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On the Cover: Cell walls constitute complex composites of macromolecules that are of profound importance to the life of plant cells. Synthesized and secreted by highly dynamic biosynthetic machinery, the polymeric constituents must be accurately deposited into the microarchitecture of the wall in order for it to function competently. Presently, these structural and developmental properties, especially as they contribute to interactive polymeric networks in the wall, are poorly resolved. In this issue, Domozych et al. (pp. 105–118) employ the unicellular charophyte green alga, *Penium margaritaceum*, to investigate pectin architecture and dynamics in the cell wall. The outer layer of the wall is comprised of homogalacturonan fibrils that form dense aggregates that organize into a distinct outer lattice. Changes to lattice architecture may be directly monitored in live cells grown under different experimental conditions. This includes variations in levels of cations (e.g. calcium), exogenous pectin, pectin methylesterase, and pectate lyase. Pectin deposition is focused at a thin band at the cell isthmus and is part of a wall expansion mechanism that occurs in a distinct bidirectional fashion. These results highlight the efficiency of *P. margaritaceum* as a unicellular model organism for cell wall studies and provide new insight into pectin-based functions, including adhesion and cell shape maintenance. The cover shows the outer pectin lattice of the cell wall labeled with the anti-homogalacturonan monoclonal antibody, LM18. Cover image credits: David Domozych.

ON THE INSIDE

Peter V. Minorsky

1

BREAKTHROUGH TECHNOLOGIES

[W][OPEN] High-Efficiency Stable Transformation of the Model Fern Species *Ceratopteris richardii* via Microparticle Bombardment. Andrew R.G. Plackett, Liandong Huang, Heather L. Sanders, and Jane A. Langdale

A highly efficient method transforms fern callus tissue, with rapid and simple selection for stable transgenic lines through antibiotic selection.

3

[W][OPEN] New Generation of Artificial MicroRNA and Synthetic Trans-Acting Small Interfering RNA Vectors for Efficient Gene Silencing in Arabidopsis. Alberto Carbonell, Atsushi Takeda, Noah Fahlgren, Simon C. Johnson, Josh T. Cuperus, and James C. Carrington

Artificial microRNAs and synthetic trans-acting small interfering RNAs produced from new, high-efficiency expression vectors induce reliable gene silencing in Arabidopsis.

15

RESEARCH REPORTS

[W][OPEN] Multigene Engineering of Triacylglycerol Metabolism Boosts Seed Oil Content in Arabidopsis. Harrie van Erp, Amélie A. Kelly, Guillaume Menard, and Peter J. Eastmond

Transgenes specifically targeting fatty acid synthesis, triacylglycerol synthesis, and triacylglycerol breakdown lead to an additive effect on seed oil content in Arabidopsis.

30

RESEARCH ARTICLES

BIOCHEMISTRY AND METABOLISM

[W] Metabolic Flux Analysis of Plastidic Isoprenoid Biosynthesis in Poplar Leaves Emitting and Nonemitting Isoprene. Andrea Ghirardo, Louwance Peter Wright, Zhen Bi, Maaria Rosenkranz, Pablo Pulido, Manuel Rodríguez-Concepción, Ülo Niinemets, Nicolas Brüggemann, Jonathan Gershenzon, and Jörg-Peter Schnitzler

Isoprene biosynthesis demands a huge carbon flux through the plastidic isoprenoid pathway, and the concentration of its immediate precursor modulates this flux.

37

Continued on next page

[W][OPEN]Plants Utilize a Highly Conserved System for Repair of NADH and NADPH Hydrates. Tom D. Niehaus, Lynn G.L. Richardson, Satinder K. Gidda, Mona ElBadawi-Sidhu, John K. Meissen, Robert T. Mullen, Oliver Fiehn, and Andrew D. Hanson

The hydrates formed from NADH and NADPH by chemical or enzymatic damage are repaired in plants by highly conserved enzymes that are targeted to multiple compartments. 52

[W][OPEN]Evolutionary Convergence of Cell-Specific Gene Expression in Independent Lineages of C₄ Grasses. Christopher R. John, Richard D. Smith-Unna, Helen Woodfield, Sarah Covshoff, and Julian M. Hibberd

Maize and Setaria viridis have independently recruited syntenic orthologs into the C₄ pathway, and transcript abundance in the mesophyll and bundle sheath cells of these species is highly convergent. 62

[C][W][OPEN]Pepper Suppressor of the G2 Allele of *skp1* Interacts with the Receptor-Like Cytoplasmic Kinase1 and Type III Effector AvrBsT and Promotes the Hypersensitive Cell Death Response in a Phosphorylation-Dependent Manner. Nak Hyun Kim, Dae Sung Kim, Eui Hwan Chung, and Byung Kook Hwang

A pepper receptor-like cytoplasmic kinase and Xanthomonas effector complex promote cell death in a phosphorylation-dependent manner. 76

[C][W]The Mitochondrial Sulfur Dioxygenase ETHYLMALONIC ENCEPHALOPATHY PROTEIN1 Is Required for Amino Acid Catabolism during Carbohydrate Starvation and Embryo Development in Arabidopsis. Lena Kriüßel, Johannes Junemann, Markus Wirtz, Hannah Birke, Jeremy D. Thornton, Luke W. Browning, Gernot Poschet, Rüdiger Hell, Janneke Balk, Hans-Peter Braun, and Tatjana M. Hildebrandt

A mitochondrial pathway oxidizes hydrogen sulfide or persulfides derived from amino acid catabolism to thiosulfate and affects alternative respiration during carbohydrate starvation. 92

[C][W]Hypoosmotic Expression of *Dunaliella bardawil* ζ -Carotene Desaturase Is Attributed to a Hypoosmolarity-Responsive Element Different from Other Key Carotenogenic Genes. Yong-Min Lao, Lan Xiao, Li-Xin Luo, and Jian-Guo Jiang

*Expression of *Dunaliella bardawil* ζ -carotene desaturase is attributed to a hypoosmolarity-responsive element different from other key carotenogenic genes.* 359

[C][W]Functional Analysis of 3-Hydroxy-3-Methylglutaryl Coenzyme A Reductase Encoding Genes in Triterpene Saponin-Producing Ginseng. Yu-Jin Kim, Ok Ran Lee, Ji Yeon Oh, Moon-Gi Jang, and Deok-Chun Yang

Coenzyme A reductases contribute to the production of triterpene saponin in ginseng. 373

[W]Unraveling Vitamin B₁₂-Responsive Gene Regulation in Algae. Katherine E. Helliwell, Mark A. Scaife, Severin Sasso, Ana Paula Ulian Araujo, Saul Purton, and Alison G. Smith

Characteristics of vitamin B₁₂-mediated gene regulation in algae provide insight into the evolution of vitamin B₁₂ auxotrophy. 388

[W][OPEN]Comparing the in Vivo Function of α -Carboxysomes and β -Carboxysomes in Two Model Cyanobacteria. Lynne Whitehead, Benedict M. Long, G. Dean Price, and Murray R. Badger

Despite evolutionary and structural differences between carboxysomes, Rubisco kinetics and in vivo performance are similar. 398

CELL BIOLOGY

[W][OPEN] Pectin Metabolism and Assembly in the Cell Wall of the Charophyte Green Alga *Penium margaritaceum*. David S. Domozych, Iben Sørensen, Zoë A. Popper, Julie Ochs, Amanda Andreas, Jonatan U. Fangel, Anna Pielach, Carly Sacks, Hannah Brechka, Pia Ruisi-Besares, William G.T. Willats, and Jocelyn K.C. Rose

The charophyte green alga Penium margaritaceum possesses an experimentally tractable pectin domain in its cell wall that offers insight into wall assembly and polar growth in plants. 105

[C][W][OPEN] Plastid Osmotic Stress Activates Cellular Stress Responses in Arabidopsis. Margaret E. Wilson, Meera R. Basu, Govinal Badiger Bhaskara, Paul E. Verslues, and Elizabeth S. Haswell

Organelles as intracellular osmosensors: Arabidopsis mutants unable to relieve plastid osmotic stress constitutively activate the same cellular responses as environmental osmotic stress. 119

[W] Dynamics and Organization of Cortical Microtubules as Revealed by Superresolution Structured Illumination Microscopy. George Komis, Martin Mistrik, Olga Šamařová, Anna Doskočilová, Miroslav Ovečka, Peter Illés, Jiri Bártek, and Jozef Šamaj

The dynamic organization of cortical microtubules in plant cells is uncovered using structured illumination superresolution microscopy. 129

GENES, DEVELOPMENT, AND EVOLUTION

[W] A Comprehensive Analysis of MicroProteins Reveals Their Potentially Widespread Mechanism of Transcriptional Regulation. Enrico Magnani, Niek de Klein, Hye-In Nam, Jung-Gun Kim, Kimberly Pham, Elisa Fiume, Mary Beth Mudgett, and Seung Yon Rhee

Transcription factor-like proteins without a DNA binding domain, are involved in a potentially ubiquitous layer of transcriptional regulation. 149

[W][OPEN] OsmiR396d-Regulated OsGRFs Function in Floral Organogenesis in Rice through Binding to Their Targets OsJM1706 and OsCR4. Huanhuan Liu, Siyi Guo, Yunyuan Xu, Chunhua Li, Zeyong Zhang, Dajian Zhang, Shujuan Xu, Cui Zhang, and Kang Chong

MicroRNA-regulated growth-regulating factors activate expression of specific targets to regulate floral organ development, affecting characteristics such as husk openness and sterile lemma length. 160

[OPEN] New Arabidopsis Advanced Intercross Recombinant Inbred Lines Reveal Female Control of Nonrandom Mating. Jonathan Nesbit Fitz Gerald, Ann Louise Carlson, Evadne Smith, Julin N. Maloof, Detlef Weigel, Joanne Chory, Justin O. Borevitz, and Robert John Swanson

A genetic mapping population is developed and reveals female control of mating choice in plants. 175

[W] Non-Cell-Autonomous Regulation of Root Hair Patterning Genes by WRKY75 in Arabidopsis. Louai Rishmawi, Martina Pesch, Christian Juengst, Astrid C. Schauss, Andrea Schrader, and Martin Hülskamp

The WRKY75 transcription factor is expressed in the pericycle and vascular tissues of the root and regulates root hair patterning in a non-cell-autonomous manner. 186

[OPEN] Truncation of LEAFY COTYLEDON1 Protein Is Required for Asexual Reproduction in *Kalanchoë daigremontiana*. Helena M.P. Garcês, Daniel Koenig, Brad T. Townsley, Minsung Kim, and Neelima R. Sinha

A mutated master regulator of zygotic embryogenesis is essential for creating somatic embryos and enhancing asexual propagation in Kalanchoë. 196

^[W]Evolution of Gene Structural Complexity: An Alternative-Splicing-Based Model Accounts for Intron-Containing Retrogenes. *Chengjun Zhang, Andrea R. Gschwend, Yidan Ouyang, and Manyuan Long*

An alternative-splicing-based model explains the formation of retrogenes that retained the parental intron structure and indicates that plants have a much higher percentage of this kind of complex retrogene than animals.

412

^[W]Hybridization Alters Spontaneous Mutation Rates in a Parent-of-Origin-Dependent Fashion in Arabidopsis. *Tufail Bashir, Christian Sailer, Florian Gerber, Nitin Loganathan, Hemadev Bhoopalan, Christof Eichenberger, Ueli Grossniklaus, and Ramamurthy Baskar*

Hybridization alters mutation rates in Arabidopsis.

424

MEMBRANES, TRANSPORT, AND BIOENERGETICS

^[W]The Arabidopsis Protein CONSERVED ONLY IN THE GREEN LINEAGE160 Promotes the Assembly of the Membranous Part of the Chloroplast ATP Synthase. *Thilo Rühle, Jafar Angouri Razeghi, Evgenia Vamvaka, Stefania Viola, Chiara Gandini, Tatjana Kleine, Danja Schünemann, Roberto Barbato, Peter Jahns, and Dario Leister*

A thylakoid membrane protein promotes the assembly of the protein complex that generates ATP in chloroplasts.

207

^{[C][W]}Proton Gradient Regulation5-Mediated Cyclic Electron Flow under ATP- or Redox-Limited Conditions: A Study of Δ ATPase *pgr5* and Δ rbcL *pgr5* Mutants in the Green Alga *Chlamydomonas reinhardtii*. *Xenie Johnson, Janina Steinbeck, Rachel M. Dent, Hiroko Takahashi, Pierre Richaud, Shin-Ichiro Ozawa, Laura Houille-Vernes, Dimitris Petroustos, Fabrice Rappaport, Arthur R. Grossman, Krishna K. Niyogi, Michael Hippler, and Jean Alric*

The Chlamydomonas reinhardtii pgr5 mutant shows photosynthetic and phenotypic traits that support the conservation of PGR5 in both redox-controlled cyclic electron flow and PSI photoprotection.

438

^{[W][OPEN]}The Response of Cyclic Electron Flow around Photosystem I to Changes in Photorespiration and Nitrate Assimilation. *Berkley J. Walker, Deserah D. Strand, David M. Kramer, and Asaph B. Cousins*

Cyclic electron flow (CEF) contributes to balancing the photosynthetic ATP/NADPH energy budget under high but not low light according to modeled ATP and NADPH demand and does not respond to changes in nitrate availability.

453

^{[C][W]}The Redox Potential of the Plastoquinone Pool of the Cyanobacterium *Synechocystis* Species Strain PCC 6803 Is under Strict Homeostatic Control. *R. Milou Schuurmans, J. Merijn Schuurmans, Martijn Bekker, Jacco C. Kromkamp, Hans C.P. Matthijs, and Klaas J. Hellingwerf*

The redox state of the plastoquinone pool of Synechocystis sp. strain PCC 6803 is regulated between narrow limits, in contrast to the more dynamic chlorophyll a fluorescence signal.

463

SIGNALING AND RESPONSE

^{[W][OPEN]}A Subfamily of Putative Cytokinin Receptors Is Revealed by an Analysis of the Evolution of the Two-Component Signaling System of Plants. *Nijuscha Gruhn, Mhyeddeen Halawa, Berend Snel, Michael F. Seidl, Alexander Heyl*

Phylogenetic analysis of members of the two-component signaling system identifies a previously unknown subfamily of putative cytokinin receptors.

227

- [W]Rice Fertilization-Independent Endosperm1 Regulates Seed Size under Heat Stress by Controlling Early Endosperm Development. *Jing J. Folsom, Kevin Begcy, Xiaojuan Hao, Dong Wang, and Harkamal Walia*
Early seed development in rice is highly sensitive to heat stress and negatively affects seed enlargement because of epigenetic misregulation of endosperm development. 238
- [C][W]Singlet Oxygen Signatures Are Detected Independent of Light or Chloroplasts in Response to Multiple Stresses. *Avishai Mor, Eugene Koh, Lev Weiner, Shilo Rosenwasser, Hadas Sibony-Benyamini, and Robert Fluhr*
Diverse stresses can produce singlet oxygen in a light-independent manner and generate a singlet oxygen transcriptome footprint. 249
- [W][OPEN]The Arabidopsis LYSIN MOTIF-CONTAINING RECEPTOR-LIKE KINASE3 Regulates the Cross Talk between Immunity and Abscisic Acid Responses. *Chiara Paparella, Daniel Valentin Savatin, Lucia Marti, Giulia De Lorenzo, and Simone Ferrari*
An Arabidopsis receptor-like kinase negatively regulates defense gene expression and resistance against microbial pathogens and is required for late responses to abscisic acid. 262
- [C][W]Abscisic Acid Uridine Diphosphate Glucosyltransferases Play a Crucial Role in Abscisic Acid Homeostasis in Arabidopsis. *Ting Dong, Zheng-Yi Xu, Youngmin Park, Dae Heon Kim, Yongjik Lee, and Inhwan Hwang*
A glucosyltransferase and its two homologs play a critical role in ABA homeostasis by converting active ABA to an inactive ABA conjugate depending on intrinsic cellular and environmental conditions in plants. 277
- [W][OPEN]Accumulation of N-Acetylglucosamine Oligomers in the Plant Cell Wall Affects Plant Architecture in a Dose-Dependent and Conditional Manner. *Bartel Vanholme, Ruben Vanholme, Halbay Turumtay, Geert Goeminne, Igor Cesarino, Florence Goubet, Kris Morreel, Jorge Rencoret, Vincent Bulone, Cortwa Hooijmaijers, Riet De Rycke, Godelieve Gheysen, John Ralph, Marc De Block, Frank Meulewaeter, and Wout Boerjan*
In planta accumulation of short chitin oligomers results in a strong conditional phenotype. 290
- [C][W][OPEN]Monoubiquitination of Histone 2B at the Disease Resistance Gene Locus Regulates Its Expression and Impacts Immune Responses in Arabidopsis. *Baohong Zou, Dong-Lei Yang, Zhenying Shi, Hansong Dong, and Jian Hua*
Histone modification at the plant immune receptor gene modulates immune responses in Arabidopsis. 309
- [C][W][OPEN]The Heat Shock Factor A4A Confers Salt Tolerance and Is Regulated by Oxidative Stress and the Mitogen-Activated Protein Kinases MPK3 and MPK6. *Imma Pérez-Salamó, Csaba Papdi, Gábor Rigó, Laura Zsigmond, Belmiro Vilela, Victoria Lumbreras, István Nagy, Balázs Horváth, Mónika Domoki, Zsuzsa Darula, Katalin Medzilhradszky, László Bögre, Csaba Koncz, and László Szabados*
An Arabidopsis Heat Shock Factor affects tolerance to salt as well as other abiotic stresses, forms homodimers dependent on the redox regulation, interacts with MAP kinases, and alters the expression of a large set of stress-induced genes. 319
- [C][W]Two Rice Authentic Histidine Phosphotransfer Proteins, OsAHP1 and OsAHP2, Mediate Cytokinin Signaling and Stress Responses in Rice. *Lijing Sun, Qian Zhang, Jinxia Wu, Liqing Zhang, Xuewen Jiao, Shengwei Zhang, Zhiguo Zhang, Daye Sun, Tiegang Lu, and Ying Sun*
Rice His phosphotransfer proteins function as positive regulators of the cytokinin signaling pathway and play different roles in salt and drought tolerance in rice. 335

Continued from preceding page

[W][OPEN] Secreted Fungal Effector Lipase Releases Free Fatty Acids to Inhibit Innate Immunity-Related Callose Formation during Wheat Head Infection. *Antje Blümke, Christian Falter, Cornelia Herrfurth, Björn Sode, Rainer Bode, Wilhelm Schäfer, Ivo Feussner, and Christian A. Voigt*

A lipase secreted by a pathogenic fungus during wheat head infection acts as an effector to inhibit the plant's innate immunity-related callose biosynthesis for successful colonization.

346

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