C.; Hartig, A. (Eds.)

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