

**Part III**  
**Unifying Theory in Resource Allocation?**

# Introduction

In continuation of Part II, which comprehended available knowledge on the topic of this book as derived from empirical evidence, Part III considers theoretical grounds. In preparing for elucidating the predictability and its enhancement of plant resource allocation, and whether elaborated knowledge allows for posing a unifying theory on the subject beyond the current status (Chap. 19), Part III introduces into theoretical approaches conducive to knowledge consolidation. Such approaches are borne by modelling. Chapter 15 explores capacities of numeric modelling for mathematically describing and synopsising cause–effect-based knowledge, and of serving as integrated hypothesis constructs amenable to validation in comparison with empirical evidence. In particular, model falsification augments knowledge. To this end, Chaps. 17 and 18 demonstrate novel models, PLATHO and BALANCE, respectively, which mirror the transition of individual plant resource allocation and its regulation between growth and defence towards a stand-level assessment of resource turnover under the perspective of long-term development. Explored is the potential of mathematical simulation in view of multi-factorial complexity inaccessible to experimentation. Chapter 16 introduces into novel approaches of statistical modelling, fathoming capacities for assessing universality of findings, in particular, for unifying evidence from diverse environmental scenarios. Means of guiding empirical research are elucidated while highlighting constraints on empirical and theoretical approaches. Part III sets the stage for the conclusions and perspectives presented in Chap. 20 (Part IV) on the book subject.