

PREFACE

Genome sequences of nonvertebrate genomes have greatly informed our understanding of animal evolution. In similar fashion, the sequencing of the genomes of the moss *Physcomitrella patens* and of the lycophyte *Selaginella moellendorffii* have helped to unriddle plant evolution by means of comparative genomics and evolutionary developmental (evo-devo) studies. However, many extant land plant lineages of non-seed plants still did not have a representative with a sequenced genome until recently, or are work in progress. The focus of this book is on these so far neglected lineages, namely charophyte algae that are the sister group of the land plants, the paraphyletic bryophytes (hornworts, mosses and liverworts), as well as the lycophytes (club mosses) and ferns.

In the first two chapters of this book, development and evolution of land plants are reviewed. While Chapter 1 by Keiko Sakakibara focuses on non-seed plant evo-devo, Chapter 2 by Volker Knoop and Mareike Schallenberg-Rüdinger highlights a very peculiar feature of land plants, organellar RNA editing.

Chapters 3–6 deal with sequenced genomes. The first non-seed plant genome, *P. patens*, is reviewed in Chapter 3 (written by Daniel Lang, Nico van Gessel, Kristian Ulrich and Ralf Reski), followed by the genomes of two other mosses that are work in progress, the purple moss *Ceratodon purpureus* (reviewed by Stuart McDaniel, Andrew Cuming, Peter Szovenyi and Pierre-Francois Perroud) and the peat moss, *Sphagnum* (by Jon Shaw, David Weston and colleagues). The hornworts are covered in Chapter 6 by Peter Szovenyi dealing with *Anthoceros agrestis*. While the actual genome drafts have not yet been published, Chapters 4–6 review what is known from transcriptomic data and provide a glimpse at how these genomes will soon inform our understanding of land plant evolution.

The two final chapters look primarily into transcriptomic data. Chapter 7 by Joshua Der and Emily Sessa deals with lycophytes and ferns and will, after reviewing transcriptomic data, outline which genomes are work in progress. What we know about charophyte algae based on their transcriptomes (and one genome) is reviewed in Chapter 8 by Charles Delwiche.

The first genomes of conifers have recently been published, closing an important gap. Hopefully, the other lineages of gymnosperms (*Ginkgo*, cycads) will also be covered in the near future. Two projects are now tackling the large genomes of the ferns, *Azolla* and *Ceratopteris*. Several projects

aim at unravelling more genomes of mosses (eg, *Takakia*) and liverworts (eg, *Jungermannia*), as well as of several lineages of charophyte algae (eg, *Chara*). The genome of the liverwort *Marchantia polymorpha* has been sequenced but not yet published. The next decade will see most of the major gaps in land plant phylogeny closed in terms of sequenced genomes of representatives. This book reviews what we know today about how land plants evolved, and lays the ground for many more exciting findings to come.

Stefan A. Rensing