

**On the Cover:** Diatoms constitute a major phylum of phytoplankton biodiversity in ocean and freshwater ecosystems. They are known to respond to variations of the environment, in particular to nutrient shortage, by the accumulation of triacylglycerol (or oil). Oil is considered a plausible alternative resource to fossil hydrocarbons; therefore, its accumulation in diatoms has become a critical question in the current decade. Triacylglycerol biosynthesis is connected with membrane glycerolipids, but the fine remodeling of membrane glycerolipids and the balance with storage glycerolipids upon nutrient shortage have not yet been characterized in a model organism. Abida et al. provide a reference for the diatom *Phaeodactylum tricorutum* and an in-depth comparison of glycerolipid changes occurring after variations of nitrogen and phosphate, and they describe two distinct glycerolipid remodeling programs. The cover shows a confocal microscopy image of *P. tricorutum* cells, with both triradiate and fusiform morphotypes, grown in artificial seawater lacking nitrogen. Chloroplasts appear in red (chlorophyll autofluorescence), and triacylglycerol droplets appear in yellow (Nile Red staining). Cover image credits: Coline Meï (Laboratoire de Physiologie Cellulaire et Végétale, Grenoble).

## THANK YOU TO REVIEWERS

Acknowledgment of *Plant Physiology* Reviewers.

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## ON THE INSIDE

*Peter V. Minorsky*

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## BREAKTHROUGH TECHNOLOGIES

Efficient Generation of Marker-Free Transgenic Rice Plants Using an Improved Transposon-Mediated Transgene Reintegration Strategy. *Xiaoqing Gao, Jie Zhou, Jun Li, Xiaowei Zou, Jianhua Zhao, Qingliang Li, Ran Xia, Ruifang Yang, Dekai Wang, Zhaoxue Zuo, Jumin Tu, Yuezhi Tao, Xiaoyun Chen, Qi Xie, Zengrong Zhu, and Shaohong Qu*

*An improved transposon-mediated transgene reintegration system efficiently generates marker-free transgenic rice plants.*

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<sup>[OPEN]</sup>Automated Update, Revision, and Quality Control of the Maize Genome Annotations Using MAKER-P Improves the B73 RefGen\_v3 Gene Models and Identifies New Genes. *MeiYee Law, Kevin L. Childs, Michael S. Campbell, Joshua C. Stein, Andrew J. Olson, Carson Holt, Nicholas Panchy, Jikai Lei, Dian Jiao, Carson M. Andorf, Carolyn J. Lawrence, Doreen Ware, Shin-Han Shiu, Yanni Sun, Ning Jiang, and Mark Yandell*

*Reannotation of the maize genome using MAKER-P results in many revised and new gene models.*

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## SCIENTIFIC CORRESPONDENCE

Direct X-Ray Microtomography Observation Confirms the Induction of Embolism upon Xylem Cutting under Tension. *José M. Torres-Ruiz, Steven Jansen, Brendan Choat, Andrew J. McElrone, Hervé Cochard, Timothy J. Brodribb, Eric Badel, Regis Burrett, Pauline S. Bouche, Craig R. Brodersen, Shan Li, Hugh Morris, and Sylvain Delzon*

*Direct visualization shows enhanced embolism of xylem samples when they are collected under tension.*

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## RESEARCH ARTICLES

### BIOCHEMISTRY AND METABOLISM

<sup>[OPEN]</sup>Transgenic Perturbation of the Decarboxylation Phase of Crassulacean Acid Metabolism Alters Physiology and Metabolism But Has Only a Small Effect on Growth. *Louisa V. Dever, Susanna F. Boxall, Jana Kneřová, and James Hartwell*

*Blocking malate decarboxylation in a Crassulacean acid metabolism species leads to loss of carbon dioxide fixation in the dark, but has minimal impact on growth.*

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[OPEN] Proteome Analysis of Cytoplasmatic and Plastidic  $\beta$ -Carotene Lipid Droplets in *Dunaliella bardawil*. Lital Davidi, Yishai Levin, Shifra Ben-Dor, and Uri Pick

*Proteome analysis of two types of lipid droplets in Dunaliella bardawil uncovers enzymes involved in  $\beta$ -carotene biosynthesis and lipid droplet biogenesis.* 60

[OPEN] Wax Layers on *Cosmos bipinnatus* Petals Contribute Unequally to Total Petal Water Resistance. Christopher Buschhaus, Dana Hager, and Reinhard Jetter

*Cuticular waxes of petals are distinct from those of leaves and stems, and limit water loss from the flower surface as effectively as waxes from the fruits of many species, but less effectively than those of leaves.* 80

[OPEN] The Last Step in Cocaine Biosynthesis Is Catalyzed by a BAHD Acyltransferase. Gregor Wolfgang Schmidt, Jan Jirschitzka, Tiffany Porta, Michael Reichelt, Katrin Luck, José Carlos Pardo Torre, Franziska Dolke, Emmanuel Varesio, Gérard Hopfgartner, Jonathan Gershenzon, and John Charles D'Auria

*The terminal step in cocaine biosynthesis is catalyzed by an acyltransferase that utilizes benzoyl-CoA and methylecgonine as substrates and is localized to the spongy mesophyll.* 89

[OPEN] Consequences of a Deficit in Vitamin B<sub>6</sub> Biosynthesis de Novo for Hormone Homeostasis and Root Development in Arabidopsis. Svetlana Boycheva, Ana Dominguez, Jakub Rolcik, Thomas Boller, and Teresa B. Fitzpatrick

*Deficits in de novo vitamin B<sub>6</sub> biosynthesis impair hormone homeostasis and root development but are a consequence of differential regulation of the genes.* 102

Membrane Glycerolipid Remodeling Triggered by Nitrogen and Phosphorus Starvation in *Phaeodactylum tricorutum*. Heni Abida, Lina-Juana Dolch, Coline Meï, Valeria Villanova, Melissa Conte, Maryse A. Block, Giovanni Finazzi, Olivier Bastien, Leïla Tirichine, Chris Bowler, Fabrice Rébeillé, Dimitris Petroustos, Juliette Jouhet, and Eric Maréchal

*Nitrogen and phosphorus limitations trigger distinct remodeling processes and adaptive responses at the level of membrane and storage glycerolipids in a marine model diatom.* 118

## CELL BIOLOGY

[OPEN] The Arabidopsis Vacuolar Sorting Receptor1 Is Required for Osmotic Stress-Induced Abscisic Acid Biosynthesis. Zhen-Yu Wang, Chris Gehring, Jianhua Zhu, Feng-Min Li, Jian-Kang Zhu, and Liming Xiong

*A vacuolar receptor is required for osmotic stress regulation of abscisic acid biosynthesis by maintaining intracellular pH homeostasis.* 137

Blocking Single-Stranded Transferred DNA Conversion to Double-Stranded Intermediates by Overexpression of Yeast DNA REPLICATION FACTOR A. Mery Dafny-Yelin, Avner Levy, Raz Dafny, and Tzvi Tzfira

*Double-stranded intermediates play a significant role in the process of Agrobacterium T-DNA integration into the host genome.* 153

Two Cytoplasmic Effectors of *Phytophthora sojae* Regulate Plant Cell Death via Interactions with Plant Catalases. Meixiang Zhang, Qi Li, Tingli Liu, Li Liu, Danyu Shen, Ye Zhu, Peihan Liu, Jian-Min Zhou, and Daolong Dou

*Oomycete effectors hijack host catalases to regulate plant programmed cell death and H<sub>2</sub>O<sub>2</sub> homeostasis.* 164

## ECOPHYSIOLOGY AND SUSTAINABILITY

Malate Synthesis and Secretion Mediated by a Manganese-Enhanced Malate Dehydrogenase Confers Superior Manganese Tolerance in *Stylosanthes guianensis*. *Zhijian Chen, Lili Sun, Pandao Liu, Guodao Liu, Jiang Tian, and Hong Liao*

*The superior manganese tolerance of a tropical legume is achieved by the coordination of internal and external manganese detoxification via enhanced malate synthesis.*

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## GENES, DEVELOPMENT, AND EVOLUTION

FRIZZY PANICLE Drives Supernumerary Spikelets in Bread Wheat. *Oxana Dobrovolskaya, Caroline Pont, Richard Sibout, Petr Martinek, Ekaterina Badaeva, Florent Murat, Audrey Chosson, Nobuyoshi Watanabe, Elisa Prat, Nadine Gautier, Véronique Gautier, Charles Poncet, Yuriy L. Orlov, Alexander A. Krasnikov, Hélène Bergès, Elena Salina, Lyudmila Laikova, and Jerome Salse*

*Wheat transcription factors located on chromosome group 2 drive the yield-related production of supernumerary spikelets.*

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[OPEN]Promotion of Testa Rupture during Garden Cress Germination Involves Seed Compartment-Specific Expression and Activity of Pectin Methylsterases. *Claudia Scheler, Karin Weitbrecht, Simon P. Pearce, Anthony Hampstead, Annette Büttner-Mainik, Kieran J.D. Lee, Antje Voegelé, Krystyna Oracz, Bas J.W. Dekkers, Xiaofeng Wang, Andrew T.A. Wood, Léonie Bentsink, John R. King, J. Paul Knox, Michael J. Holdsworth, Kerstin Müller, and Gerhard Leubner-Metzger*

*Seed tissue-specific gene expression of pectin methylsterases mediates seed cell wall pectin alterations to control the seed coat permeability and germination.*

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## MEMBRANES, TRANSPORT, AND BIOENERGETICS

Alternative Splicing-Mediated Targeting of the Arabidopsis GLUTAMATE RECEPTOR3.5 to Mitochondria Affects Organelle Morphology. *Enrico Teardo, Luca Carraretto, Sara De Bortoli, Alex Costa, Smrutisanjita Behera, Richard Wagner, Fiorella Lo Schiavo, Elide Formentin, and Ildiko Szabo*

*A unique mitochondrial ion channel affects organelle physiology and its lack is associated with senescence in the model plant Arabidopsis.*

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[OPEN]Decreasing Electron Flux through the Cytochrome and/or Alternative Respiratory Pathways Triggers Common and Distinct Cellular Responses Dependent on Growth Conditions. *Kristina Kühn, Guangkun Yin, Owen Duncan, Simon R. Law, Szymon Kubiszewski-Jakubiak, Parwinder Kaur, Etienne Meyer, Yan Wang, Catherine Colas des Francs Small, Estelle Giraud, Reena Narsai, and James Whelan*

*Diverse signaling pathways are activated by perturbation of mitochondrial function under different growth conditions.*

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## SIGNALING AND RESPONSE

Involvement of the Electrophilic Isothiocyanate Sulforaphane in Arabidopsis Local Defense Responses. *Mats X. Andersson, Anders K. Nilsson, Oskar N. Johansson, Gülin Boztaş, Lisa E. Adolfsson, Francesco Pinosa, Christel Garcia Petit, Henrik Aronsson, David Mackey, Mahmut Tör, Mats Hamberg, and Mats Ellerström*

*The secondary metabolite sulforaphane is produced during the hypersensitive response and is involved in protection against infections.*

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[<sup>OPEN</sup>] In Planta Processing and Glycosylation of a Nematode CLAVATA3/ENDOSPERM SURROUNDING REGION-Like Effector and Its Interaction with a Host CLAVATA2-Like Receptor to Promote Parasitism. *Shiyan Chen, Ping Lang, Demosthenis Chronis, Sheng Zhang, Walter S. De Jong, Melissa G. Mitchum, and Xiaohong Wang*

*A nematode effector peptide is modified and processed in planta and the resulting glycopeptide interacts with a plant membrane-associated receptor to facilitate parasite infection.* 262

[<sup>OPEN</sup>] Iron-Binding E3 Ligase Mediates Iron Response in Plants by Targeting Basic Helix-Loop-Helix Transcription Factors. *Devarshi Selote, Rozalynne Samira, Anna Matthiadis, Jeffrey W. Gillikin, and Terri A. Long*

*An iron-binding protein causes degradation of proteins involved in the iron deficiency response.* 273

[<sup>OPEN</sup>] Articles can be viewed without a subscription.