On the Cover: To maintain or improve basic stomatal performance criteria such as regulation of water use or rates of CO₂ assimilation while global atmosphere and climate underwent long-term changes, structural and mechanical modifications to the stomatal apparatus were necessary. Pictured are cryo-SEM images of fresh leaves of the fern *Nephrolepis exaltata* showing a single stoma frozen in its fully open state. The top panel shows a surface view; while in the bottom panel the sample has been cryo-sectioned and etched to reveal detail of the two guard cells in cross section. In this species the guard cells undergo only moderate swelling and little mechanical interaction with adjacent cells to create the stomatal pore. By combining cryo-SEM, cell pressure probe, gas exchange, and modeling techniques, Franks and Farquhar (pp. 78–87) show how increasingly elaborate modes of guard cell swelling and mechanical interaction with adjacent cells during stomatal opening have given rise to a wide range of leaf gas-exchange capacities and sensitivities to environmental fluctuations. Images were created by P.J. Franks, assisted by C.X. Huang.

Real-Time Plant Physiology provides Open Access publication for all articles whose corresponding author is a member of ASPB. For more information on this new feature, please see the editorial in the September 2006 issue of Plant Physiology (Vol. 142, p. 5).
Embolism Formation during Freezing in the Wood of Picea abies.  Stefan Mayr, Hervé Cochard, Thierry Améglio, and Silvia B. Kikuta

Modification of Leaf Apoplastic pH in Relation to Stomatal Sensitivity to Root-Sourced Abscisic Acid Signals. Wensuo Jia and William John Davies

The Mechanical Diversity of Stomata and Its Significance in Gas-Exchange Control.  Peter J. Franks and Graham D. Farquhar

Spatial Variation of Deuterium Enrichment in Bulk Water of Snowgum Leaves. Jiří Šantrůček, Jiří Květoň, Jiří Šetlík, and Lenka Bulíčková

Environment or Development? Lifetime Net CO₂ Exchange and Control of the Expression of Crassulacean Acid Metabolism in Mesembryanthemum crystallinum. Klaus Winter and Joseph A.M. Holtum

Evaluation of Source Leaf Responses to Water-Deficit Stresses in Cotton Using a Novel Stress Bioassay. John J. Burke

Putative Role of Aquaporins in Variable Hydraulic Conductance of Leaves in Response to Light. Hervé Cochard, Jean-Stéphane Venisse, Téth Séverien Barigah, Nicole Brunel, Stéphane Herbette, Agnès Guillot, Melvin T. Tyree, and Soultanian Sakr


Helianthus Nighttime Conductance and Transpiration Respond to Soil Water But Not Nutrient Availability. Ava R. Howard and Lisa A. Donovan

REGULAR ISSUE

GENOME ANALYSIS

Genome-Wide Analysis of the Arabidopsis Leaf Transcriptome Reveals Interaction of Phosphate and Sugar Metabolism. Renate Müller, Marc Morant, Hanne Jarmer, Lena Nilsson, and Tom Hamborg Nielsen

Combining Expression and Comparative Evolutionary Analysis. The COBRA Gene Family. Siobhan M. Brady, Shuang Song, Kanwarpal S. Dhugga, J. Antoni Rafalski, and Philip N. Benfey

BIOCHEMICAL PROCESSES AND MACROMOLECULAR STRUCTURES

Arabidopsis Sucrose Transporter AtSUC9. High-Affinity Transport Activity, Intragenic Control of Expression, and Early Flowering Mutant Phenotype. Alicia B. Sivitz, Anke Reinders, Meghan E. Johnson, Anthony D. Kreutz, Christopher P.L. Graf, Jai M. Perroux, and John M. Ward

Insights into the Role of Specific Lipids in the Formation and Delivery of Lipid Microdomains to the Plasma Membrane of Plant Cells. Maryse Laloi, Anne-Marie Perret, Laurent Chatre, Su Melser, Catherine Cantrel, Marie-Noëlle Vautel, Alain Zachowski, Katell Bathany, Jean-Marie Schmitter, Myriam Vallet, René Lessire, Marie-Andrée Hartmann, and Patrick Moreau

CELL BIOLOGY AND SIGNAL TRANSDUCTION

Characterization of the Preprotein and Amino Acid Transporter Gene Family in Arabidopsis. Monika W. Murcha, Dina Elhafez, Ryan Lister, Julian Tonti-Filippini, Manuela Baumgartner, Katrin Philippar, Chris Carrie, Dejana Mokranjac, Jürgen Soll, and James Whelan

GIIGNANTEA Acts in Blue Light Signaling and Has Biochemically Separable Roles in Circadian Clock and Flowering Time Regulation. Ellen L. Martin-Byon, Joel A. Kreps, and Stacey L. Harmer

Continued on next page
Cold Transiently Activates Calcium-Permeable Channels in Arabidopsis Mesophyll Cells. 

Armando Carpaneto, Natalya Ivashikina, Victor Lecchenko, Elebieto Krol, Elena Jeworutzki, Jian-Kang Zhu, and Rainer Hedrich

DEVELOPMENT AND HORMONE ACTION


Zhaqing Chu, Hao Chen, Yiyue Zhang, Zhonghui Zhang, Nougan Zheng, Bojiay Yin, Hongyan Yan, Lei Zhu, Xiangyu Zhao, Ming Yuan, Xiansheng Zhang, and Qi Xie

Short Vegetative Phase-Like MADS-Box Genes Inhibit Floral Meristem Identity in Barley. 

Ben Trevaskis, Million Tadege, Megan N. Hemming, W. James Peacock, Elizabeth S. Dennis, and Candice Sheldon

ENVIRONMENTAL STRESS AND ADAPTATION TO STRESS

Reciprocal Leaf and Root Expression of AtAmt1.1 and Root Architectural Changes in Response to Nitrogen Starvation. 

Cawas B. Engineer and Robert G. Kranz


Yee-yung Charng, Hsiang-chin Liu, Nai-yu Liu, Wen-tzu Chi, Chun-neng Wang, Shih-hsun Chang, and Tsu-tsuen Wang

Manganese Deficiency in Chlamydomonas Results in Loss of Photosystem II and MnSOD Function, Sensitivity to Peroxides, and Secondary Phosphorus and Iron Deficiency. 

Michael D. Allen, Janette Kropat, Stephen Tottey, José A. Del Campo, and Sabeena S. Merchant

Association of Specific Expansins with Growth in Maize Leaves Is Maintained under Environmental, Genetic, and Developmental Sources of Variation. 

Bertrand Muller, Gildas BAourdais, Beat Reidy, Christelle Bencivenni, Agnès Massonneau, Pascal Condamine, Gaëlle Rolland, Geneviève Conéjéro, Peter Rogowsky, and François Tardieu

Degradation of Oxidized Proteins by Autophagy during Oxidative Stress in Arabidopsis. 

Yan Xiong, Anthony L. Contenko, Phan Quang Nguyen, and Diane C. Bassham

PsTRXh1 and PsTRXh2 Are Both Pea h-Type Thioredoxins with Antagonistic Behavior in Redox Imbalances. 

José A. Traverso, Florence Vignols, Roland Cazalis, Amada Pulido, Mariam Sahrawy, Francisco Javier Cejudo, Yves Meyer, and Ana Chueca

The Metabolic Response of Heterotrophic Arabidopsis Cells to Oxidative Stress. 


Germanium-68 as an Adequate Tracer for Silicon Transport in Plants. Characterization of Silicon Uptake in Different Crop Species. 

Miroslav Nikolic, Nina Nikolic, Yongchao Liang, Ernest A. Kirkby, and Volker Roehl

GENETICS, GENOMICS, AND MOLECULAR EVOLUTION

Transcriptome Analysis Reveals a Critical Role of CHS7 and CHS8 Genes for Isoflavonoid Synthesis in Soybean Seeds. 

Sangeeta Dhaubhadel, Mark Gijzen, Pat Moy, and Mana Farhangkhoei

MAIZEWALL. Database and Developmental Gene Expression Profiling of Cell Wall Biosynthesis and Assembly in Maize. 

Sabine Guillaumie, Hélène San-Clemente, Caroline Deswarte, Yves Martinez, Catherine Lapierre, Alain Murigneux, Yves Barrière, Magalie Pichon, and Deborah Goffner


Francesco Paolocci, Mark P. Robbins, Laura Maleo, Sergio Arcioni, Stefan Martens, and Francesco Damiani

PLANTS INTERACTING WITH OTHER ORGANISMS

Phytophthora infestans Cystatin-Like Protein Targets a Novel Tomato Papain-Like Apoplastic Protease. 

Miaoying Tian, Joe Win, Jing Song, Renier van der Hoorn, Esther van der Knaap, and Sophien Kamoun

Tobacco Nectaries Express a Novel NADPH Oxidase Implicated in the Defense of Floral Reproductive Tissues against Microorganisms. Clay Carter, Rosanne Healy, Nicole M. O'Toole, S.M. Saqlan Naqvi, Gang Ren, Sanggyu Park, Gwyn A. Beattie, Harry T. Horner, and Robert W. Thornburg

AtERF14, a Member of the ERF Family of Transcription Factors, Plays a Nonredundant Role in Plant Defense. Luis Oihate-Sánchez, Jonathan P. Anderson, Jodi Young, and Karam B. Singh


Dissection of the AtNRT2.1:AtNRT2.2 Inducible High-Affinity Nitrate Transporter Gene Cluster. Wenbin Li, Ye Wang, Mamoru Okamoto, Nigel M. Crawford, M. Yaeesh Siddiqi, and Anthony D.M. Glass

Genetic Variation Suggests Interaction between Cold Acclimation and Metabolic Regulation of Leaf Senescence. Céline Masclaux-Daubresse, Sarah Purdy, Thomas Lemaitre, Nathalie Pourtau, Ludinie Taconnat, Jean-Pierre Renou, and Astrid Wingler

Physiological Roles of the Light, Oxygen, or Voltage Domains of Phototropin 1 and Phototropin 2 in Arabidopsis. Hae-Young Cho, Tong-Seung Tseng, Eirini Kaiserli, Stuart Sulcian, John M. Christie, and Winslow R. Briggs

MIKC* MADS-Protein Complexes Bind Motifs Enriched in the Proximal Region of Late Pollen-Specific Arabidopsis Promoters. Wim Verelst, Heinz Saedler, and Thomas Münster

Tobacco Isoenzyme 1 of NAD(H)-Dependent Glutamate Dehydrogenase Catabolizes Glutamate in Vivo. Matthew Peter Purnell and José Ramon Botella

Circadian Rhythms of Isoprene Biosynthesis in Grey Poplar Leaves. Maaria Loivamäki, Sandrine Louis, Gyöngyi Cinege, Ina Zimmer, Robert J. Fischbach, and Jörg-Peter Schnitzler

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.