

On the Cover: Climate-change-driven stresses, such as salinity, drought, and heat, jeopardize global food security. The extensive research on plant responses to single abiotic stresses has underlain major physiological and molecular mechanisms. However, under field conditions, these stresses usually occur simultaneously and the ability to predict plant responses to a combination of stresses based on single stresses is very limited. In this issue, Shaar-Moshe et al. (pp. 421–434) investigated the transcriptional patterns and morphophysiological acclimations of the cereal model plant, *Brachypodium distachyon*, to single salinity, drought, and heat stresses, as well as their double and triple stress combinations. Comprehensive morphophysiological analyses demonstrated a gradual decrease in plant performances as more stresses were combined, as well as dominance of a specific stress treatment that shaped plant acclimations. The cover image shows the severe reduction in plant growth under combined stresses. A comparison between common stress- and combination unique genes revealed specific transcriptional signatures and functional processes, within each gene subset. Photo was taken by Lidor Shaar-Moshe.

ON THE INSIDE

Peter V. Minorsky

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COMMENTARY

How to Grow a Cell: Fine-Tuning Secretory Activity to Balance Growth and Cell Wall Integrity.

Andreas Nebenführ

An unusual exocyst subunit appears to function as a novel rheostat controlling cell growth rates.

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TOPICAL REVIEW

[OPEN] Plant Chemical Genetics: From Phenotype-Based Screens to Synthetic Biology. Wim Dejonghe and Eugenia Russinova

An overview of progress in chemical genetics in plants, with a focus on the discoveries of small molecules in screens designed for the discovery of biological processes.

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SCIENTIFIC CORRESPONDENCE

[OPEN] Seedlings Lacking the PTM Protein Do Not Show a *genomes uncoupled (gun)* Mutant Phenotype. Mike T. Page, Sylwia M. Kacprzak, Nobuyoshi Mochizuki, Haruko Okamoto, Alison G. Smith, and Matthew J. Terry

The ptm mutant of Arabidopsis does not show a genomes uncoupled mutant phenotype and PTM is therefore unlikely to function in chloroplast-to-nucleus signaling as previously reported.

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RESEARCH REPORT

[OPEN] Phylogeny-Based Systematization of Arabidopsis Proteins with Histone H1 Globular Domain. Maciej Kotliński, Lukasz Knizewski, Anna Muszewska, Kinga Rutowicz, Maciej Lirski, Anja Schmidt, Célia Baroux, Krzysztof Ginalski, and Andrzej Jerzmanowski

We propose a unified nomenclature of an important group of plant chromatin proteins, based on evolutionary relationships of their common nucleosome recognition element, a linker histone-type globular domain (GH1).

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RESEARCH ARTICLES

BIOCHEMISTRY AND METABOLISM

Temperature-Induced Remodeling of the Photosynthetic Machinery Tunes Photosynthesis in the Thermophilic Alga *Cyanidioschyzon merolae*. *Denitsa Nikolova, Dieter Weber, Martin Scholz, Till Bald, Jörn Peter Scharsack, and Michael Hippler*

C. merolae acclimates to suboptimal growth temperature by tuning its photosynthetic capacity and by adjusting its machinery for protein folding, degradation, and homeostasis. 35

[OPEN] Identification of a Second Site of Pyrrolizidine Alkaloid Biosynthesis in Comfrey to Boost Plant Defense in Floral Stage. *Lars H. Kruse, Thomas Stegemann, Christian Sievert, and Dietrich Ober*

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Localization and in-Vivo Characterization of *Thapsia garganica* CYP76AE2 Indicates a Role in Thapsigargin Biosynthesis. *Trine Bundgaard Andersen, Karen Agatha Martinez-Swatson, Silas Anselm Rasmussen, Berin Alain Boughton, Kirsten Jørgensen, Johan Andersen-Ranberg, Nils Nyberg, Søren Brøgger Christensen, and Henrik Toft Simonsen*

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[OPEN] A Specialized Diacylglycerol Acyltransferase Contributes to the Extreme Medium-Chain Fatty Acid Content of *Cuphea* Seed Oil. *Umidjon Iskandarov, Jillian E. Silva, Hae Jin Kim, Mariette Andersson, Rebecca E. Cahoon, Keithanne Mockaitis, and Edgar B. Cahoon*

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[OPEN] Phospholipase D ζ Enhances Diacylglycerol Flux into Triacylglycerol. *Wenyu Yang, Geilang Wang, Jia Li, Philip D. Bates, Xuemin Wang, and Doug K. Allen*

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[OPEN] **Biochemical Principles and Functional Aspects of Pipecolic Acid Biosynthesis in Plant Immunity.**
Michael Hartmann, Denis Kim, Friederike Bernsdorff, Ziba Ajami-Rashidi, Nicola Scholten, Stefan Schreiber, Tatyana Zeier, Stefan Schuck, Vanessa Reichel-Deland, and Jürgen Zeier

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Mutation in the mitochondrial HEMN1 gene of Arabidopsis impairs tetrapyrrole biosynthesis in flower buds, which generates ROS and prevents polar cell fusion in the embryo sac and also affects pollen development. 258

^[OPEN]Awake1, an ABC-Type Transporter, Reveals an Essential Role for Suberin in the Control of Seed Dormancy. *Fabio Fedi, Carmel M. O'Neill, Guillaume Menard, Martin Trick, Simone Dechirico, Françoise Corbineau, Christophe Bailly, Peter J. Eastmond, and Steven Penfield*

A mutant screen reveals a role for seed coat suberin in temperature-responsive seed dormancy through the exclusion of molecular oxygen from the seed. 276

^[OPEN]Hierarchically Aligning 10 Legume Genomes Establishes a Family-Level Genomics Platform.
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^[CC-BY]MtLAX2, a Functional Homologue of the Arabidopsis Auxin Influx Transporter AUX1, Is Required for Nodule Organogenesis. *Sonali Roy, Fran Robson, Jodi Lilley, Cheng-Wu Liu, Xiaofei Cheng, Jiangqi Wen, Simon Walker, Jongho Sun, Donna Cousins, Caitlin Bone, Malcolm J. Bennett, J. Allan Downie, Ranjan Swarup, Giles Oldroyd, and Jeremy D. Murray*

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SIGNALING AND RESPONSE

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[OPEN] RXLR Effector AVR2 Up-Regulates a Brassinosteroid-Responsive bHLH Transcription Factor to Suppress Immunity. Dionne Turnbull, Lina Yang, Shaista Naqvi, Susan Breen, Lydia Welsh, Jennifer Stephens, Jenny Morris, Petra C. Boevink, Pete E. Hedley, Jiasui Zhan, Paul R. J. Birch, and Eleanor M. Gilroy

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O-Acyl Sugars Protect a Wild Tobacco from Both Native Fungal Pathogens and a Specialist Herbivore. Van Thi Luu, Alexander Weinhold, Chhana Ullah, Stefanie Dressel, Matthias Schoettner, Klaus Gase, Emmanuel Gaquerel, Shuqing Xu, and Ian T. Baldwin

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[OPEN] Light Controls Cytokinin Signaling via Transcriptional Regulation of Constitutively Active Sensor Histidine Kinase CKI1. Tereza Dobisova, Vendula Hrdinova, Candela Cuesta, Sarka Michlickova, Ioana Urbankova, Romana Hejatkova, Petra Zadnikova, Marketa Pernisova, Eva Benkova, and Jan Hejatk

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[OPEN] Cyst Nematode Parasitism Induces Dynamic Changes in the Root Epigenome. Tarek Hewezi, Thomas Lane, Sarbottam Piya, Aditi Rambani, J Hollis Rice, and Meg Staton

Plant-parasitic cyst nematodes induce extensive changes in DNA methylation patterns that impact the expression of Arabidopsis genes required for nematode parasitism.

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SYSTEMS AND SYNTHETIC BIOLOGY

[OPEN] Unique Physiological and Transcriptional Shifts under Combinations of Salinity, Drought, and Heat. Lidor Shaar-Moshe, Eduardo Blumwald, and Zvi Peleg

Naturally co-occurring abiotic stresses that mimic field conditions revealed different transcriptional signatures and functional pathways among common stress- and stress combination unique-genes.

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pTAC10, a Key Subunit of Plastid-Encoded RNA Polymerase, Promotes Chloroplast Development. Sun Hyun Chang, Sangyool Lee, Tae Young Um, Ju-Kon Kim, Yang Do Choi, and Geupil Jang

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