# Plant Physiology

January 2006 • Vol. 140 • No. 1

The electronic form of this issue, available as of January 11, 2006, at www.plantphysiol.org, is considered the journal of record.

On the Cover: Germination of pea seeds on ice. Dry pea seeds were placed on ice in a covered polystyrene box that was stored at 1.5°C. Ice was changed weekly and the photograph was taken after 6 weeks. When transferred to soil, the ice-germinated seeds developed into healthy pea plants. Such a performance is likely to be related to the amazing temperature tolerance of seed mitochondria that are able to sustain oxidative phosphorylation at subfreezing temperatures, using exogenous NADH as a substrate (Stupnikova et al., pp. 326–335).

#### ON THE INSIDE

Peter V. Minorsky

#### **BREAKTHROUGH TECHNOLOGIES**

Agroinjection of Tomato Fruits. A Tool for Rapid Functional Analysis of Transgenes Directly in Fruit. Diego Orzaez, Sophie Mirabel, Willemien H. Wieland, and Antonio Granell

3

#### **BIOINFORMATICS**

[OA]Oryzabase. An Integrated Biological and Genome Information Database for Rice. Nori Kurata and Yukiko Yamazaki

12

# **RESEARCH ARTICLES**

## BIOCHEMICAL PROCESSES AND MACROMOLECULAR STRUCTURES

Role of Petal-Specific Orcinol O-Methyltransferases in the Evolution of Rose Scent. *Gabriel Scalliet, Claire Lionnet, Mickaël Le Bechec, Laurence Dutron, Jean-Louis Magnard, Sylvie Baudino, Véronique Bergougnoux, Frédéric Jullien, Pierre Chambrier, Philippe Vergne, Christian Dumas, J. Mark Cock, and Philippe Hugueney* 

18

[W][OA]A coumaroyl-ester-3-hydroxylase Insertion Mutant Reveals the Existence of Nonredundant meta-Hydroxylation Pathways and Essential Roles for Phenolic Precursors in Cell Expansion and Plant Growth.

Nawroz Abdulrazzak, Brigitte Pollet, Jürgen Ehlting, Kim Larsen, Carole Asnaghi, Sebastien Ronseau, Caroline Proux, Mathieu Erhardt, Virginie Seltzer, Jean-Pierre Renou, Pascaline Ullmann, Markus Pauly, Catherine Lapierre, and Danièle Werck-Reichhart

30

<sup>[W]</sup>ARABINAN DEFICIENT 1 Is a Putative Arabinosyltransferase Involved in Biosynthesis of Pectic Arabinan in Arabidopsis. *Jesper Harholt, Jacob Krüger Jensen, Susanne Oxenbøll Sørensen, Caroline Orfila, Markus Pauly, and Henrik Vibe Scheller* 

49

<sup>[W]</sup>An LL-Diaminopimelate Aminotransferase Defines a Novel Variant of the Lysine Biosynthesis Pathway in Plants. *André O. Hudson, Bijay K. Singh, Thomas Leustek, and Charles Gilvarg* 

292

Continued on next page

# **BIOENERGETICS AND PHOTOSYNTHESIS**

<sup>[WllOA]</sup> The Photorespiratory Arabidopsis <i>shm1</i> Mutant Is Deficient in <i>SHM1</i> . <i>Lars M. Voll, Aziz Jamai, Petra Renné, Hildegard Voll, C. Robertson McClung, and Andreas P.M. Weber</i>	59
CELL BIOLOGY AND SIGNAL TRANSDUCTION	
Cell Type-Specific Role of the Retinoblastoma/E2F Pathway during Arabidopsis Leaf Development. Bénédicte Desvoyes, Elena Ramirez-Parra, Qi Xie, Nam-Hai Chua, and Crisanto Gutierrez	67
Lectin Receptor Kinases Participate in Protein-Protein Interactions to Mediate Plasma Membrane-Cell Wall Adhesions in Arabidopsis. <i>Anne Gouget, Virginie Senchou, Francine Govers, Arnaud Sanson, Annick Barre, Pierre Rougé, Rafael Pont-Lezica, and Hervé Canut</i>	81
Overexpression of <i>RAN1</i> in Rice and Arabidopsis Alters Primordial Meristem, Mitotic Progress, and Sensitivity to Auxin. <i>Xin Wang, Yunyuan Xu, Ye Han, Shilai Bao, Jizhou Du, Ming Yuan, Zhihong Xu, and Kang Chong</i>	91
<sup>[W]</sup> MICROTUBULE ORGANIZATION 1 Regulates Structure and Function of Microtubule Arrays during Mitosis and Cytokinesis in the Arabidopsis Root. <i>Eiko Kawamura, Regina Himmelspach, Madeleine C. Rashbrooke, Angela T. Whittington, Kevin R. Gale, David A. Collings, and Geoffrey O. Wasteneys</i>	102
[W] ABA-Hypersensitive Germination3 Encodes a Protein Phosphatase 2C (AtPP2CA) That Strongly Regulates Abscisic Acid Signaling during Germination among Arabidopsis Protein Phosphatase 2Cs. Tomo Yoshida, Noriyuki Nishimura, Nobutaka Kitahata, Takashi Kuromori, Takuya Ito, Tadao Asami, Kazuo Shinozaki, and Takashi Hirayama	115
The Regulator of G-Protein Signaling Proteins Involved in Sugar and Abscisic Acid Signaling in Arabidopsis Seed Germination. <i>Yun Chen, Fangfang Ji, Hong Xie, Jiansheng Liang, and Jianhua Zhang</i>	302
DEVELOPMENT AND HORMONE ACTION	
<sup>[W]</sup> The Protein Phosphatase AtPP2CA Negatively Regulates Abscisic Acid Signal Transduction in Arabidopsis, and Effects of abh1 on AtPP2CA mRNA. Josef M. Kuhn, Aurélien Boisson-Dernier, Marie B. Dizon, Mohammad H. Maktabi, and Julian I. Schroeder	127
<sup>[W]</sup> The Arabidopsis Group 1 LATE EMBRYOGENESIS ABUNDANT Protein ATEM6 Is Required for Normal Seed Development. <i>Alicia J. Manfre, Lea M. Lanni, and William R. Marcotte Jr.</i>	140
Grapes on Steroids. Brassinosteroids Are Involved in Grape Berry Ripening. <i>Gregory M. Symons, Christopher Davies, Yuri Shavrukov, Ian B. Dry, James B. Reid, and Mark R. Thomas</i>	150
[OA] The Onset of Gravisensitivity in the Embryonic Root of Flax. Zhong Ma and Karl H. Hasenstein	159
Cell Wall Proteome in the Maize Primary Root Elongation Zone. I. Extraction and Identification of Water-Soluble and Lightly Ionically Bound Proteins. <i>Jinming Zhu, Sixue Chen, Sophie Alvarez, Victor S. Asirvatham, Daniel P. Schachtman, Yajun Wu, and Robert E. Sharp</i>	311

# ENVIRONMENTAL STRESS AND ADAPTATION TO STRESS

Organ-Specific Expression of Glutathione <i>S</i> -Transferases and the Efficacy of Herbicide Safeners in Arabidopsis. <i>Ben P. DeRidder and Peter B. Goldsbrough</i>	167
<sup>[W]</sup> Increased Accumulation of Cuticular Wax and Expression of Lipid Transfer Protein in Response to Periodic Drying Events in Leaves of Tree Tobacco. <i>Kimberly D. Cameron, Mark A. Teece, and Lawrence B. Smart</i>	176
Pea Seed Mitochondria Are Endowed with a Remarkable Tolerance to Extreme Physiological Temperatures.  Irina Stupnikova, Abdelilah Benamar, Dimitri Tolleter, Johann Grelet, Genadii Borovskii, Albert-Jean Dorne, and David Macherel	326
GENETICS, GENOMICS, AND MOLECULAR EVOLUTION	
[W][OA]Identification of a Glyphosate-Resistant Mutant of Rice 5-Enolpyruvylshikimate 3-Phosphate Synthase Using a Directed Evolution Strategy. <i>Min Zhou, Honglin Xu, Xiaoli Wei, Zhiqiang Ye, Liping Wei, Weimin Gong, Yongqin Wang, and Zhen Zhu</i>	184
Distinct Roles of the First Introns on the Expression of Arabidopsis Profilin Gene Family Members. <i>Young-Min Jeong, Jeong-Hwan Mun, Ilha Lee, Je Chang Woo, Choo Bong Hong, and Sang-Gu Kim</i>	196
[W]Patterns of Sequence Loss and Cytosine Methylation within a Population of Newly Resynthesized <i>Brassica napus</i> Allopolyploids. <i>Lewis N. Lukens, J. Chris Pires, Enrique Leon, Robert Vogelzang, Lynne Oslach, and Thomas Osborn</i>	336
<sup>[W]</sup> Proteomic Analysis of Different Mutant Genotypes of Arabidopsis Led to the Identification of 11 Proteins Correlating with Adventitious Root Development. <i>Céline Sorin, Luc Negroni, Thierry Balliau, Hélène Corti, Marie-Pierre Jacquemot, Marlène Davanture, Göran Sandberg, Michel Zivy, and Catherine Bellini</i>	349
PLANTS INTERACTING WITH OTHER ORGANISMS	
Heterotrimeric G Proteins Facilitate Arabidopsis Resistance to Necrotrophic Pathogens and Are Involved in Jasmonate Signaling. Yuri Trusov, James Edward Rookes, David Chakravorty, David Armour, Peer Martin Schenk, and José Ramón Botella	210
<sup>[W]</sup> Transcript Analysis of Early Nodulation Events in Medicago truncatula. Dasharath Prasad Lohar, Natalya Sharopova, Gabriella Endre, Silvia Peñuela, Deborah Samac, Christopher Town, Kevin A.T. Silverstein, and Kathryn A. VandenBosch	221
<sup>[W]</sup> A Circadian Rhythm-Regulated Tomato Gene Is Induced by Arachidonic Acid and <i>Phythophthora infestans</i> Infection. <i>Philip D. Weyman, Zhiqiang Pan, Qin Feng, David G. Gilchrist, and Richard M. Bostock</i>	235
The Outcomes of Concentration-Specific Interactions between Salicylate and Jasmonate Signaling Include Synergy, Antagonism, and Oxidative Stress Leading to Cell Death. Luis A.J. Mur, Paul Kenton, Rainer Atzorn, Otto Miersch, and Claus Wasternack	249
The <i>DMI1</i> and <i>DMI2</i> Early Symbiotic Genes of <i>Medicago truncatula</i> Are Required for a High-Affinity Nodulation Factor-Binding Site Associated to a Particulate Fraction of Roots. <i>Bridget V. Hogg, Julie V. Cullimore, Raoul Ranjeva, and Jean-Jacques Bono</i>	365
WHOLE PLANT AND ECOPHYSIOLOGY	
Analysis of Freeze-Thaw Embolism in Conifers. The Interaction between Cavitation Pressure and Tracheid Size. <i>Jarmila Pittermann and John S. Sperry</i>	374
Phloem Loading in Two Scrophulariaceae Species. What Can Drive Symplastic Flow via Plasmodesmata? Olga V. Voitsekhovskaja, Olga A. Koroleva, Denis R. Batashev, Christian Knop, A. Deri Tomos, Yuri V. Gamalei, Hans-Walter Heldt, and Gertrud Lohaus	383

## SYSTEMS BIOLOGY, MOLECULAR BIOLOGY, AND GENE REGULATION

 $^{[W]}$ Repressing the Expression of the SUCROSE NONFERMENTING-1-RELATED PROTEIN KINASE Gene in Pea Embryo Causes Pleiotropic Defects of Maturation Similar to an Abscisic Acid-Insensitive Phenotype. Ruslana Radchuk, Volodymyr Radchuk, Winfriede Weschke, Ljudmilla Borisjuk, and Hans Weber

263

Identification of the Flavonoid Hydroxylases from Grapevine and Their Regulation during Fruit Development. Jochen Bogs, Ali Ebadi, Debra McDavid, and Simon P. Robinson

279

## **CORRECTION**

Ethylene Inhibits Abscisic Acid-Induced Stomatal Closure in Arabidopsis. Y. Tanaka, T. Sano, M. Tamaoki, N. Nakajima, N. Kondo, and S. Hasezawa

396

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

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