On the Cover: Detection of the diurnal environment requires a circadian system that is correctly integrated with the light-dark cycle. EARLY FLOWERING4 (ELF4) is required to fulfill this normal circadian function. McWatters et al. (pp. 391–401) have shown that ELF4 has two functions within the clock. ELF4 was found to be a circadian element required both for clock resetting at the evening phase of the day (the light-to-dark phase of entrainment), and it was also found to be required for persistence of clock oscillations. For the latter, ELF4 was found to be a dose-dependent activator of the morning clock genes CCA1 and LHY. ELF4 is thus a core component of the circadian oscillator. The cover cartoon illustrates a plant having trouble sleeping. This caricature is indicative of elf4 mutant defects in detecting dusk. The cartoon was drawn by Prof. Dr. Edward Himelblau at California Polytechnic State University.

ON THE INSIDE

Peter V. Minorsky

HIGH IMPACT

The Role of Trehalose Biosynthesis in Plants.  
Aleel K. Grennan

GENOME ANALYSIS

Increases in the Number of SNARE Genes Parallels the Rise of Multicellularity among the Green Plants.  
Anton Sanderfoot

BREAKTHROUGH TECHNOLOGIES

Successful Gene Tagging in Lettuce Using the Tnt1 Retrotransposon from Tobacco.  
Marianne Mazier, Emmanuel Botton, Fabrice Flamain, Jean-Paul Bouchet, Béatrice Courtial, Marie-Christine Chpeau, Yves Chpeau, Brigitte Maisonneuve, and Héléne Lucas

Sampling the Arabidopsis Transcriptome with Massively Parallel Pyrosequencing.  
Andreas P.M. Weber, Katrin L. Weber, Kevin Carr, Curtis Wilkerson, and John B. Ohlrogge

BIOINFORMATICS

A Novel Bioinformatics Approach Identifies Candidate Genes for the Synthesis and Feruloylation of Arabinoxylan.  
Rowan A.C. Mitchell, Paul Dupree, and Peter R. Shewry

SCIENTIFIC CORRESPONDENCE

Solar UV Radiation Drives CO2 Fixation in Marine Phytoplankton: A Double-Edged Sword.  
Kunshan Gao, Yaping Wu, Gang Li, Hongyan Wu, Virginia E. Villafañe, and E. Walter Helbling
RESEARCH ARTICLES

BIOCHEMICAL PROCESSES AND MACROMOLECULAR STRUCTURES

MAM3 Catalyzes the Formation of All Aliphatic Glucosinolate Chain Lengths in Arabidopsis.  
Susanne Textor, Jan-Willem de Kraker, Bettina Hause, Jonathan Gershenzon, and James G. Tokuhisa  
### 60

Characterization of Lipid Rafts from Medicago truncatula Root Plasma Membranes: A Proteomic Study Reveals the Presence of a Raft-Associated Redox System.  
Benoit Lefebvre, Fabienne Furt, Marie-Andrée Hartmann, Louise V. Michaelson, Jean-Pierre Carde, Françoise Sargueil-Boiron, Michel Rossignol, Johnathan A. Napier, Julie Cullimore, Jean-Jacques Bessoule, and Sébastien Mongrand  
### 402

A Genomic Approach to Suberin Biosynthesis and Cork Differentiation.  
Marc Soler, Olga Serra, Marisa Molinas, Gemma Huguet, Silvia Fluch, and Mercè Figueras  
### 419

Flavonoid Biosynthesis in Barley Primary Leaves Requires the Presence of the Vacuole and Controls the Activity of Vacuolar Flavonoid Transport.  
Krasimira Marinova, Katja Kleinschmidt, Gottfried Weissenböck, and Markus Klein  
### 432

Synergistic Substrate Inhibition of ent-Copalyl Diphosphate Synthase: A Potential Feed-Forward Inhibition Mechanism Limiting Gibberellin Metabolism.  
Sladjana Prisic and Reuben J. Peters  
### 445

Cloning and Characterization of Unusual Fatty Acid Desaturases from Anemone leveillei: Identification of an Acyl-Coenzyme A C20 Δ5-Desaturase Responsible for the Synthesis of Sciadonic Acid.  
Olga Sayanova, Richard Haslam, Monica Venegas Caleron, and Johnathan A. Napier  
### 455

Light and Metabolic Signals Control the Selective Degradation of Sucrose Synthase in Maize Leaves during Deetiolation.  
Quan-Sheng Qiu, Shane C. Hardin, Jacob Mace, Thomas P. Brunnell, and Steven C. Huber  
### 468

BIOENERGETICS AND PHOTOSYNTHESIS

Coordinate Regulation of Phosphoenolpyruvate Carboxylase and Phosphoenolpyruvate Carboxykinase by Light and CO2 during C3 Photosynthesis.  
Karen J. Bailey, Julie E. Gray, Robert P. Walker, and Richard C. Leegood  
### 479

Shunichi Takahashi, Hermann Bauwe, and Murray Badger  
### 487

CELL BIOLOGY AND SIGNAL TRANSDUCTION

Actin Dynamics in Papilla Cells of Brassica rapa during Self- and Cross-Pollination.  
Megumi Iwano, Hiroshi Shiba, Kyoko Matoba, Teruhiro Miwa, Miyuki Funato, Tetsuyuki Entani, Pulla Nakayama, Hiroko Shitabata, Akio Takaoka, Akira Isogai, and Seiji Takayama  
### 72

Participation of Endomembrane Cation/H+ Exchanger AtCHX20 in Osmoregulation of Guard Cells.  
Senthilkumar Padmanabhan, Salil Chanroj, June M. Kwak, Xiyan Li, John M. Ward, and Heven Sze  
### 82

Nitric Oxide and cGMP Signaling in Calcium-Dependent Development of Cell Polarity in Ceratopteris richardii.  
Mari L. Salati, Kacey E. Morris, Stanley J. Roux, and D. Marshall Porterfield  
### 94

F2F Regulates FASCIATA1, a Chromatin Assembly Gene Whose Loss Switches on the Endocycle and Activates Gene Expression by Changing the Epigenetic Status.  
Elena Ramirez-Parra and Crisanto Gutierrez  
### 105

GIGANTEA Regulates Phytochrome A-Mediated Photomorphogenesis Independently of Its Role in the Circadian Clock.  
Karina Andrea Oliverio, María Crepy, Ellen L. Martin-Tryon, Raechel Milich, Stacey L. Harmer, Jo Putterill, Marcelo J. Yanovsky, and Jorge J. Casal  
### 495

DEVELOPMENT AND HORMONE ACTION

The Rice YABBY1 Gene Is Involved in the Feedback Regulation of Gibberellin Metabolism.  
Mingqiu Dai, Yu Zhao, Qian Ma, Yongfeng Hu, Peter Hedden, Qifa Zhang, and Dao-Xiu Zhou  
### 121

Continued on next page
Transcript Profiling and Identification of Molecular Markers for Early Microspore Embryogenesis in Brassica napus. Meghna R. Malik, Feng Wang, Joan M. Dirpaud, Ning Zhou, Patricia L. Polowick, Alison M.R. Ferrie, and Joan E. Krochko

Combined Transcriptome and Proteome Analysis Identifies Pathways and Markers Associated with the Establishment of Raspeose Microspore-Derived Embryo Development. Ronny Joosen, Jan Cordeau, Ene Darmo Jaya Supena, Oscar Vorst, Michiel Lammers, Chris Malepaard, Tieme Zeilmaker, Brian Miki, Tuxan America, Jan Custers, and Kim Boutilier


The FRD3-Mediated Efflux of Citrate into the Root Vasculature Is Necessary for Efficient Iron Translocation. Timothy P. Durret, Walter Gassmann, and Elizabeth E. Rogers

Nitric Oxide Synthase-Dependent Nitric Oxide Production Is Associated with Salt Tolerance in Arabidopsis. Min-Gui Zhao, Qu-Ying Tian, and Wen-Hao Zhang

Transcript Profiling of the Anoxic Rice Coleoptile. Rasika Lasanthi-Kudahettige, Leonardo Magneschi, Elena Loreti, Silvia Gonzali, Francesco Licausi, Giacomo Novi, Otavio Beretta, Federico Vitulli, Amedeo Alpi, and Pierdomenico Ferata


A Norway Spruce FLOWERING LOCUS T Homolog Is Implicated in Control of Growth Rhythm in Conifers. Niclas Gyllenstrand, David Clapham, Thomas Källman, and Ulf Lagercrantz

Comprehensive Expression Profiling of Rice Grain Filling-Related Genes under High Temperature Using DNA Microarray. Hirono Yamanaka, Tatsuro Hirose, Masaharu Kuroda, and Takehi Yamauchi

Iron Deficiency-Induced Secretion of Phenolics Facilitates the Reutilization of Root Apoplastic Iron in Red Clover. Chongwei Jin, Guang Yi You, Yun Feng He, Caixian Tang, Ping Wu, and Shao Jian Zheng

Calcium Signaling via Phospholipase C Is Essential for Proline Accumulation upon Ionic But Not Nonionic Hyperosmotic Stresses in Arabidopsis. Edodie Parre, Mohamed Ali Ghars, Anne-Sophie Leprince, Laurent Thiery, Delphine Lefebvre, Marianne Bordenave, Luc Richard, Christian Mazars, Chedly Abdelly, and Arnoldaud Sceavouré

Arabidopsis Cor15am Is a Chloroplast Stromal Protein That Has Cryoprotective Activity and Forms Oligomers. Katsuhiro Nakayama, Kuniko Okawa, Tomohiro Kakizaki, Takanori Homma, Hideaki Itoh, and Takehito Inaba

Iron Transport and Adaptation to Stress


Plants Interacting with Other Organisms

Soybean Root Suberin: Anatomical Distribution, Chemical Composition, and Relationship to Partial Resistance to Phytophthora sojae. Raymond Thomas, Xingxiao Fang, Kosala Ranathunge, Terry R. Anderson, Carol A. Peterson, and Mark A. Bernards

The Mi-1-Mediated Pest Resistance Requires Hsp90 and Sgt1. Kishor K. Bhattacharai, Qi Li, Yule Liu, Sawithranna P. Dinesh-Kumar, and Isgovhi Kaloshian

Genetic Interactions of TGA Transcription Factors in the Regulation of Pathogenesis-Related Genes and Disease Resistance in Arabidopsis. Meenu Kesarwani, Jungmin Yoo, and Xinnian Dong

Transcript Profiling of Poplar Leaves upon Infection with Compatible and Incompatible Strains of the Foliar Rust Melampsora larici-populina. Cécile Rinaldi, Annegret Kohler, Pascal Frey, Frédéric Duchaussoy, Nathalie Ningre, Arnaud Couloux, Patrick Wincker, Didier Le Thiec, Silvia Fluch, Francis Martin, and Sébastien Duplessis

Resistance to Botrytis cinerea Induced in Arabidopsis by Elicitors Is Independent of Salicylic Acid, Ethylene, or Jasmonate Signaling But Requires PHYTOALEXIN DEFICIENT3. Simone Ferrari, Roberta Galletti, Carine Denoux, Giulia De Lorenzo, Frederick M. Ausubel, and Julia Dewdney

Magnaporthe grisea Infection Triggers RNA Variation and Antisense Transcript Expression in Rice. Malali Gowda, R.-C. Venu, Huameng Li, Chatchawan Jantasuriyarat, Songbiao Chen, Maria Bellizzi, Vishal Pampanwar, HyeRan Kim, Ralph A. Dean, Eric Stahlberg, Rod Wing, Cari Soderlund, and Guo-Liang Wang

SYSTEMS BIOLOGY, MOLECULAR BIOLOGY, AND GENE REGULATION

A WUSCHEL-LIKE HOMEOBOX Gene Represses a YABBY Gene Expression Required for Rice Leaf Development. Mingqiu Dai, Yongfeng Hu, Yu Zhao, Huifang Liu, and Dao-Xiu Zhou


Some figures in this article are displayed in color online but in black and white in the print edition.

Indicates Web-only data.

Open Access articles can be viewed online without a subscription.