

The electronic form of this issue, available as of October 11, 2006, at [www.plantphysiol.org](http://www.plantphysiol.org), is considered the journal of record.

**On the Cover:** Companion cells (CCs) have been implicated to play an important role in phloem loading and maintenance of basic life functions in the neighboring, enucleate sieve elements (SEs), including membrane lipid and protein turnover. Pore-plasmodesma units between CCs and SEs are known to link the cytosol of these cells intimately. However, the role of the endoplasmic reticulum (ER) compound in the pore-plasmodesma units remains unknown. In this issue, Martens et al. (pp. 471–480) demonstrate that the ER of CCs and SEs is continuous, using an ER-specific fluorochrome and fluorescence redistribution after photobleaching. Compared to other cell types, the highest degree of ER coupling was measured between SE and CC. The cover photograph shows three optical sections of a series through living phloem as visualized by confocal and two-photon microscopy. CCs of collection and transport phloem were highlighted by green fluorescent protein (GFP) fluorescence in a tobacco transformant expressing GFP under the *SUC2* promoter and targeted to the ER. SEs are linked to one another and to the CCs by sieve pores, appearing blue after callose staining. The image series was recorded by Helle J. Martens and Alexander Schulz.

## ON THE INSIDE

Peter V. Minorsky 377

## EDITORIAL

Announcing Focus Collections in *Plant Physiology*. Donald R. Ort 379

## GENOME ANALYSIS

<sup>[W]</sup>Whole-Genome Analysis of *Oryza sativa* Reveals Similar Architecture of Two-Component Signaling Machinery with Arabidopsis. Ashwani Pareek, Anupama Singh, Manoj Kumar, Hemant R. Kushwaha, Andrew M. Lynn, and Sneha L. Singla-Pareek 380

## BREAKTHROUGH TECHNOLOGIES

<sup>[W]</sup>Clarification of Pathway-Specific Inhibition by Fourier Transform Ion Cyclotron Resonance/Mass Spectrometry-Based Metabolic Phenotyping Studies. Akira Oikawa, Yukiko Nakamura, Tomonori Ogura, Atsuko Kimura, Hideyuki Suzuki, Nozomu Sakurai, Yoko Shinbo, Daisuke Shibata, Shigehiko Kanaya, and Daisaku Ohta 398

## BIOINFORMATICS

<sup>[O<sup>A</sup>]</sup>Whole-Plant Growth Stage Ontology for Angiosperms and Its Application in Plant Biology. Anuradha Pujar, Pankaj Jaiswal, Elizabeth A. Kellogg, Katica Ilic, Leszek Vincent, Shulamit Avraham, Peter Stevens, Felipe Zapata, Leonore Reiser, Seung Y. Rhee, Martin M. Sachs, Mary Schaeffer, Lincoln Stein, Doreen Ware, and Susan McCouch 414

<sup>[W]</sup><sup>[O<sup>A</sup>]</sup>Computational Estimation and Experimental Verification of Off-Target Silencing during Posttranscriptional Gene Silencing in Plants. Ping Xu, Yuanji Zhang, Li Kang, Marilyn J. Roossinck, and Kirankumar S. Mysore 429

Continued on next page

## RESEARCH ARTICLES

### BIOCHEMICAL PROCESSES AND MACROMOLECULAR STRUCTURES

- A Cytosolic Arabidopsis D-Xylulose Kinase Catalyzes the Phosphorylation of 1-Deoxy-D-Xylulose into a Precursor of the Plastidial Isoprenoid Pathway. *Andréa Hemmerlin, Denis Tritsch, Michael Hartmann, Karine Pacaud, Jean-François Hoeffler, Alain van Dorsselaer, Michel Rohmer, and Thomas J. Bach* 441
- <sup>[W]</sup>Characterization of Synthetic Hydroxyproline-Rich Proteoglycans with Arabinogalactan Protein and Extensin Motifs in Arabidopsis. *José M. Estévez, Marcia J. Kieliszewski, Natalie Khitrov, and Chris Somerville* 458

### BIOENERGETICS AND PHOTOSYNTHESIS

- A Transgenic Approach to Understanding the Influence of Carbonic Anhydrase on C<sup>18</sup>OO Discrimination during C<sub>4</sub> Photosynthesis. *Asaph B. Cousins, Murray R. Badger, and Susanne von Caemmerer* 662
- Species Having C<sub>4</sub> Single-Cell-Type Photosynthesis in the Chenopodiaceae Family Evolved a Photosynthetic Phosphoenolpyruvate Carboxylase Like That of Kranz-Type C<sub>4</sub> Species. *María Valeria Lara, Simon D.X. Chuong, Hossein Akhiani, Carlos Santiago Andreo, and Gerald E. Edwards* 673

### CELL BIOLOGY AND SIGNAL TRANSDUCTION

- <sup>[W]</sup>Quantification of Plasmodesmatal Endoplasmic Reticulum Coupling between Sieve Elements and Companion Cells Using Fluorescence Redistribution after Photobleaching. *Helle J. Martens, Alison G. Roberts, Karl J. Oparka, and Alexander Schulz* 471
- Species Preferentiality of the Pollen Tube Attractant Derived from the Synergid Cell of *Torenia fournieri*. *Tetsuya Higashiyama, Rie Inatsugi, Sachio Sakamoto, Narie Sasaki, Toshiyuki Mori, Haruko Kuroiwa, Takashi Nakada, Hisayoshi Nozaki, Tsuneyoshi Kuroiwa, and Akihiko Nakano* 481
- Chimeric Proteins Suggest That the Catalytic and/or C-Terminal Domains Give CesA1 and CesA3 Access to Their Specific Sites in the Cellulose Synthase of Primary Walls. *Jian Wang, Paul A. Howles, Ann H. Cork, Rosemary J. Birch, and Richard E. Williamson* 685

### DEVELOPMENT AND HORMONE ACTION

- <sup>[W]</sup>Receptor Signal Output Mediated by the ETR1 N Terminus Is Primarily Subfamily I Receptor Dependent. *Fang Xie, Qian Liu, and Chi-Kuang Wen* 492
- <sup>[W]</sup>Gibberellin Mobilizes Distinct DELLA-Dependent Transcriptomes to Regulate Seed Germination and Floral Development in Arabidopsis. *Dongni Cao, Hui Cheng, Wei Wu, Hui Meng Soo, and Jinrong Peng* 509
- <sup>[W]</sup>The *turnip* Mutant of Arabidopsis Reveals That *LEAFY COTYLEDON1* Expression Mediates the Effects of Auxin and Sugars to Promote Embryonic Cell Identity. *Stuart A. Casson and Keith Lindsey* 526
- <sup>[W]</sup>Mutations in an Auxin Receptor Homolog AFB5 and in SGT1b Confer Resistance to Synthetic Picolinate Auxins and Not to 2,4-Dichlorophenoxyacetic Acid or Indole-3-Acetic Acid in Arabidopsis. *Terence A. Walsh, Roben Neal, Ann Owens Merlo, Mary Honma, Glenn R. Hicks, Karen Wolff, Wendy Matsumura, and John P. Davies* 542
- <sup>[W]</sup>Transcriptional Regulation of Gibberellin Metabolism Genes by Auxin Signaling in Arabidopsis. *Martín Frigerio, David Alabađí, José Pérez-Gómez, Laura García-Cárcel, Andrew L. Phillips, Peter Hedden, and Miguel A. Blázquez* 553

Continued on next page

Galactoglucomannans Increase Cell Population Density and Alter the Protoxylem/Metaxylem Tracheary Element Ratio in Xylogenic Cultures of *Zinnia*. *Anna Beňová-Kákošová, Catherine Digonnet, Florence Goubet, Philippe Ranocha, Alain Jauneau, Edouard Pesquet, Odile Barbier, Zhinong Zhang, Peter Capek, Paul Dupree, Desana Lišková, and Deborah Goffner* 696

<sup>[W]</sup>Suppression of LX Ribonuclease in Tomato Results in a Delay of Leaf Senescence and Abscission. *Amnon Lers, Lilian Sonego, Pamela J. Green, and Shaul Burd* 710

## ENVIRONMENTAL STRESS AND ADAPTATION TO STRESS

<sup>[W]</sup><sup>[OA]</sup>Adenosine Kinase Modulates Root Gravitropism and Cap Morphogenesis in *Arabidopsis*. *Li-Sen Young, Benjamin R. Harrison, Narayana Murthy U.M., Barbara A. Moffatt, Simon Gilroy, and Patrick H. Masson* 564

IMMUTANS Does Not Act as a Stress-Induced Safety Valve in the Protection of the Photosynthetic Apparatus of *Arabidopsis* during Steady-State Photosynthesis. *Dominic Rosso, Alexander G. Ivanov, Aigen Fu, Jane Geisler-Lee, Luke Hendrickson, Matt Geisler, Gregory Stewart, Marianna Krol, Vaughan Hurry, Steven R. Rodermeil, Denis P. Maxwell, and Norman P.A. Hüner* 574

<sup>[W]</sup>*Arabidopsis* Carboxyl-Terminal Domain Phosphatase-Like Isoforms Share Common Catalytic and Interaction Domains But Have Distinct in Planta Functions. *Wooyoung Bang, Sewon Kim, Akihiro Ueda, Meenu Vikram, Daejin Yun, Ray A. Bressan, Paul M. Hasegawa, Jeongdong Bahk, and Hisashi Koizumi* 586

<sup>[W]</sup>Interaction between Nitric Oxide and Ethylene in the Induction of Alternative Oxidase in Ozone-Treated Tobacco Plants. *Luisa Ederli, Roberta Morettini, Andrea Borgogni, Claus Wasternack, Otto Miersch, Lara Reale, Francesco Ferranti, Nicola Tosti, and Stefania Pasqualini* 595

<sup>[W]</sup>Hormonal and Stress Induction of the Gene Encoding Common Bean Acetyl-Coenzyme A Carboxylase. *Rosa Elia Figueroa-Balderas, Berenice García-Ponce, and Mario Rocha-Sosa* 609

<sup>[W]</sup>The Key Role of Chlorocatechol 1,2-Dioxygenase in Phytoremoval and Degradation of Catechol by Transgenic *Arabidopsis*. *Yang Liao, Xiao Zhou, Jin Yu, Yajun Cao, Xian Li, and Benke Kuai* 620

Transgenic Tobacco Plants Overexpressing Chitinases of Fungal Origin Show Enhanced Resistance to Biotic and Abiotic Stress Agents. *María de las Mercedes Dana, José A. Pintor-Toro, and Beatriz Cubero* 722

Effects of Zinc Deficiency on Rice Growth and Genetic Factors Contributing to Tolerance. *Matthias Wissuwa, Abdelbagi M. Ismail, and Seiji Yanagihara* 731

Detection and Quantification of Unbound Phytochelatin 2 in Plant Extracts of *Brassica napus* Grown with Different Levels of Mercury. *Santiago Iglesia-Turiño, Anna Febrero, Olga Jauregui, Cristina Caldelas, Jose Luis Araus, and Jordi Bort* 742

<sup>[W]</sup>Quantitative Profiling of *Arabidopsis* Polar Glycerolipids in Response to Phosphorus Starvation. Roles of Phospholipases D $\zeta$ 1 and D $\zeta$ 2 in Phosphatidylcholine Hydrolysis and Digalactosyldiacylglycerol Accumulation in Phosphorus-Starved Plants. *Maoyin Li, Ruth Welti, and Xuemin Wang* 750

## GENETICS, GENOMICS, AND MOLECULAR EVOLUTION

<sup>[W]</sup>Self-Compatibility of Two Apricot Selections Is Associated with Two Pollen-Part Mutations of Different Nature. *Santiago Vilanova, María Luisa Badenes, Lorenzo Burgos, José Martínez-Calvo, Gerardo Llácer, and Carlos Romero* 629

Continued on next page

**SYSTEMS BIOLOGY, MOLECULAR BIOLOGY, AND GENE REGULATION**

- <sup>[OA]</sup>Dual Temporal Role of Plastid Sigma Factor 6 in Arabidopsis Development. *Heike Loschelder, Jennifer Schweer, Brigitte Link, and Gerhard Link* 642
- Down-Regulation of the 26S Proteasome Subunit RPN9 Inhibits Viral Systemic Transport and Alters Plant Vascular Development. *Hailing Jin, Songtao Li, and Andy Villegas Jr.* 651
- <sup>[W]</sup><sup>[OA]</sup>Transcriptional Coordination of the Metabolic Network in Arabidopsis. *Hairong Wei, Staffan Persson, Tapan Mehta, Vinodh Srinivasasainagendra, Lang Chen, Grier P. Page, Chris Somerville, and Ann Loraine* 762
- Dehydroascorbate Reductase Affects Leaf Growth, Development, and Function. *Zhong Chen and Daniel R. Gallie* 775
- <sup>[W]</sup>The Frequency and Efficiency of Endogene Suppression by Transitive Silencing Signals Is Influenced by the Length of Sequence Homology. *Annick Bleys, Leen Vermeersch, Helena Van Houdt, and Anna Depicker* 788
- <sup>[W]</sup>A Heteromeric RNA-Binding Protein Is Involved in Maintaining Acrophase and Period of the Circadian Clock. *Dobromir Iliev, Olga Voytsekh, Eva-Maria Schmidt, Monika Fiedler, Alla Nykytenko, and Maria Mittag* 797

<sup>[W]</sup> Indicates Web-only data.

<sup>[OA]</sup> Open Access articles can be viewed online without a subscription.