

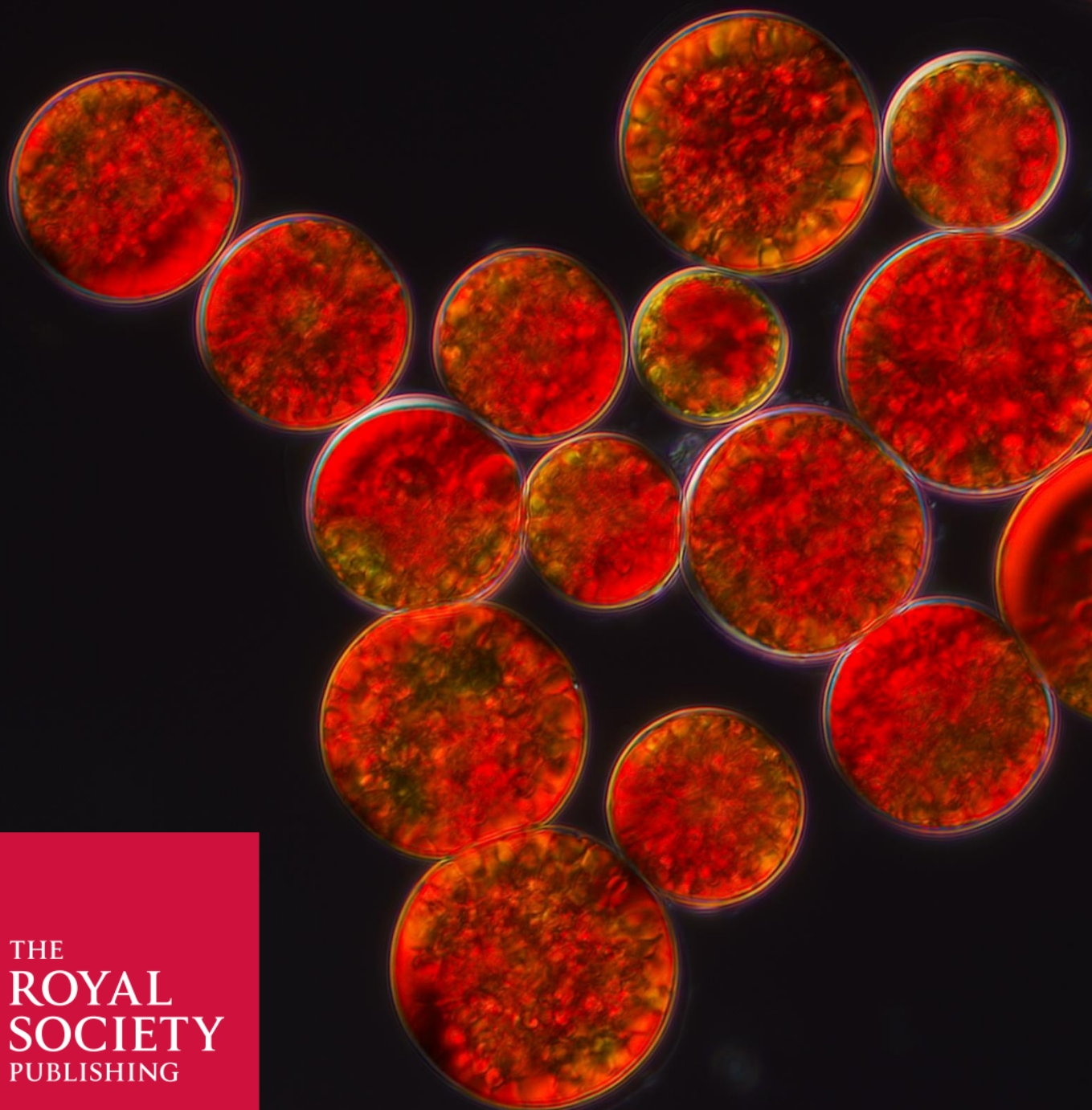
PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B

BIOLOGICAL SCIENCES

The evolution of plant metabolism

A theme issue compiled and edited by Alisdair R Fernie, Sophie de Vries and Jan de Vries

Published September 2024



THE
ROYAL
SOCIETY
PUBLISHING

About this issue

Plants and algae occur in almost any habitat imaginable on our Earth. In the course of evolution, they have diversified into a rich array of forms with astounding properties. An important part of this tangible diversity is the ability to produce a bouquet of compounds. These fulfil a whole range of functions, from attracting pollinators and repelling foes, to giving structure to the plant body and communicating across a single plant and between different individuals. Yet, we are only beginning to grasp the complex nature of this chemical diversity and its tangled evolutionary history. In this special issue, scientists from diverse fields have come together to present their recent findings and thoughts on the evolution of plant chemical diversity.

Introduction *Evolution of plant metabolism: the state-of-the-art* Alisdair R Fernie, Sophie de Vries and Jan de Vries

Applications of ancestral sequence reconstruction for understanding the evolution of plant specialized metabolism Todd J Barkman

Phylogenomic and synteny analysis of BAHD and SCP/SCPL gene families reveal their evolutionary histories in plant specialized metabolism Thomas Naake, John C D'Auria, Alisdair R Fernie and Federico Scossa

Plant terrestrialization: an environmental pull on the evolution of multi-sourced streptophyte phenolics Căcilia F Kunz, Sophie de Vries and Jan de Vries

Zygospor formation in Zygnematophyceae predates several land plant traits Charlotte Permann and Andreas Holzinger

Evolution of aromatic amino acid metabolism in plants: a key driving force behind plant chemical diversity in aromatic natural products Ryo Yokoyama

Evolution of the regulatory subunits for the heteromeric acetyl-CoA carboxylase Ana Caroline Conrado *et al.*

Presence of vitamin B₁₂ metabolism in the last common ancestor of land plants Richard G Dorrell, Charlotte Nef, Setsen Altan-Ochir, Chris Bowler and Alison G Smith

Overlooked and misunderstood: can glutathione conjugates be clues to understanding plant glutathione transferases? Nikola Micic, Asta Holmelund Rønager, Mette Sørensen and Nanna Bjarnholt

Evolution of phosphate scouting in the terrestrial biosphere Steffen Abel and Christin Naumann

Evolution of small molecule-mediated regulation of arbuscular mycorrhiza symbiosis Pierre-Marc Delaux and Caroline Gutjahr

Access content online at bit.ly/PTB1914

Purchase the print issue at the reduced price of £40 (usual price £65) by contacting our sales team (sales@royalsociety.org) and quoting promotional code **TB1914**.

Front image: Light micrograph of *Haematococcus* sp. SAG 34-1f, which appears reddish owing to a high accumulation of the carotenoid astaxanthin. The image was taken by Dr T. Darienko (University of Göttingen).

Evolutionary conservation and metabolic significance of autophagy in algae Juliette Laude, Matteo Scarsini, Charlotte Nef and Chris Bowler

The evolution of plant responses underlying specialized metabolism in host–pathogen interactions Astrid Agorio, Eilyn Mena, Mathias F Rockenbach and Inés Ponce De León

Biotic interactions, evolutionary forces and the pan-plant specialized metabolism Sophie de Vries and Ivo Feussner

*Characterization of a β -carotene isomerase from the cyanobacterium *Cyanobacteria aponinum** Derry Alvarez *et al.*

Conserved carotenoid pigmentation in reproductive organs of Charophyceae Tim P Rieseberg *et al.*

The evolution of flavonoid biosynthesis Kevin M Davies *et al.*

Cytochromes P450 evolution in the plant terrestrialization context Danièle Werck-Reichhart, David R Nelson and Hugues Renault

Understanding metabolic diversification in plants: branchpoints in the evolution of specialized metabolism Wenjuan Ji, Anne Osbourn and Zhenhua Liu

Evolution of the biochemistry underpinning purine alkaloid metabolism in plants Xinxin Jia, Shijie Luo, Xiali Ye, Lin Liu and Weiwei Wen

Plant sesquiterpene lactones Olivia Agatha, Daniela Mutwil-Anderwald, Jhing Yein Tan and Marek Mutwil

Evolutionary trajectory of transcription factors and selection of targets for metabolic engineering Yun Sun Lee, Edward L Braun and Erich Grotewold

Current and future perspectives for enhancing our understanding of the evolution of plant metabolism Jan de Vries, Sophie de Vries and Alisdair R Fernie