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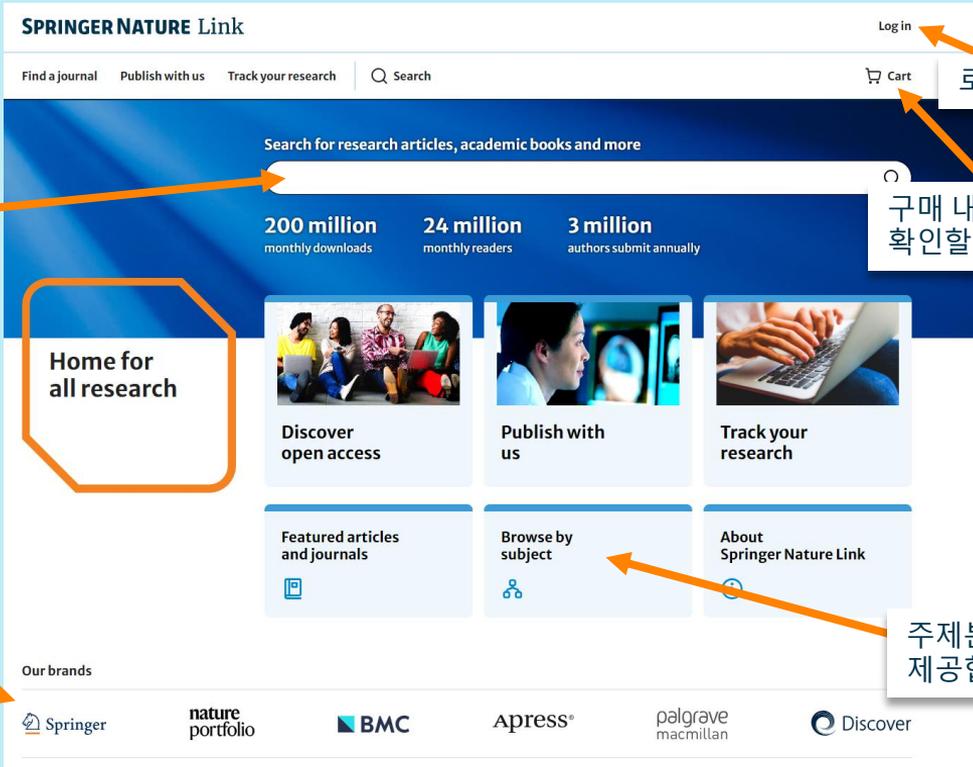
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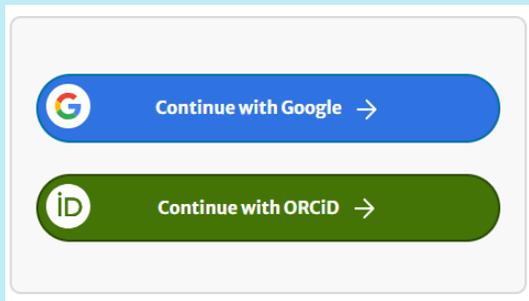
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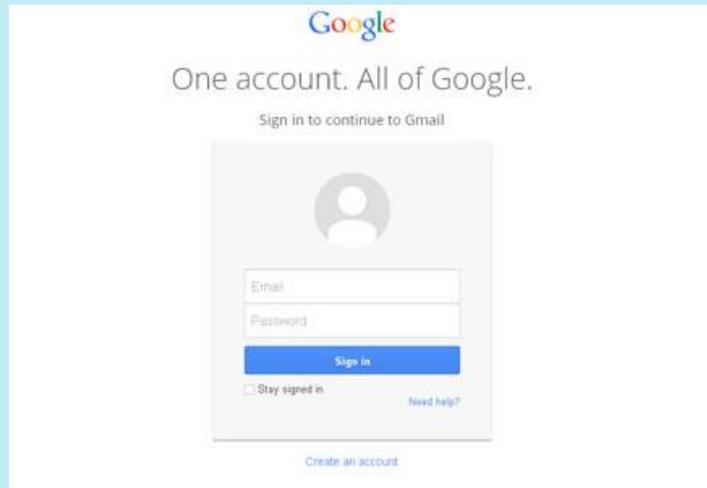
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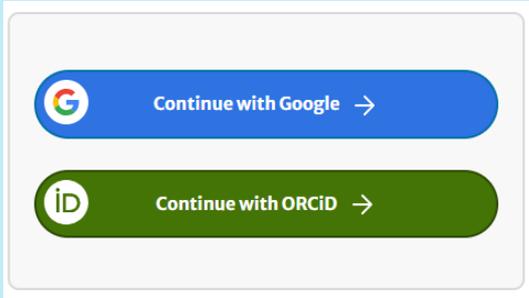
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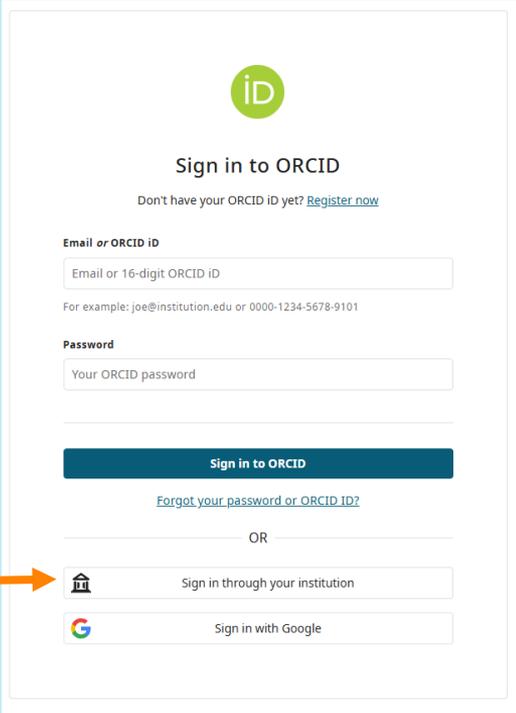
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Editors: [Ralph Bock](#), [Volker Knopp](#)

- Up-to-date and well-illustrated reviews on structure and evolution of plastid and mitochondrial genomes, written by leading experts in the field
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The past decade has witnessed an explosion of our knowledge on the structure, coding capacity and evolution of the genomes of the two DNA-containing cell organelles in plants: chloroplasts (plastids) and mitochondria. Comparative genomics analyses have provided new insights into the origin of organelles by endosymbioses and uncovered an enormous evolutionary dynamics of organellar genomes. In addition, they have greatly helped to clarify phylogenetic relationships, especially in algae and early land plants with limited morphological and anatomical diversity. This book, written by leading experts, summarizes our current knowledge about plastid and mitochondrial genomes in all major groups of algae and land plants. It also includes chapters on endosymbioses, plastid and mitochondrial mutants, gene expression profiling and methods for organelle transformation. The book is designed for students and researchers in plant molecular biology, taxonomy, biotechnology and evolutionary biology.

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Summary

Algae are characterized by the presence of plastids (chloroplasts), which are organelles of cyanobacterial origin. Plastids have their own genome, machineries for replication, transcription and translation, and are the site of photosynthesis (except in secondarily non-photosynthetic species) and a variety of other biological functions. Algae are subdivided into those whose plastids can be traced back to a common cyanobacterial endosymbiont (algae with primary plastids), and others in which plastids are second-hand acquisitions that were introduced by eukaryote–eukaryote endosymbioses.

Only a fraction of plastid components is encoded in plastid DNA; the majority of genes coding for plastid proteins are in the nucleus, many of which originated through transfers (in some cases still ongoing) from the organelle to the nuclear genome. Despite the broad phylogenetic affiliation of algae, most plastid genomes are fairly homogenous, coding for about 100–250 genes, except in non-photosynthetic algae that rapidly lose genes involved in photosynthesis. The most gene-rich and cyanobacteria-like plastid genomes are in red algae, followed by glaucophyte and green algae. Genomes in secondary or higher-order plastids usually have a reduced gene count, compared to their primary photosynthetic donors. In this chapter, we provide an overview on the evolutionary history, organization and coding properties of algal plastid genomes, for which complete (or almost complete) sequences are publicly available.

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