**On the Cover:** Germ cells are indispensable carriers of genetic information from one generation to the next. SPOROCYTELESS/NOZZLE (SPL/NZZ) was previously identified as an essential regulator of archesporial cell differentiation in the stamens and ovules of Arabidopsis. In this issue, Zhao et al. (pp. 2265–2277) demonstrate that MPK3/6 kinases are required for the differentiation of archesporial cells in Arabidopsis anthers by interacting with and phosphorylating SPL proteins. The cover image shows the specificity of the expression pattern of a newly generated P_{SPL}:GUS reporter in mpk3/1mpk6/2 flowers. While SPL/NZZ expression is highly specific to the primordia of the anther and ovule and is concentrated where germ cells differentiated, the upstream sequence of SPL/NZZ does not have the specificity. To obtain proper tools to precisely manipulate gene expression, a new cassette was constructed by replacing the first exon with a GUS gene. As shown in the photo, the reporter can precisely mimic the expression pattern of SPL/NZZ examined by in situ hybridization and can be used as a new tool for analysis of regulatory mechanisms in germ cell initiation and differentiation in Arabidopsis.

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**ON THE INSIDE**

*Peter V. Minorsky*

**COMMENTARY**

The First Broad-Spectrum Abscisic Acid Antagonist. **Jeffrey Leung**

*This is a commentary on an accepted manuscript by Ye et al., requested by Plant Physiology.*

**BREAKTHROUGH TECHNOLOGIES**

A Viral Satellite DNA Vector (TYLCCNV) for Functional Analysis of miRNAs and siRNAs in Plants. Zheng Ju, Dongyan Cao, Chao Gao, Jinhua Zuo, Baiqiang Zhai, Shan Li, Hongliang Zhu, Daqi Fu, Yunbo Luo, and Benzhong Zhu

*A new small RNA overexpression system could highly overexpress not only artificial and endogenous miRNAs but also endogenous siRNAs in Nicotiana benthamiana.*

**RESEARCH REPORT**

[OPEN] Mechanism of Dual Targeting of the Phytochrome Signaling Component HEMERA/pTAC12 to Plastids and the Nucleus. *P. Andrew Nevarez, Yongjian Qiu, Hitoshi Inoue, Chan Yul Yoo, Philip N. Benfey, Danny J. Schnell, and Meng Chen*

*HEMERA/pTAC12 accumulation in the nucleus requires localization to the plastids.*

**UPDATE**

[OPEN] Pollen Development at High Temperature: From Acclimation to Collapse. *Ivo Rieu, David Twell, and Nurit Firon*

*Pollen development at high temperature depends on a fine balance between acclimation and injury.*
RESEARCH ARTICLES

BIOCHEMISTRY AND METABOLISM


AAO4 plays a critical role in delaying silique senescence by catalyzing aldehyde detoxification and generates both hydrogen peroxide and superoxide.


The various tissue types of oilseed rape seeds have different lipid compositions, which are established early in seed development.

[OPEN] Discovery and Characterization of the 3-Hydroxyacyl-ACP Dehydratase Component of the Plant Mitochondrial Fatty Acid Synthase System. Xin Guan, Yozo Okazaki, Andrew Lithio, Ling Li, Xuefeng Zhao, Huanan Jin, Dan Nettleton, Kazuki Saito, and Basil J. Nikolau

Identification and characterization of the mitochondrial 3-hydroxyacyl-ACP dehydratase reveal novel functionalities associated with the mitochondrial fatty acid synthase system.

[OPEN] Salicylic Acid-Dependent Plant Stress Signaling via Mitochondrial Succinate Dehydrogenase. Katharina Belt, Shaobai Huang, Louise F. Thatcher, Hayley Casarotto, Karam B. Singh, Olivier Van Aken, and A. Harvey Millar

Salicylic acid stimulates succinate dehydrogenase activity and induces mitochondrial ROS production to induce stress signaling.


A computational pipeline generates high-quality and genome-scale sets of metabolic enzymes, pathways, and gene clusters from plant genomes.


Analysis of the lipid profile of O. tauri revealed that those in the plastid were enriched in C18-PUFAs and the omega-3 docosahexaenoic acid was exclusively extraplastidial, but that highly unsaturated TAGs originate from both ER and plastid precursors.

[OPEN] Two Acyltransferases Contribute Differently to Linolenic Acid Levels in Seed Oil. Sofia Marmon, Drew Sturtevant, Cornelia Herrfurth, Kent Chapman, Sten Stymne, and Ivo Feussner

Changes in expression of DGAT1 and PDAT alter the fatty acid composition and spatial distribution of triacylglycerol and phosphatidylcholine molecular species in Camelina sativa seeds.
Mitochondrial ABC Transporter ATM3 Is Essential for Cytosolic Iron-Sulfur Cluster Assembly. Jia Zuo, Zhigeng Wu, Ying Li, Zedan Shen, Xiangyang Feng, Mingyong Zhang, and Hong Ye

Mitochondrial transporter ATM3-dependent cytosolic Fe-S cluster assembly is important for the development of lateral roots, root apical meristem, and shoot apical meristem in rice.

Photosynthetic Trichomes Contain a Specific Rubisco with a Modified pH-Dependent Activity. Raphaëlle Laterre, Mathieu Pottier, Claire Remacle, and Marc Boutry

Secretory cells contain a specific Rubisco, the small subunit of which belongs to a so-far-uncharacterized phylogenetic cluster and confers a modified pH-dependent activity.

CELL BIOLOGY

Identification of Putative Substrates of SEC2, a Chloroplast Inner Envelope Translocase. Yubing Li, Jonathan R. Martin, Giovanni A. Aldama, Donna E. Fernandez, and Kenneth Cline

The protein translocase SEC2 in the inner chloroplast envelope facilitates membrane integration of a subset of envelope proteins.


Molecular cloning of a cytoplasmic stay-green mutant gene revealed that a small subunit of PSII is involved in chlorophyll b degradation.

Chloroplast Preproteins Bind to the Dimer Interface of the Toc159 Receptor during Import. Jun-Shian Chang, Lih-Jen Chen, Yi-Hung Yeh, Chwan-Deng Hsiao, and Hsou-min Li

Preprotein-binding sites are mapped to the dimer interface and the switch II region of the Toc159 GTPase domain.

ECOPHYSIOLOGY AND SUSTAINABILITY

Importance of Fluctuations in Light on Plant Photosynthetic Acclimation. Silvere Vialet-Chabrand, Jack S.A. Matthews, Andrew J. Simkin, Christine A. Raines, and Tracy Lawson

Fluctuating light influences acclimation in Arabidopsis independently of light intensity.

The Accumulation of miRNAs Differentially Modulated by Drought Stress Is Affected by Grafting in Grapevine. Chiara Poglarani, Marco Vitali, Manuela Ferrero, Nicola Vitulo, Marco Incarbone, Claudio Lovisolo, Giorgio Valle, and Andrea Schubert

The abundance of drought-regulated miRNAs is affected by grafting in grapevine.


Monitoring of freezing in trees via nondestructive methods revealed complex spatial and temporal freezing patterns that promote internal water shifts and cavitation events.
GENES, DEVELOPMENT, AND EVOLUTION

Selection for a Zinc-Finger Protein Contributes to Seed Oil Increase during Soybean Domestication. Qing-Tian Li, Xiang Lu, Qing-Xin Song, Hao-Wei Chen, Wei Wei, Jian-Jun Tao, Xiao-Hui Bian, Ming Shen, Biao Ma, Wan-Ke Zhang, Ying-Dong Bi, Wei Li, Yong-Cai Lai, Sin-Man Lam, Guang-Hou Shui, Shou-Yi Chen, and Jin-Song Zhang

Domestication-selective GmZF351 encoding tandem CCCH zinc finger protein promotes seed oil accumulation in soybean.

Changes in Anthocyanin Production during Domestication of Citrus. Eugenio Butelli, Andrés García-Lor, Concetta Licciardello, Giuseppina Las Casas, Lionel Hill, Giuseppe Reforgiato Recupero, Manjunath L. Keremane, Chandrika Ramadugu, Robert Krueger, Qiang Xie, Xiuxin Deng, Anne-Laure Fanciullino, Yann Froelicher, Luis Navarro, and Cathie Martin

Ruby, a regulatory gene encoding a MYB transcription factor, is essential for anthocyanin production, and differences in its activity determine most of the natural variation in pigmentation in Citrus and related genera.

Histone Lysine-to-Methionine Mutations Reduce Histone Methylation and Cause Developmental Pleiotropy. Dean Sanders, Shuiming Qian, Rachael Fieweger, Li Lu, James A. Dowell, John M. Denu, and Xuehua Zhong

Transgenic plants expressing H3K36M mutations have a dominant-negative effect on the endogenous histone methylation landscape, leading to pleiotropic developmental defects.

EARLY FLOWERING3 Redundancy Fine-Tunes Photoperiod Sensitivity. Andrew J.S. Rubench, Valérie Hecht, Jacqueline K. Vander Schoor, Lim Chee Liew, Gregoire Aubert, Judith Burstin, and James L. Weller

A legume-specific duplication of the circadian clock gene ELF3 provides functional redundancy in pea and may help explain the importance of ELF3 genes in flowering time adaptation.

Phosphorylation of SPOROCYTELESS/NOZZLE by the MPK3/6 Kinase Is Required for Anther Development. Feng Zhao, Ya-Feng Zheng, Ting Zeng, Rui Sun, Ji-Yuan Yang, Yuan Li, Dong-Tao Ren, Hong Ma, Zhi-Hong Xu, and Shu-Nong Bai

MPK3/6 is responsible for phosphorylation of SPOROCYTELESS/NOZZLE protein, which is required for its function in Arabidopsis anther development.

An Organelle RNA Recognition Motif Protein Is Required for Photosystem II Subunit psbF Transcript Editing. Justin B. Hackett, Xiaowen Shi, Amy T. Kobylarz, Meriah K. Lucas, Ryan L. Wessendorf, Kevin M. Hines, Stephane Bentolila, Maureen R. Hanson, and Yan Lu

An organelle RNA recognition motif protein is required for psbF transcript editing and the production of efficient PSII in Arabidopsis.

The Arabidopsis Mitochondrial Protease FtSH4 Is Involved in Leaf Senescence via Regulation of WRKY-Dependent Salicylic Acid Accumulation and Signaling. Shengchun Zhang, Cui Li, Rui Wang, Yaxue Chen, Si Shu, Ruihua Huang, Daowei Zhang, Jian Li, Shi Xiao, Nan Yao, and Chengwei Yang

The mitochondria-localized protein FtSH4 regulates leaf senescence and modulates the cross talk of ROS, SA, and WRKY signaling pathways.
The REVEILLE Clock Genes Inhibit Growth of Juvenile and Adult Plants by Control of Cell Size. Jennifer A. Gray, Akiva Shalit-Kaneh, Dalena Nhu Chu, Polly Yingshan Hsu, and Stacey L. Harmer

Myb-like transcription factors important for circadian clock function also inhibit cell expansion, affecting the size of both juvenile and adult plants.

SIGNALING AND RESPONSE

The Pepper RING-Type E3 Ligase CaAIRF1 Regulates ABA and Drought Signaling via CaADIP1 Protein Phosphatase Degradation. Chae Woo Lim, Woonhee Baek, and Sung Chul Lee

RING-type E3 ligase controls clade A protein phosphatase 2C, a core ABA component indirectly or directly at the transcriptional and posttranslational levels in ABA and drought signaling.


Arabidopsis roots activate cytokinin signaling in response to shoot removal independently of reduced auxin signaling and induce chloroplast development and photosynthetic remodeling.

A Novel Chemical Inhibitor of ABA Signaling Targets All ABA Receptors. Yajin Ye, Lijuan Zhou, Xue Liu, Hao Liu, Deqiang Li, Minjie Cao, Haifeng Chen, Lin Xu, Jian-kang Zhu, and Yang Zhao

Small molecule AA1 as a novel antagonist of ABA targets all ABA receptors of Arabidopsis.

STABILIZED1 Modulates Pre-mRNA Splicing for Thermotolerance. Geun-Don Kim, Young-Hee Cho, Byeong-Ha Lee, and Sang-Dong Yoo

Heat-inducible STA1 activity is involved in the pre-mRNA splicing of heat stress response genes and contributes to the establishment of heat stress tolerance in Arabidopsis.


Cellulobiose, a danger signal derived from breakdown of the major cell wall polymer cellulose, enhances plant defenses triggered by microbe-derived elicitors.

Antiviral Resistance Protein Tm-2^2 Functions on the Plasma Membrane. Tianyuan Chen, Dan Liu, Xiaolin Niu, Junzhu Wang, Lichao Qian, Lu Han, Na Liu, Jinping Zhao, Yiguo Hong, and Yule Liu

Tomato antiviral resistance protein Tm-2^2 functions on the plasma membrane independent of the plasmodesmata localization of its avirulence protein.

ADDENDUM

CORRECTIONS


RETRACTION

G-Box Binding Factor1 Reduces CATALASE2 Expression and Regulates the Onset of Leaf Senescence in Arabidopsis. Smykowski A., Zimmermann P., and Zentgraf U.

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