

---

# Contents

|                                                                                                                                                                                       |           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <i>Preface</i> .....                                                                                                                                                                  | <i>v</i>  |
| <i>Contributors</i> .....                                                                                                                                                             | <i>ix</i> |
| 1 Image-Based Analysis of Light-Grown Seedling Hypocotyls in Arabidopsis .....                                                                                                        | 1         |
| <i>Benjamin J. Cole and Joanne Chory</i>                                                                                                                                              |           |
| 2 High-Throughput Phenotyping of Plant Shoots.....                                                                                                                                    | 9         |
| <i>Bettina Berger, Bas de Regt, and Mark Tester</i>                                                                                                                                   |           |
| 3 High-Throughput Phenotyping of Root Growth Dynamics .....                                                                                                                           | 21        |
| <i>Nima Yazdanbakhsh and Joachim Fisahn</i>                                                                                                                                           |           |
| 4 LEAF GUI: Analyzing the Geometry of Veins and Areoles Using<br>Image Segmentation Algorithms.....                                                                                   | 41        |
| <i>Charles A. Price</i>                                                                                                                                                               |           |
| 5 Remote Chlorophyll Fluorescence Measurements<br>with the Laser-Induced Fluorescence Transient Approach .....                                                                        | 51        |
| <i>Roland Pieruschka, Denis Klimov, Joseph A. Berry, C. Barry Osmond,<br/>Uwe Rascher, and Zbigniew S. Kolber</i>                                                                     |           |
| 6 Leaf Hue Measurements: A High-Throughput Screening<br>of Chlorophyll Content .....                                                                                                  | 61        |
| <i>László Sass, Petra Majer, and Éva Hideg</i>                                                                                                                                        |           |
| 7 High-Resolution, Time-Lapse Imaging for Ecosystem-Scale<br>Phenotyping in the Field.....                                                                                            | 71        |
| <i>Tim Brown, Christopher Zimmermann, Whitney Panneton,<br/>Nina Noah, and Justin Borevitz</i>                                                                                        |           |
| 8 High-Throughput Phenotyping of Plant Populations Using<br>a Personal Digital Assistant .....                                                                                        | 97        |
| <i>Raju Naik Vankudavath, Reddaiah Bodanapu, Yellamaraju Sreelakshmi,<br/>and Rameshwar Sharma</i>                                                                                    |           |
| 9 High-Throughput Fractionation of Natural Products for Drug Discovery .....                                                                                                          | 117       |
| <i>Ying Tu and Bing Yan</i>                                                                                                                                                           |           |
| 10 Conducting Molecular Biomarker Discovery Studies in Plants.....                                                                                                                    | 127       |
| <i>Christian Schudoma, Matthias Steinfath, Heike Sprenger,<br/>Joost T. van Dongen, Dirk Hinch, Ellen Zuther, Peter Geigenberger,<br/>Joachim Kopka, Karin Köhl, and Dirk Walther</i> |           |
| 11 Highly Sensitive High-Throughput Profiling of Six Phytohormones<br>Using MS-Probe Modification and Liquid Chromatography–Tandem<br>Mass Spectrometry .....                         | 151       |
| <i>Mikiko Kojima and Hitoshi Sakakibara</i>                                                                                                                                           |           |
| 12 Qualitative and Quantitative Screening of Amino Acids in Plant Tissues .....                                                                                                       | 165       |
| <i>Will I. Menzel, Wen-Ping Chen, Adrian D. Hegeman, and Jerry D. Cohen</i>                                                                                                           |           |

|    |                                                                                                                                                                                                  |     |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 13 | <i>Arabidopsis thaliana</i> Membrane Lipid Molecular Species<br>and Their Mass Spectral Analysis .....                                                                                           | 179 |
|    | <i>Thilani Samarakoon, Sunitha Shiva, Kaleb Lowe, Pamela Tamura,<br/>Mary R. Roth, and Ruth Welti</i>                                                                                            |     |
| 14 | Inductively Coupled Plasma–Mass Spectrometry as a Tool<br>for High-Throughput Analysis of Plants.....                                                                                            | 269 |
|    | <i>Javier Seravalli</i>                                                                                                                                                                          |     |
| 15 | The Plant Volatilome: Methods of Analysis .....                                                                                                                                                  | 289 |
|    | <i>Carlo Bicchi and Massimo Maffei</i>                                                                                                                                                           |     |
| 16 | High-Throughput Monitoring of Plant Nuclear DNA Contents<br>Via Flow Cytometry .....                                                                                                             | 311 |
|    | <i>David W. Galbraith and Georgina M. Lambert</i>                                                                                                                                                |     |
| 17 | Transient RNAi Assay in 96-Well Plate Format Facilitates<br>High-Throughput Gene Function Studies in Planta .....                                                                                | 327 |
|    | <i>Shu-Zon Wu and Magdalena Bezanilla</i>                                                                                                                                                        |     |
| 18 | A High-Throughput Biological Conversion Assay for Determining<br>Lignocellulosic Quality .....                                                                                                   | 341 |
|    | <i>Scott J. Lee, Thomas A. Warnick, Susan B. Leschine, and Samuel P. Hazen</i>                                                                                                                   |     |
| 19 | Carbohydrate Microarrays in Plant Science.....                                                                                                                                                   | 351 |
|    | <i>Jonatan U. Fangel, Henriette L. Pedersen, Silvia Vidal-Melgosa,<br/>Louise I. Abl, Armando Asuncion Salmean, Jack Egelund,<br/>Maja Gro Rydahl, Mads H. Clausen, and William G.T. Willats</i> |     |
|    | <i>Index</i> .....                                                                                                                                                                               | 363 |