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# Chloroplast Research in Arabidopsis

## Methods and Protocols, Volume I

Edited by

**R. Paul Jarvis**

*Department of Biology, University of Leicester, Leicester, UK*

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*Editor*
R. Paul Jarvis, PhD
Department of Biology
University of Leicester
University Road
Leicester, LE1 7RH
United Kingdom
rpj3@leicester.ac.uk

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# Preface

Chloroplasts are green plastids found in land plants, algae, and some protists. They are the unique site for the reactions of photosynthesis in such cells, and thus chloroplasts are responsible for much of the world's primary productivity. As photosynthesis is the only significant mechanism of energy-input into living cells, these organelles are essential for the survival of plants and animals alike. Consequently, agriculture is wholly dependent upon the photosynthesis that takes place in chloroplasts. Moreover, many other important cellular activities occur uniquely inside chloroplasts or in other non-photosynthetic types of plastid. These activities include the production of starch, amino acids, fatty acids, lipids, terpenoids, purine and pyrimidine bases, and colourful pigments in fruits, flowers, and leaves, as well as key aspects of nitrogen and sulphur metabolism. Many products of these biosynthetic processes are vital components of mammalian diets or offer opportunities for industrial exploitation. Advances in our understanding of plastid biogenesis will facilitate the manipulation and exploitation of these processes and aid improvements in the quantity or quality of the various products.

Over the years, chloroplast biology has been studied in a variety of different organisms, based on technical considerations. Such work has undoubtedly led to major advances in the field, but has had the significant disadvantage that findings made using different experimental systems or species are not always directly cross-comparable. The relatively recent adoption of *Arabidopsis thaliana* as the model organism of choice for plant science research, across the globe, has led to its emergence as a pre-eminent system for research on chloroplasts and other types of plastid. The availability of genomic sequence resources and extensive germplasm collections for Arabidopsis, as well as its amenability to molecular genetic analysis, have all contributed to this change. This book (together with its partner, Volume II) aims to bring together in a single location some of the most important, modern techniques and approaches for chloroplast research, with the unifying theme of Arabidopsis as the model system. Within the confines of this remit, we have produced a book that is relatively broad in its scope, and which many Arabidopsis researchers and biotechnologists with a general interest in chloroplasts, plastids, or related processes might use as an aid to their work. In essence, it is a book for Arabidopsis integrative biologists with a general focus on chloroplast and plastid research. In spite of the central position afforded to Arabidopsis, many of the presented methods can be applied to other experimental organisms with minimal modification.

***Leicester, UK*** ***R. Paul Jarvis***

# Contents

# Contributors


Henrik Aronsson • *Department of Plant and Environmental Sciences, University of Gothenburg, Gothenburg, Sweden*

Arun Azhagiri • *Waksman Institute of Microbiology Rutgers, The State University of New Jersey, Piscataway, NJ, USA*

Thomas Bals • *Molecular Biology of Plant Organelles, Ruhr-University Bochum, Bochum, Germany*

Alice Barkan • *Institute of Molecular Biology, University of Oregon, Eugene, OR, USA*

Arnold J. Bendich • *Department of Biology, University of Washington, Seattle, WA, USA*

Thomas Börner • *Institut für Biologie (Genetik), Humboldt-Universität zu Berlin, Berlin, Germany*

Chiung-Chih Chu • *Institute of Molecular Biology, Academia Sinica, Taipei, Taiwan*

Adrian K. Clarke • *Department of Plant and Environmental Sciences, Gothenburg University, Gothenburg, Sweden*

John Froehlich • *MSU-DOE Plant Research Laboratory, Michigan State University, East Lansing, MI, USA*

John C. Gray • *Department of Plant Sciences, University of Cambridge, Cambridge, UK*

Alison Hills • *School of Biological Sciences, Royal Holloway, University of London, Egham, Surrey, UK*

Inhwan Hwang • *Division of Integrative Bioscience and Biotechnology, Pohang University of Sciences and Technology, Pohang, Republic of Korea*

Stefan Hyman • *Core Biotechnology Services Electron Microscopy Laboratory, University of Leicester, Leicester, UK*

Takehito Inaba • *Department of Biochemistry and Molecular Biology, University of Massachusetts, Amherst, MA, USA*

Hitoshi Inoue • *Department of Biochemistry and Molecular Biology, University of Massachusetts, Amherst, MA, USA*

R. Paul Jarvis • *Department of Biology, University of Leicester, Leicester, UK*

Sam-Geun Kong • *Department of Biology, Kyushu University, Higashi-ku, Fukuoka, Japan*

Dong Wook Lee • *Department of Life Science, Pohang University of Science and Technology, Pohang, Republic of Korea*

Hsou-min Li • *Institute of Molecular Biology, Academia Sinica, Taipei, Taiwan*

Karsten Liere • *Institut für Biologie (Genetik), Humboldt-Universität zu Berlin, Berlin, Germany*

Enrique López-Juez • *School of Biological Sciences, Royal Holloway, University of London, Egham, Surrey, UK*

Kerry Ann Lutz • *Waksman Institute of Microbiology Rutgers, The State University of New Jersey, Piscataway, NJ, USA*
Pal Maliga • *Waksman Institute of Microbiology Rutgers, The State University of New Jersey, Piscataway, NJ, USA*
Patrick H. Masson • *Laboratory of Genetics, University of Wisconsin-Madison, Madison, WI, USA*
Christine A. Newell • *Department of Plant Sciences, University of Cambridge, Cambridge, UK*
Kenji Okuda • *Department of Life Science, Faculty of Science and Engineering, Chuo University, Tokyo, Japan*
Katherine W. Osteryoung • *Department of Plant Biology, Michigan State University, East Lansing, MI, USA*
Paolo Pesaresi • *Dipartimento di Scienze Biomolecolari e Biotecnologie, Università degli studi di Milano, Milano, Italy*
Kevin Pyke • *Division of Plant and Crop Sciences, School of Biosciences, University of Nottingham, Leicestershire, UK*
Beth A. Rowan • *Department of Biology, University of Washington, Seattle, WA, USA*
Danny J. Schnell • *Department of Biochemistry and Molecular Biology, University of Massachusetts, Amherst, MA, USA*
Danja Schünemann • *Molecular Biology of Plant Organelles, Ruhr-University Bochum, Bochum, Germany*
Toshiharu Shikanai • *Department of Botany, Graduate School of Science, Kyoto University, Kyoto, Japan*
Lars L.E. Sjögren • *Department of Plant and Environmental Sciences, Gothenburg University, Gothenburg, Sweden*
Ian Small • *Australian Research Council Centre of Excellence in Plant Energy Biology, University of Western Australia, Crawley, WA, Australia*
John Stanga • *Laboratory of Genetics, University of Wisconsin-Madison, Madison, WI, USA*
Allison Strohm • *Laboratory of Genetics, University of Wisconsin-Madison, Madison, WI, USA*
James A. Sullivan • *School of Biological and Chemical Sciences, Queen Mary, University of London, London, UK*
Sandra K. Tanz • *Australian Research Council Centre of Excellence in Plant Energy Biology, University of Western Australia, Crawley, WA, Australia*
Stanislav Vitha • *Microscopy and Imaging Center, Texas A&M University, College Station, TX, USA*
Masamitsu Wada • *Department of Biology, Kyushu University, Higashi-ku, Fukuoka, Japan*
Fei Wang • *Department of Biochemistry and Molecular Biology, University of Massachusetts, Amherst, MA, USA*
Yan O. Zubo • *Institut für Biologie (Genetik), Humboldt-Universität zu Berlin, Berlin, Germany*