Preface

Plant cells go through distinct phases of development. They are generally formed in meristems and undergo expansion before differentiating and acquiring their final functions. In this sequence, cell expansion is the process that mainly contributes to the cell's size and hence to the plant's size and morphology. Furthermore, it allows the plant to rapidly adapt to changes in the environment and to respond to several hormone signals.

Cell expansion primarily occurs by the uptake of water in the cytoplasm and vacuole of the plant cell. This process is driven by osmotic forces generated by accumulation of solutes by several classes of (transporter) proteins. This causes the vacuole to expand and to exert a pressure against the cell wall. In order to enlarge, the cell wall has to yield to the stress imposed by the turgor pressure. Several families of proteins and enzymes, as well as the composition and architecture of the cell wall itself, render the wall stiff and tough but at the same time modifiable for a drastic increase in surface area. The direction of cell expansion is hereby governed by cytoskeletal elements in the cytoplasm as well as by load-bearing elements in the cell wall. The process of cell expansion is thus a complex process brought about by activities at different levels in both the symplast and apoplast.

This book addresses the involvement of the different actors in plant cell expansion and its control by integrating the up-to-date views of cell biologists, biochemists, physiologists, molecular biologists, biophysicists and microscopists. The combination of these different views, resulting from different experimental techniques and methodologies (explained in distinct boxes), gives a timely summary on what is currently known and believed to occur during the cell expansion process.

August 2006 Jean-Pierre Verbelen & Kris Vissenberg