

---

## Preface

*When they got home to dinner they met the Hemulen on the steps. He was beaming with happiness. "Well?" said Moomintroll. "What is it?" "Nature study!" shouted the Hemulen. "I shall botanize ..."*

Tove Jansson

Plants are essential to life on earth, and, while some readers of this book may not be entirely familiar with the cell wall *per se*, they will have come across it in many forms. Cellulose, a major plant cell wall polysaccharide, is also the most abundantly occurring natural biopolymer, with many other plant cell wall components being among the next most abundant. Some ways in which people may be familiar with the cell wall and/or cell wall components are as; textiles (many, such as cotton, are cellulose); paper; timber; pectin, which is the gelling agent used in jams and other foods; dietary fiber; and cell wall characteristics and metabolism control, for example, fruit ripening and texture. We are therefore dependent on plant cell walls for health, food, and clothing, and a major current area of research is their use as biofuels.

Plant cells are surrounded by a cell wall which is fundamental to their function and survival. The cell wall and its constituent polysaccharides and proteins control nearly all plant-based biological and biophysical processes including expansive plant cell growth, plant development, cell shape and size, cell–cell communication, and interactions with, and defence against pathogens. Understanding the cell wall is therefore not only fundamental to the plant sciences but it is also pertinent to aspects of human and animal nutrition and health as well as plant–microbe and plant–animal interactions. Furthermore, advanced cell wall analysis is the key to developing novel or improving current uses of the wall and plants.

Comprehensive analysis of the plant cell wall demands a multidisciplinary approach and employs a multitude of tools and techniques. This volume describes some of the methods which are currently applied to investigate the many aspects of the plant cell wall including its structure, biochemical composition, and metabolism, to name but a few. Each chapter is written by leading experts in cell wall research and is written with the aim that the protocol(s) can be carried out by someone without previous experience in that particular method or specifically in cell wall research. The techniques included in this volume range from plant tissue culture techniques, which can be applied to investigating cell wall structure and metabolism, to methods directed towards structural analysis and occurrence of carbohydrates, to the development and use of microscopy-based tools and techniques, to those which measure the physical properties of the wall, to methods based on the application of molecular genetic approaches. Many of the methods have been recently developed or are becoming more widely used with the development of advanced instrumentation and technology, and several are high throughput and/or *in situ* techniques which facilitate powerful new insights into cell wall biochemistry and metabolism.

While this volume aims to describe a wide-range of cell wall-directed protocols that can be used to investigate the cell wall, there are other resources which the reader is also likely to find extremely useful. *The Growing Plant Cell Wall: Chemical and Metabolic*

*Analysis* [1] provides detailed and user-friendly descriptions of cell wall-directed methods, the majority of which are not contained in this volume, and which are widely used and fundamental to research in the field. Furthermore, it also provides a comprehensive and accessible introduction to the cell wall. The reader may also find helpful the video-based explanations of protocols which are available from companies such as Megazyme in addition to recent JoVE publications [2–4].

I would like to wish the reader every success with their plant-based conjectures, hypotheses, and experiments (Fig. 1). Finally, I would like to thank all members of the cell wall community and colleagues at NUI Galway who have supported and enabled this project.

*Zoë A. Popper*



Fig. 1. Simon Popper. Copyright: The artist (Courtesy: Rachmaninoff's, London and the artist).

## References

1. Fry SC (2000) The growing plant cell wall: chemical and metabolic analysis. Reprint Edition, Blackburn, Caldwell, NJ. [ISBN 1-930665-08-3]
2. Foster CE, Martin TM, Pauly M (2010) Comprehensive analysis of plant cell walls (lignocellulosic biomass). Part I: lignin. JoVE. 37. <http://www.jove.com/index/details.stp?id=1745>, doi: 10.3791/1745
3. Foster CE, Martin TM, Pauly M (2010) Comprehensive compositional analysis of plant cell walls (lignocellulosic biomass). Part II: carbohydrates. JoVE. 37. <http://www.jove.com/index/details.stp?id=1837>, doi: 10.3791/1837
4. Durachko DM, Cosgrove DJ (2009) Measuring plant cell wall extension (creep) induced by acidic pH and alpha-expansin. JoVE. 25. <http://www.jove.com/index/details.stp?id=1263>, doi: 10.3791/1263

The Plant Cell Wall

Methods and Protocols

Popper, Z. (Ed.)

2011, XIII, 310 p., Hardcover

ISBN: 978-1-61779-007-2

A product of Humana Press