On the Cover: The cover depicts symbiotic arbuscular mycorrhizal (AM) fungus *Rhizophagus irregularis* in *Lotus japonicus* roots. AM symbiosis is a mutualistic interaction that supplies the plant with inorganics, including phosphate and nitrate, and the fungus with photosynthetic products. The fungus enters and affects hyphae (blue) within the host root, forming symbiotic vesicles (red) and arbuscules (green) to facilitate material exchange between the host and the fungus. Takeda et al. (pp. 545–557) describe a role for the phytohormone GA in AM symbiosis, including an up-regulation of GA synthesis and its accumulation in the root. The fungal structures shown were stained with Wheat Germ Agglutinin-Alexafluor 594 for confocal microscopy, and images were rendered to generate these three-dimensional projections. Cover image credits: Naoya Takeda (National Institute for Basic Biology, Division of Symbiotic Systems).

**ON THE INSIDE**

*Peter V. Minorsky*

**SCIENTIFIC CORRESPONDENCE**

OPEN ALL NIGHT LONG: The Dark Side of Stomatal Control.  
*J. Miguel Costa, Fabien Monnet, Dorothée Jannaud, Nathalie Leonhardt, Brigitte Ksas, Ilja M. Reiter, Florent Pantin, and Bernard Genty*

Isolation of Arabidopsis mutants that maintain stomata open all night long credits the existence of dedicated regulators for stomatal closure in darkness.

**UPDATES**

Regulation of Specialized Metabolism by WRKY Transcription Factors.  
*Craig Schluttenhofer and Ling Yuan*

WRKY transcription factors play an essential role in regulating the biosynthesis of plant-specialized metabolites.

**RESEARCH ARTICLES**

**BIOCHEMISTRY AND METABOLISM**

[OPEN] Pepper Heat Shock Protein 70a Interacts with the Type III Effector AvrBsT and Triggers Plant Cell Death and Immunity.  
*Nak Hyun Kim and Byung Kook Hwang*

A pepper heat shock protein acts as a positive regulator of plant cell death and immunity signaling in response to heat stress and microbial pathogens.

*Patricia Lam, Lifang Zhao, Nathan Eveleigh, Yu Yu, Xuemei Chen, and Ljerka Kunst*

The exosome and small RNAs control Arabidopsis cuticular wax biosynthesis.

[OPEN] Down-Regulation of Kelch Domain-Containing F-Box Protein in Arabidopsis Enhances the Production of (Poly)phenols and Tolerance to Ultraviolet Radiation.  
*Xuebin Zhang, Mingyue Gou, Chunrong Guo, Huijun Yang, and Chang-Jun Liu*

Kelch repeat F-box proteins physically interact with phenylpropanoid biosynthetic enzymes, and regulate the production of (poly)phenolics and plant tolerance to ultraviolet irradiation.

Two Activities of Long-Chain Acyl-Coenzyme A Synthetase Are Involved in Lipid Trafficking between the Endoplasmic Reticulum and the Plastid in Arabidopsis.  
*Dirk Jessen, Charlotte Roth, Marcel Wiermer, and Martin Fulda*

Lipid reassembly is a key step in the transfer of cytosolic lipid precursors to the plastid.
Continued from preceding page

CELL BIOLOGY

PECTIN METHYLESTERASE48 Is Involved in Arabidopsis Pollen Grain Germination. Christelle Leroux, Sophie Bouton, Marie-Christine Kiefer-Meyer, Tohnyui Ndinyanka Fabrice, Alain Mareck, Stéphanie Guénin, Françoise Fournet, Christoph Ringli, Jérôme Pelloux, Azeddine Driouich, Patrice Lerouge, Arnaud Lehner, and Jean-Claude Mollet

Modifying homogalacturonans in the intine cell wall during maturation of the pollen grain is central for proper germination.

CESA TRAFFICKING INHIBITOR Inhibits Cellulose Deposition and Interferes with the Trafficking of Cellulose Synthase Complexes and Their Associated Proteins KORRIGAN1 and POM2/CELLOLUSE SYNTHASE INTERACTIVE PROTEIN1. Natasha Worden, Thomas E. Wilkop, Victor Esteva Esteve, Richard Jeannotte, Rahul Lathe, Samantha Vernhettes, Bart Weimer, Glenn Hicks, Jose Alonso, John Labavitch, Staffan Persson, David Ehrhardt, and Georgia Drakakaki

The compound CESTRIN reduces cellulose content and inhibits the trafficking of CESA in Arabidopsis hypocotyls.

DEVELOPMENTALLY REGULATED PLASMA MEMBRANE PROTEIN of Nicotiana benthamiana Contributes to Potyvirus Movement and Transports to Plasmodesmata via the Early Secretory Pathway and the Actomyosin System. Chao Geng, Qian-Qian Cong, Xiang-Dong Li, An-Li Mou, Rui Gao, Jin-Liang Liu, and Yan-Ping Tian

Virus movement in tobacco depends on interactions between tobacco and viral movement proteins and on their traffic to plasmodesmata.

ECOPHYSIOLOGY AND SUSTAINABILITY

A Wheat CCAAT Box-Binding Transcription Factor Increases the Grain Yield of Wheat with Less Fertilizer Input. Baoyuan Qu, Xue He, Jing Wang, Yanyan Zhao, Wan Teng, An Shao, Xueqiang Zhao, Wenyong Ma, Junyi Wang, Bin Li, Zhensheng Li, and Yiping Tong

The transcription factor TaNFYA-B1 is up-regulated by low-nitrogen and low-phosphorus treatment in wheat seedlings, and overexpressing this gene increases the grain yield of wheat under differing nitrogen and phosphorus supply levels.

GENES, DEVELOPMENT, AND EVOLUTION

Transcriptional, Posttranscriptional, and Posttranslational Regulation of SHOOT MERISTEMLESS Gene Expression in Arabidopsis Determines Gene Function in the Shoot Apex. José Antonio Aguilar-Martínez, Naoyuki Uchida, Brad Townsley, Donnelly Ann West, Andrea Yanez, Nafeesa Lynn, Seisuke Kimura, and Neelima Sinha

A homeobox gene key for plant development is regulated at the transcriptional, posttranscriptional, and posttranslational levels.

The naked endosperm Genes Encode Duplicate INDETERMINATE Domain Transcription Factors Required for Maize Endosperm Cell Patterning and Differentiation. Gibum Yi, Anjanasree K. Neelakandan, Bryan C. Gontarek, Erik Vollbrecht, and Philip W. Becraft

A duplicated pair of transcription factors control cell patterning and cell differentiation in maize endosperm development.

MEMBRANES, TRANSPORT, AND BIOENERGETICS

High Light-Dependent Phosphorylation of Photosystem II Inner Antenna CP29 in Monocots Is STN7 Independent and Enhances Nonphotochemical Quenching. Nico Betterle, Matteo Ballottari, Sacha Baginsky, and Roberto Bassi

Phosphorylation of a monomeric antenna protein correlates with increased photoprotective energy dissipation in monocots and is controlled by distinct enzymes compared with trimeric major antennae.

Continued on next page

Two iron-bound flavodoxin-domain proteins mediate an oxygen-dependent alternative electron flow in the cyanobacterium *Synechocystis* under CO₂-limited conditions.

PHOTOSYSTEM II PROTEIN33, a Protein Conserved in the Plastid Lineage, Is Associated with the Chloroplast Thylakoid Membrane and Provides Stability to Photosystem II Supercomplexes in Arabidopsis. Rikard Fristedt, Andrei Herdean, Crysten E. Blaby-Haas, Fikret Mamedov, Sabeeha S. Merchant, Robert L. Last, and Björn Lundin

The study of a previously undescribed protein shows its involvement in the maintenance of the photosystem II light-harvesting supercomplex.

Protein phosphatase 2A targets peroxisomes and positively affects fatty acid oxidation.

Phosphorylation of a scaffold protein negatively regulates its function by affecting protein stability.

Antiphase light and temperature cycles disrupt an auxin-ethylene-induced signaling cascade, leading to reduced hypocotyl elongation.

A single mechanism exists of gibberellin perception for gene expression in rice aleurone cells.

Gibberellin signaling is enhanced by, and exerts positive and negative effects on, arbuscular mycorrhiza development by interfering with symbiotic signaling and gene expression.

Nitrogen deprivation induces orderly, multilevel down-regulation of the photosynthetic apparatus, energy capture, and carbon fixation.
The benefits of a photorespiratory bypass depend on its metabolic and chloroplast membrane diffusion properties.

Integrated flux balance analysis accurately reconstructs phototrophic and heterotrophic metabolism in Chlorella protothecoides.

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