The cover photo, taken by Drs. Yong-Ling Ruan and Eric Hines, shows rapidly elongating cotton (*Gossypium hirsutum*) fiber cells from the outer seed coat epidermis using a confocal microscope for preloaded fluorescent dye, carboxyfluorescein. Each cotton fiber is a single cell that undergoes rapid and synchronized unidirectional expansion to several centimeters long by approximately 18 d after anthesis before it switches to cell wall cellulose synthesis. Thus, cotton fiber represents an excellent cell model to study regulation of cell expansion. In this issue, Wang et al. (pp. 744–756) explore the roles and mechanisms of vacuolar invertase (VIN) in controlling plant cell expansion. They discovered that VIN regulates cotton fiber and Arabidopsis (*Arabidopsis thaliana*) root elongation in osmotic-dependent and -independent pathways, respectively. The study provides an example that a given protein (e.g. VIN) could control similar developmental processes such as cell expansion through different mechanisms in different cell types.

**EDITORIAL**

*Plant Physiology Celebrates Its 25,000th Article!*  Rick Amasino, Bonnie Bartel, and Don Ort  

**FUTURE PERSPECTIVES IN PLANT BIOLOGY**

Early Evolution of Photosynthesis.  Robert E. Blankenship  

Basal Signaling Regulates Plant Growth and Development.  Wendy F. Boss, Heike Winter Sederoff, Yang Ju Im, Nava Moran, Amy M. Grunden, and Imara Y. Perera  

Emerging Complexity in Reactive Oxygen Species Production and Signaling during the Response of Plants to Pathogens.  Tamara Vellosillo, Jorge Vicente, Satish Kulasekaran, Mats Hamberg, and Carmen Castresana  

Understanding Lignification: Challenges Beyond Monolignol Biosynthesis.  Xu Li and Clint Chapple  

Flavonoids and Isoflavonoids: From Plant Biology to Agriculture and Neuroscience.  Richard A. Dixon and Giulio M. Pasinetti  

Endoplasmic Reticulum: The Rising Compartment in Auxin Biology.  Jiří Friml and Angharad R. Jones  

Opportunities to Explore Plant Membrane Organization with Super-Resolution Microscopy.  Ryan Gutierrez, Guido Grossmann, Wolf B. Frommer, and David W. Ehrhardt  

Plant Biology in the Fourth Dimension.  Stacey Harmer  

Ubiquitin Ligase-Coupled Receptors Extend Their Reach to Jasmonate.  Gregg A. Howe  


Abscisic Acid Receptors.  Kelli G. Kline, Michael R. Sussman, and Alan M. Jones  

Plant Cell Walls.  Kenneth Keegstra  


Climbing the Branches of the Strigolactones Pathway One Discovery at a Time.  Charles Goulet and Harry J. Klee  

Twenty-First Century Plant Biology: Impacts of the Arabidopsis Genome on Plant Biology and Agriculture.  C. Robin Buell and Robert L. Last  

The Power of Auxin in Plants.  Ottoline Leyser  

Do Transcription Factors Play Special Roles in Adaptive Variation?  Cathie Martin, Noel Ellis, and Fred Rook  

The Elements of Plant Micronutrients.  Sabeeha S. Merchant  

The Timing of Flowering.  Richard M. Amasino and Scott D. Michaels  

Oxidative Stress: Antagonistic Signaling for Acclimation or Cell Death?  Philip M. Mullineaux and Neil R. Baker  

Continued on next page


CELL BIOLOGY AND SIGNAL TRANSDUCTION
[WI][OA] Extracellular Nucleotides Elicit Cytosolic Free Calcium Oscillations in Arabidopsis. Kiwamu Tanaka, Sarah J. Swanson, Simon Gilroy, and Gary Stacey 705

[WI] Tethering Factors Required for Cytokinesis in Arabidopsis. Martha Thellmann, Katarzyna Rybak, Knut Thiele, Gerhard Wanner, and Farhah F. Assaad 720

[WI][OA] Leaf Senescence Signaling: The Ca^{2+}-Conducting Arabidopsis Cyclic Nucleotide Gated Channel2 Acts through Nitric Oxide to Repress Senescence Programming. Wei Ma, Andries Smigel, Robin K. Walker, Wolfgang Moeder, Keiko Yoshioka, and Gerald A. Berkowitz 733

DEVELOPMENT AND HORMONE ACTION
[CI][WI][OA] Evidence That High Activity of Vacuolar Invertase Is Required for Cotton Fiber and Arabidopsis Root Elongation through Osmotic Dependent and Independent Pathways, Respectively. Lu Wang, Xiao-Rong Li, Heng Lian, Di-An Ni, Yu-Ke He, Xiao-Ya Chen, and Yong-Ling Ruan 744


[WI] The Plant-Specific SR45 Protein Negatively Regulates Glucose and ABA Signaling during Early Seedling Development in Arabidopsis. Raquel Fonseca Carvalho, Sofia Domingues Carvalho, and Paula Duque 772

[CI][WI][OA] Vernalization-Mediated VIN3 Induction Overcomes the LIKE-HETEROCHROMATIN PROTEIN1/POLYCOMB REPRESSION COMPLEX2-Mediated Epigenetic Repression. Dong-Hwan Kim, Brett R. Zografos, and Shibum Sung 949

[CI][WI][OA] Reproductive Development Modulates Gene Expression and Metabolite Levels with Possible Feedback Inhibition of Artemisinin in Artemisia annua. Patrick R. Arsenault, Daniel Vail, Kristin K. Wobbe, Karen Erickson, and Pamela J. Weathers 958

ENVIRONMENTAL STRESS AND ADAPTATION TO STRESS


GENETICS, GENOMICS, AND MOLECULAR EVOLUTION
[OA] Proper Levels of the Arabidopsis Cohesion Establishment Factor CTF7 Are Essential for Embryo and Megagametophyte, But Not Endosperm, Development. Ling Jiang, Li Yuan, Ming Xia, and Christopher A. Makaroff 820
PLANTS INTERACTING WITH OTHER ORGANISMS

The glabra1 Mutation Affects Cuticle Formation and Plant Responses to Microbes. Ye Xia, Keshun Yu, Duroy Navarre, Kenneth Seebold, Aardra Kachroo, and Pradeep Kachroo

Abscisic Acid Deficiency Causes Changes in Cuticle Permeability and Pectin Composition That Influence Tomato Resistance to Botrytis cinerea. Katrien Curvers, Hamed Seifi, Grégoire Mouille, Riet de Rycke, Bob Asselbergh, Annelies Van Hecke, Dieter Vanderschaege, Herman Höfte, Nico Callewaert, Frank Van Breusegem, and Monica Höfte


WHOLE PLANT AND ECOPHYSIOLOGY


Tyloses and Phenolic Deposits in Xylem Vessels Impede Water Transport in Low-Lignin Transgenic Poplars: A Study by Cryo-Fluorescence Microscopy. Peter Kitin, Steven L. Voelker, Frederick C. Meinzer, Hans Beeckman, Steven H. Strauss, and Barbara Lachenbruch

Endogenous Abscisic Acid as a Key Switch for Natural Variation in Flooding-Induced Shoot Elongation. Xin Chen, Ronald Pierik, Anton J.M. Peeters, Hendrik Poorter, Eric J.W. Visser, Heidrun Huber, Hans de Kroon, and Laurentius A.C.J. Voesenek


Nonreductive Iron Uptake Mechanism in the Marine Alveolate Chromera velia. Robert Sutak, Jan Šlapeta, Mabel San Roman, Jean-Michel Camadro, and Emmanuel Lesuisse

SYSTEMS BIOLOGY, MOLECULAR BIOLOGY, AND GENE REGULATION

Transcriptional-Metabolic Networks in β-Carotene-Enriched Potato Tubers: The Long and Winding Road to the Golden Phenotype. Gianfranco Diretto, Salim Al-Babili, Raffaela Tavazza, Federico Scossa, Vélia Papachritou, Robert G. Pate, Peter Beyer, and Giovanni Giuliano

The Seed Composition of Arabidopsis Mutants for the Group 3 Sulfate Transporters Indicates a Role in Sulfate Translocation within Developing Seeds. Hélène Zuber, Jean-Claude Davidian, Grégoire Aubert, Delphine Aimé, Maya Belghazi, Raphaël Legant, Dimitri Heintz, Markus Wirtz, Rudiger Herr, Richard Thompson, and Karline Gallardo

Coexpression Analysis Identifies Rice Starch Regulator1, a Rice AP2/EREBP Family Transcription Factor, as a Novel Rice Starch Biosynthesis Regulator. Fang-Fang Fu and Hong-Wei Xue


13C-Tracer and Gas Chromatography-Mass Spectrometry Analyses Reveal Metabolic Flux Distribution in the Oleaginous Microalga Chlorella protothecoides. Wei Xiong, Lixia Liu, Chao Wu, Chen Yang, and Qingyu Wu

CORRECTIONS

Phosphatidic Acid Inhibits Blue Light-Induced Stomatal Opening via Inhibition of Protein Phosphatase 1. A. Takemiya and K.-i. Shimazaki

Arabinogalactan-Proteins: Key Regulators at the Cell Surface? M. Ellis, J. Egelund, C.J. Schultz, and A. Bacic

RETRACTION


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.