

ON THE INSIDE

Peter V. Minorsky

535

BREAKTHROUGH TECHNOLOGIES

^{[C][W][I][O][A]}Dynamic Transcriptomic Profiles between Tomato and a Wild Relative Reflect Distinct Developmental Architectures. Daniel H. Chitwood, Julin N. Maloof, and Neelima R. Sinha

An exploratory data-analysis method describes changes in gene expression profiles across multiple tissues between species.

537

^{[C][W][I][O][A]}Identifying Genotype-by-Environment Interactions in the Metabolism of Germinating Arabidopsis Seeds Using Generalized Genetical Genomics. Ronny Viktor Louis Joosen, Danny Arends, Yang Li, Leo A.J. Willems, Joost J.B. Keurentjes, Wilco Ligterink, Ritsert C. Jansen, and Henk W.M. Hilhorst

A novel genetical genomics analysis of metabolites in four developmental stages of Arabidopsis germination unravels both genetic and genetic × environment loci controlling these metabolites.

553

RESEARCH ARTICLES

BIOCHEMISTRY AND METABOLISM

^[W]Arabidopsis 3-Ketoacyl-Coenzyme A Synthase9 Is Involved in the Synthesis of Tetracosanoic Acids as Precursors of Cuticular Waxes, Suberins, Sphingolipids, and Phospholipids. Juyoung Kim, Jin Hee Jung, Saet Buyl Lee, Young Sam Go, Hae Jin Kim, Rebecca Cahoon, Jonathan E. Markham, Edgar B. Cahoon, and Mi Chung Suh

KCS9 is involved in the elongation of C22 to C24 fatty acids, which are essential precursors for the biosynthesis of cuticular waxes, aliphatic suberins, and membrane lipids, including sphingolipids and phospholipids.

567

^{[W][O][A]}Identification of Mitochondrial Coenzyme A Transporters from Maize and Arabidopsis. Rémi Zallot, Gennaro Agrimi, Claudia Lerma-Ortiz, Howard J. Teresinski, Océane Frelin, Kenneth W. Ellens, Alessandra Castegna, Annamaria Russo, Valérie de Crécy-Lagard, Robert T. Mullen, Ferdinando Palmieri, and Andrew D. Hanson

Coenzyme A made in the cytosol is imported into plant mitochondria by twin transporters from the mitochondrial carrier family that are cognates of coenzyme A transporters of animals and yeast and can functionally replace the yeast transporter.

581

^{[W][O][A]}Functional Redundancy and Divergence within the Arabidopsis RETICULATA-RELATED Gene Family. José Manuel Pérez-Pérez, David Esteve-Bruna, Rebeca González-Bayón, Saijaliisa Kangasjärvi, Camila Caldana, Matthew A. Hannah, Lothar Willmitzer, María Rosa Ponce, and José Luis Micol

Proteins of the RETICULATA-RELATED family functionally link photoperiodic growth, amino acid homeostasis, and reactive oxygen species metabolism during Arabidopsis leaf growth.

589

^[W]Genetic Analysis of the Biosynthesis of 2-Methoxy-3-Isobutylpyrazine, a Major Grape-Derived Aroma Compound Impacting Wine Quality. Sabine Guillaumie, Andrea Ilg, Stéphane Réty, Maxime Brette, Claudine Trossat-Magnin, Stéphane Decroocq, Céline Léon, Céline Keime, Tao Ye, Raymonde Baltenweck-Guyot, Patricia Claudel, Louis Bordenave, Sandra Vanbrabant, Eric Duchêne, Serge Delrot, Philippe Darriet, Philippe Huguency, and Eric Gomès

Genetic and candidate gene approaches are combined to identify an O-methyltransferase with a major role in methoxy-pyrazine biosynthesis in grapevine.

604

Continued on next page

^[W]Sporopollenin Biosynthetic Enzymes Interact and Constitute a Metabolon Localized to the Endoplasmic Reticulum of Tapetum Cells. Benjamin Lallemand, Mathieu Erhardt, Thierry Heitz, and Michel Legrand

Enzymes involved in the biosynthesis of sporopollenin, the main constituent of pollen exine, likely form a metabolon in the endoplasmic reticulum of the anther tapetal cells.

616

^{[W][OA]}In Vivo Packaging of Triacylglycerols Enhances Arabidopsis Leaf Biomass and Energy Density. Somrutai Winichayakul, Richard William Scott, Marissa Roldan, Jean-Hugues Bertrand Hatier, Sam Livingston, Ruth Cookson, Amy Christina Curran, and Nicholas John Roberts

The coexpression of a uniquely stabilized plant structural protein (Cys-oleosin) and diacylglycerol O-acyltransferase in Arabidopsis led to a 24% increase in the CO₂ assimilation rate and a 50% increase in leaf biomass as well as oil accumulation in the leaves and roots.

626

^{[C][W]}Elucidation of the Structure and Reaction Mechanism of Sorghum Hydroxycinnamoyltransferase and Its Structural Relationship to Other Coenzyme A-Dependent Transferases and Synthases. Alexander M. Walker, Robert P. Hayes, Buhyun Youn, Wilfred Vermerris, Scott E. Sattler, and ChulHee Kang

The catalytic mechanism and exact specificity for hydroxycinnamoyltransferase from sorghum were determined by comprehensive approaches with crystal structures of apo-form and ternary product complex, site-directed mutagenesis, and kinetic and thermodynamic analyses.

640

^{[C][W][OA]}A Chloroplast ABC1-like Kinase Regulates Vitamin E Metabolism in Arabidopsis. Jacopo Martinis, Gaétan Glauser, Sergiu Valimareanu, and Felix Kessler

The chloroplast ABC1-like kinase ABC1K3 affects the accumulation of VTE1-dependent metabolites, α -tocopherol quinone and plastochromanol, most likely via phosphorylation of VTE1.

652

^{[C][W][OA]}Responses of *Nannochloropsis oceanica* IMET1 to Long-Term Nitrogen Starvation and Recovery. Hong-Po Dong, Ernest Williams, Da-zhi Wang, Zhang-Xian Xie, Ru-ching Hsia, Alizée Jenck, Rolf Halden, Jing Li, Feng Chen, and Allen R. Place

Nannochloropsis oceanica IMET1 has the ability to recover from long periods of nitrate deprivation without apparent detriment to the culture.

1110

CELL BIOLOGY

^{[C][W][OA]}A Guanine Nucleotide Exchange Factor for Rab5 Proteins Is Essential for Intracellular Transport of the Proglutelin from the Golgi Apparatus to the Protein Storage Vacuole in Rice Endosperm. Masako Fukuda, Liuying Wen, Mio Satoh-Cruz, Yasushi Kawagoe, Yoshiaki Nagamura, Thomas W. Okita, Haruhiko Washida, Aya Sugino, Sonoko Ishino, Yoshizumi Ishino, Masahiro Ogawa, Mariko Sunada, Takashi Ueda, and Toshihiro Kumamaru

GLUP6/GEF is the activator of Rab5 GTPase, and the cycling of GTP- and GDP-bound forms of this regulatory protein is essential for the intracellular transport of proglutelin and α -globulin from the Golgi to PSV and in the maintenance of the general structural organization of the endomembrane system in rice seeds.

663

^[W]Patterning and Lifetime of Plasma Membrane-Localized Cellulose Synthase Is Dependent on Actin Organization in Arabidopsis Interphase Cells. Arun Sampathkumar, Ryan Gutierrez, Heather E. McFarlane, Martin Bringmann, Jelmer Lindeboom, Anne-Mie Emons, Lacey Samuels, Tijs Ketelaar, David W. Ehrhardt, and Staffan Persson

The rate of insertion and lifetime of cellulose-synthesizing complexes at the plasma membrane is dependent on the organization of the actin cytoskeleton.

675

^{[W][OA]}The Endoplasmic Reticulum Is a Reservoir for WAVE/SCAR Regulatory Complex Signaling in the Arabidopsis Leaf. Chunhua Zhang, Eileen Mallery, Sara Reagan, Vitaly P. Boyko, Simeon O. Kotchoni, and Daniel B. Szymanski

In Arabidopsis leaf pavement cells and trichomes, the ER is a reservoir for W/SRC signaling and may have a key role in the early steps of W/SRC activation.

689

Continued on next page

[W]Involvement of the Sieve Element Cytoskeleton in Electrical Responses to Cold Shocks. Jens B. Hafke, Katrin Ehlers, Jens Föller, Sabina-Roxana Höll, Stefanie Becker, and Aart J.E. van Bel

The involvement of the sieve element cytoskeleton in electrical responses to cold shocks is described. 707

[C][W][OA]AUXIN RESPONSE FACTOR17 Is Essential for Pollen Wall Pattern Formation in Arabidopsis. Jun Yang, Lei Tian, Ming-Xi Sun, Xue-Yong Huang, Jun Zhu, Yue-Feng Guan, Qi-Shi Jia, and Zhong-Nan Yang

The isolation and characterization of the arf17 mutant uncovers potential roles for auxin in pollen wall pattern formation and pollen tube growth. 720

ECOPHYSIOLOGY AND SUSTAINABILITY

[W][OA]Characterization of the Complex Regulation of *AtALMT1* Expression in Response to Phytohormones and Other Inducers. Yasufumi Kobayashi, Yuriko Kobayashi, Miki Sugimoto, Venkatachalam Lakshmanan, Satoshi Iuchi, Masatomo Kobayashi, Harsh P. Bais, and Hiroyuki Koyama

Complex transcriptional response of AtALMT1 malate transporter could account for its contribution to pleiotropic traits. 732

GENES, DEVELOPMENT, AND EVOLUTION

[C][W][OA]A Significant Fraction of 21-Nucleotide Small RNA Originates from Phased Degradation of Resistance Genes in Several Perennial Species. Thomas Källman, Jun Chen, Niclas Gyllenstrand, and Ulf Lagercrantz

NBS-LRR genes, which constitute the major class of plant innate immune receptors, are massively degraded through microRNA-guided generation of secondary small interfering RNAs in several perennial species. 741

[W][OA]Identification of Novel Loci Regulating Interspecific Variation in Root Morphology and Cellular Development in Tomato. Mily Ron, Michael W. Dorrity, Miguel de Lucas, Ted Toal, R. Ioan Hernandez, Stefan A. Little, Julin N. Maloof, Daniel J. Kliebenstein, and Siobhan M. Brady

Identification of novel loci that regulate root cellular and morphological development that may be useful for breeding programs. 755

[C][W]Function Relaxation Followed by Diversifying Selection after Whole-Genome Duplication in Flowering Plants. Hui Guo, Tae-Ho Lee, Xiyin Wang, and Andrew H. Paterson

There is a phase of diversifying selection of duplicated genes following function relaxation after whole-genome duplication. 769

[W][OA]Cytochrome P450 CYP78A9 Is Involved in Arabidopsis Reproductive Development. Mariana Sotelo-Silveira, Mara Cucinotta, Anne-Laure Chauvin, Ricardo A. Chávez Montes, Lucia Colombo, Nayelli Marsch-Martínez, and Stefan de Folter

The cyp78a8 cyp78a9 loss-of-function mutant has reduced seed set due to outer integument development arrest leading to female sterility. 779

[C][W][OA]Using Arabidopsis to Study Shoot Branching in Biomass Willow. Sally P. Ward, Jemma Salmon, Steven J. Hanley, Angela Karp, and Ottoline Leyser

Knowledge and assays from Arabidopsis axillary meristem biology can be successfully applied to Salix spp. and can increase the understanding of a fundamental aspect of SRC biomass production, allowing more targeted breeding. 800

[W]EMBRYONIC FLOWER1 and ULTRAPETALA1 Act Antagonistically on Arabidopsis Development and Stress Response. Li Pu, Mao-Sen Liu, Sang Yeol Kim, Long-Fang O. Chen, Jennifer C. Fletcher, and Zinmay Renee Sung

EMF1 and ULT1 counteract each other in the regulation of flowering and stress tolerance. 812

[W]The ATM-Dependent DNA Damage Response Acts as an Upstream Trigger for Compensation in the *fas1* Mutation during Arabidopsis Leaf Development. Tetsuya Hisanaga, Ali Ferjani, Gorou Horiguchi, Naoko Ishikawa, Ushio Fujikura, Minoru Kubo, Taku Demura, Hiroo Fukuda, Takashi Ishida, Keiko Sugimoto, and Hirokazu Tsukaya

The ATM-dependent DNA damage response acts as an upstream trigger for compensation, an enhanced cell expansion caused by defective cell proliferation, during Arabidopsis leaf development. 831

^[W]EBE, an AP2/ERF Transcription Factor Highly Expressed in Proliferating Cells, Affects Shoot Architecture in Arabidopsis. *Mohammad Mehrnia, Salma Balazadeh, María-Inés Zanon, and Bernd Mueller-Roeber*

A transcription factor is expressed in proliferating cells and affects shoot architecture. 842

^{[C][W][IOA]}COLLAPSED ABNORMAL POLLEN1 Gene Encoding the Arabinokinase-Like Protein Is Involved in Pollen Development in Rice. *Kenji Ueda, Fumiaki Yoshimura, Akio Miyao, Hirohiko Hirochika, Ken-Ichi Nonomura, and Hiroetsu Wabiko*

Pollen-expressed arabinokinase-like protein gene CAP1 is important for rice pollen development, and its related genes are conserved in both monocotyledonous and dicotyledonous plants. 858

^{[C][W]}MULTI-FLORET SPIKELET1, Which Encodes an AP2/ERF Protein, Determines Spikelet Meristem Fate and Sterile Lemma Identity in Rice. *Deyong Ren, Yunfeng Li, Fangming Zhao, Xianchun Sang, Junqiong Shi, Nan Wang, Shuang Guo, Yinghua Ling, Changwei Zhang, Zhenglin Yang, and Guanghua He*

MULTI-FLORET SPIKELET1 determines spikelet meristem fate and sterile lemma identity in rice. 872

^{[C][W]}The Methylation of the PcMYB10 Promoter Is Associated with Green-Skinned Sport in Max Red Bartlett Pear. *Zhigang Wang, Dong Meng, Aide Wang, Tianlai Li, Shuling Jiang, Peihua Cong, and Tianzhong Li*

In MRB-G fruits, the expression of PcMYB10 was reduced by the methylation of regions –604 to –911 bp and –1,218 to –1,649 bp in its promoter. As a result, the expression of PcUFGT, a key gene involved in anthocyanin biosynthesis and regulated by PcMYB10, was also reduced. This might cause the inhibition of anthocyanin biosynthesis and the formation of green-skinned sport. 885

^{[W][IOA]}Ubiquitin-Specific Proteases UBP12 and UBP13 Act in Circadian Clock and Photoperiodic Flowering Regulation in Arabidopsis. *Xia Cui, Falong Lu, Yue Li, Yongming Xue, Yanyuan Kang, Shuaibin Zhang, Qi Qiu, Xiekui Cui, Shuzhi Zheng, Bin Liu, Xiaodong Xu, and Xiaofeng Cao*

Deubiquitination plays a role in daylength measurement to regulate flowering time. 897

^{[C][W]}A Change in SHATTERPROOF Protein Lies at the Origin of a Fruit Morphological Novelty and a New Strategy for Seed Dispersal in Medicago Genus. *Chloé Fourquin, Carolina del Cerro, Filipe C. Victoria, Aurélie Vialette-Guiraud, Antonio C. de Oliveira, and Cristina Ferrándiz*

The evolutionary origin of a novel fruit morphology in legumes and the importance of changes in coding regions of master genes to generate diversity. 907

^{[W][IOA]}Genome-Wide Prediction of Nucleosome Occupancy in Maize Reveals Plant Chromatin Structural Features at Genes and Other Elements at Multiple Scales. *Justin A. Fincher, Daniel L. Vera, Diana D. Hughes, Karen M. McGinnis, Jonathan H. Dennis, and Hank W. Bass*

Genome-wide prediction of nucleosome occupancy in maize was performed using a computational approach, and the predictions were validated using biochemical data and reveal novel features of maize promoters. 1127

MEMBRANES, TRANSPORT, AND BIOENERGETICS

^[W]Proton-Dependent Coniferin Transport, a Common Major Transport Event in Differentiating Xylem Tissue of Woody Plants. *Taku Tsuyama, Ryo Kawai, Nobukazu Shitan, Toru Matoh, Junji Sugiyama, Arata Yoshinaga, Keiji Takabe, Minoru Fujita, and Kazufumi Yazaki*

Differentiating xylem tissues of both hybrid poplar and Japanese cypress exhibits almost identical transport properties of coniferin, a monoglucoside, suggesting the involvement of a common endomembrane H⁺/coniferin antiport mechanism in the lignifying tissues of woody plants. 918

^{[W][IOA]}Preferential Delivery of Zinc to Developing Tissues in Rice Is Mediated by P-Type Heavy Metal ATPase OsHMA2. *Naoki Yamaji, Jixing Xia, Namiki Mitani-Ueno, Kengo Yokosho, and Jian Feng Ma*

OsHMA2 is a plasma membrane-localized transporter for zinc and cadmium in rice that mainly expresses at the phloem region of developed vascular tissues in the nodes and mediates exclusive zinc and cadmium delivery to upper nodes and finally to the panicle. 927

Continued on next page

[C][W][OA] Reduced Tonoplast Fast-Activating and Slow-Activating Channel Activity Is Essential for Conferring Salinity Tolerance in a Facultative Halophyte, Quinoa. *Edgar Bonales-Alatorre, Sergey Shabala, Zhong-Hua Chen, and Igor Pottosin*

The negative control of SV and FV tonoplast channel activity in quinoa leaves reduces Na⁺ leak. This improves the efficiency of Na⁺ sequestration in leaf vacuoles, thus enabling optimal photosynthetic performance and conferring salinity tolerance in this halophyte species. 940

[C][W] Functional Characterization and Determination of the Physiological Role of a Calcium-Dependent Potassium Channel from Cyanobacteria. *Vanessa Checchetto, Elide Formentin, Luca Carraretto, Anna Segalla, Giorgio Mario Giacometti, Ildiko Szabo, and Elisabetta Bergantino*

Lack of a calcium-activated potassium channel confers increased resistance to zinc in cyanobacteria. 953

[W][OA] ROOT ULTRAVIOLET B-SENSITIVE1/WEAK AUXIN RESPONSE3 Is Essential for Polar Auxin Transport in Arabidopsis. *Hong Yu, Michael Karampelias, Stephanie Robert, Wendy Ann Peer, Ranjan Swarup, Songqing Ye, Lei Ge, Jerry Cohen, Angus Murphy, Jiri Friml, and Mark Estelle*

The growth phenotype of the rus1/wxr3 mutant is related to a defect in auxin transport caused by decreased accumulation of auxin transporters. 965

[W][OA] Quantification of Extracellular Carbonic Anhydrase Activity in Two Marine Diatoms and Investigation of Its Role. *Brian M. Hopkinson, Christof Meile, and Chen Shen*

eCA enhances CO₂ supply for photosynthesis in two marine diatoms. 1142

[W] Deletion of the Transcriptional Regulator cyAbrB2 Deregulates Primary Carbon Metabolism in *Synechocystis* sp. PCC 6803. *Yuki Kaniya, Ayumi Kizawa, Atsuko Miyagi, Maki Kawai-Yamada, Hirofumi Uchimiya, Yasuko Kaneko, Yoshikata Nishiyama, and Yukako Hihara*

The transcriptional regulator cyAbrB2 in Synechocystis sp. PCC 6803 is indispensable for coordination of cellular metabolism upon the changes in trophic conditions. 1153

SIGNALING AND RESPONSE

[C][W] Divergent DNA-Binding Specificities of a Group of ETHYLENE RESPONSE FACTOR Transcription Factors Involved in Plant Defense. *Tsubasa Shoji, Masaki Mishima, and Takashi Hashimoto*

A group of ERF transcription factors involved in plant defense has similar but divergent DNA-binding specificities, and amino acid residues in the DNA-binding domain are critical for such divergence. 977

[C][W][OA] A Regulatory Cascade Involving Class II ETHYLENE RESPONSE FACTOR Transcriptional Repressors Operates in the Progression of Leaf Senescence. *Tomotsugu Koyama, Haruka Nii, Nobutaka Mitsuda, Masaru Ohta, Sakihito Kitajima, Masaru Ohme-Takagi, and Fumihiko Sato*

The proteasome-mediated regulation of class II ERF transcriptional repressors is involved in the progression of leaf senescence. 991

[C][W][OA] Negative Feedback Control of Jasmonate Signaling by an Alternative Splice Variant of JAZ10. *Javier E. Moreno, Christine Shyu, Marcelo L. Campos, Lalita C. Patel, Hoo Sun Chung, Jian Yao, Sheng Yang He, and Gregg A. Howe*

A transcriptional regulator generated by alternative splicing uses a cryptic binding site to negatively regulate bHLH-type transcription factors that promote jasmonate responses. 1006

[C][W][OA] The *Pseudomonas syringae* Type III Effector AvrRpt2 Promotes Pathogen Virulence via Stimulating Arabidopsis Auxin/Indole Acetic Acid Protein Turnover. *Fuhao Cui, Shujing Wu, Wenxian Sun, Gitta Coaker, Barbara Kunkel, Ping He, and Libo Shan*

The bacterial effector AvrRpt2 promotes pathogen virulence via stimulating the turnover of Arabidopsis auxin regulators AXR2 and AXR3. 1018

Continued on next page

[C][W][OA] **CYCLIN H;1 Regulates Drought Stress Responses and Blue Light-Induced Stomatal Opening by Inhibiting Reactive Oxygen Species Accumulation in Arabidopsis.** Xiao Feng Zhou, Yin Hua Jin, Chan Yul Yoo, Xiao-Li Lin, Woe-Yeon Kim, Dae-Jin Yun, Ray A. Bressan, Paul M. Hasegawa, and Jing Bo Jin

CYCLIN H;1 regulates reactive oxygen species-dependent but abscisic acid-independent inhibition of blue light-induced stomatal aperture required for drought stress responses.

1030

[C][W][OA] **ANTI-SILENCING FUNCTION1 Proteins Are Involved in Ultraviolet-Induced DNA Damage Repair and Are Cell Cycle Regulated by E2F Transcription Factors in Arabidopsis.** Luciana D. Lario, Elena Ramirez-Parra, Crisanto Gutierrez, Claudia P. Spampinato, and Paula Casati

ASF1A and ASF1B genes are regulated by cell cycle progression and are involved in DNA repair after UV-B irradiation.

1164

[C][W] **A Basic Helix-Loop-Helix Transcription Factor, PtrbHLH, of Poncirus trifoliata Confers Cold Tolerance and Modulates Peroxidase-Mediated Scavenging of Hydrogen Peroxide.** Xiao-San Huang, Wei Wang, Qian Zhang, and Ji-Hong Liu

A bHLH gene (PtrbHLH) confers cold tolerance and modulates peroxidase-mediated scavenging of H₂O₂.

1178

[C][W] **Involvement of AtPol λ in the Repair of High Salt- and DNA Cross-Linking Agent-Induced Double Strand Breaks in Arabidopsis.** Sujit Roy, Swarup Roy Choudhury, Dibyendu N. Sengupta, and Kali Pada Das

DNA Pol λ participates in the repair of double strand breaks induced by high salinity and DNA cross-linking agent in Arabidopsis seedlings, demonstrating the importance of Pol λ in the double strand break repair signaling network in higher plant genome.

1195

SYSTEMS AND SYNTHETIC BIOLOGY

[C][W][OA] **Deciphering Herbivory-Induced Gene-to-Metabolite Dynamics in *Nicotiana attenuata* Tissues Using a Multifactorial Approach.** Jyotasana Gulati, Sang-Gyu Kim, Ian T. Baldwin, and Emmanuel Gaquerel

*A multifactorial SOM-based approach can be used to investigate the time and spatial dimensions of induced changes in gene and metabolite expression following herbivory in shoot and root tissues of a wild tobacco, *Nicotiana attenuata*.*

1042

[C][W][OA] **Responses to Light Intensity in a Genome-Scale Model of Rice Metabolism.** Mark G. Poolman, Sudip Kundu, Rahul Shaw, and David A. Fell

Analysis of a genome-scale metabolic of rice shows numerous coordinated changes between chloroplast and mitochondrial reactions in response to alteration in available light.

1060

[W][OA] **Gene Discovery of Modular Diterpene Metabolism in Nonmodel Systems.** Philipp Zerbe, Björn Hamberger, Macaire M.S. Yuen, Angela Chiang, Harpreet K. Sandhu, Lina L. Madilao, Anh Nguyen, Britta Hamberger, Søren Spanner Bach, and Jörg Bohlmann

Metabolite-guided transcriptome sequencing of nonmodel species, custom reference databases of terpene synthases and cytochrome P450s, and phylogenetic and enzymatic analyses identified new gene family members for modular biosynthesis of diterpenes with applications as bioproducts.

1073

[C][W][OA] **RNA-Seq of Arabidopsis Pollen Uncovers Novel Transcription and Alternative Splicing.** Ann E. Loraine, Sheila McCormick, April Estrada, Ketan Patel, and Peng Qin

High-throughput sequencing of Arabidopsis pollen cDNA uncovers novel transcription and alternative splicing.

1092

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