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On the Cover: In each plant lineage, some pathways have evolved that diverge from primary metabolism and lead to the synthesis of specialized compounds (secondary metabolites) with diverse ecological roles, many of them involving defense. Some of these compounds can be toxic to a predatory organism through external or internal contact and are occasionally synthesized in dedicated cells such as glandular trichomes, perhaps because they divert primary metabolic pathways and also because they might be toxic to the plant itself. The background image shows the surface of a leaf of a wild tomato (*Solanum habrochaites* f. sp. *glabratum*) with its dense distribution of glandular trichomes and (out of focus) long, nonglandular trichomes. Superimposed is a scanning electron micrograph image of a single glandular trichome, which serves as the site of synthesis and accumulation of methylketones (mostly 2-tridecanone and 2-undecanone), compounds that are toxic to many insects. In this issue, Ben-Israel et al. (pp. 1952–1964) investigated the polygenic basis for the monophyletic divergence of this metabolic pathway (found in only in one wild species of tomato) from fatty acid biosynthesis. Comprehensive analysis of progeny derived from an interspecific cross between the cultivated and wild species revealed tight correlation between the shape of the glandular trichomes and their methylketone content. In addition, the presence of a wild species-specific transcript for a novel thioesterase, named *Methylketone Synthase2* (*MKS2*), showed significant correlation with methylketone accumulation as well as epistatic interactions with the previously identified gene *MKS1* in this pathway. Cover design and leaf picture made by Eran Pichersky and Eyal Fridman. Photograph of the scanning electron micrograph taken by Jihong Wang.

ON THE INSIDE

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HIGH IMPACT

MoTo DB: A Metabolic Database for Tomato. Aleel K. Grennan 1701

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- [C][W][O]A]Deciphering Transcriptional and Metabolic Networks Associated with Lysine Metabolism during Arabidopsis Seed Development. *Ruthie Angelovici, Aaron Fait, Xiaohong Zhu, Jędrzej Szymanski, Ester Feldmesser, Alisdair R. Fernie, and Gad Galili* 2058

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- [W][O]A]The Variegated Mutants Lacking Chloroplastic FtsHs Are Defective in D1 Degradation and Accumulate Reactive Oxygen Species. *Yusuke Kato, Eiko Miura, Kunio Ido, Kentaro Ifuku, and Wataru Sakamoto* 1790
- [W]A Cytoplasmically Inherited Barley Mutant Is Defective in Photosystem I Assembly Due to a Temperature-Sensitive Defect in *ycf3* Splicing. *Alejandra Mabel Landau, Heiko Lokstein, Henrik Vibe Scheller, Verónica Lainez, Sara Maldonado, and Alberto Raúl Prina* 1802
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- [W][O]A]Mechanical Stimuli Modulate Lateral Root Organogenesis. *Gregory L. Richter, Gabriele B. Monshausen, Alexandra Krol, and Simon Gilroy* 1855
- [W][O]A]Petunia hybrida CAROTENOID CLEAVAGE DIOXYGENASE7 Is Involved in the Production of Negative and Positive Branching Signals in Petunia. *Revel S.M. Drummond, N. Marcela Martínez-Sánchez, Bart J. Janssen, Kerry R. Templeton, Joanne L. Simons, Brian D. Quinn, Sakuntala Karunairetnam, and Kimberley C. Snowden* 1867
- [W][O]A]Distal Expression of *knotted1* in Maize Leaves Leads to Reestablishment of Proximal/Distal Patterning and Leaf Dissection. *Julio Ramirez, Nathalie Bolduc, Damon Lisch, and Sarah Hake* 1878

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- [C][W][OA]Upgrading Root Physiology for Stress Tolerance by Ectomycorrhizas: Insights from Metabolite and Transcriptional Profiling into Reprogramming for Stress Anticipation. Zhi-Bin Luo, Dennis Janz, Xiangning Jiang, Cornelia Göbel, Henning Wildhagen, Yupeng Tan, Heinz Rennenberg, Ivo Feussner, and Andrea Polle 1902
- [W][OA]The Impact of Water Deficiency on Leaf Cuticle Lipids of Arabidopsis. Dylan K. Kosma, Brice Bourdenx, Amélie Bernard, Eugene P. Parsons, Shiyu Lü, Jérôme Joubès, and Matthew A. Jenks 1918
- [W]Specific Domain Structures Control Abscisic Acid-, Salicylic Acid-, and Stress-Mediated SIZ1 Phenotypes. Mi Sun Cheong, Hyeong Cheol Park, Mi Ju Hong, Jiyoung Lee, Wonkyun Choi, Jing Bo Jin, Hans J. Bohmert, Sang Yeol Lee, Ray A. Bressan, and Dae-Jin Yun 1930
- [W][OA]Uncovering Small RNA-Mediated Responses to Phosphate Deficiency in Arabidopsis by Deep Sequencing. Li-Ching Hsieh, Shu-I. Lin, Arthur Chun-Chieh Shih, June-Wei Chen, Wei-Yi Lin, Ching-Ying Tseng, Wen-Hsiung Li, and Tzyy-Jen Chiou 2120

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- [W][OA]Multiple Biochemical and Morphological Factors Underlie the Production of Methylketones in Tomato Trichomes. Imri Ben-Israel, Geng Yu, Michael B. Austin, Nazmul Bhuiyan, Michele Auldridge, Thuong Nguyen, Ines Schauvinhold, Joseph P. Noel, Eran Pichersky, and Eyal Fridman 1952
- [W][OA]Nucleotide Polymorphism in the Wheat Transcriptional Activator *Spa* Influences Its Pattern of Expression and Has Pleiotropic Effects on Grain Protein Composition, Dough Viscoelasticity, and Grain Hardness. Catherine Ravel, Pierre Martre, Isabelle Romeuf, Mireille Dardevet, Redouane El-Malki, Jacques Bordes, Nathalie Duchateau, Dominique Brunel, François Balfourier, and Gilles Charmet 2133

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- [W]Identification of Defense Compounds in *Barbarea vulgaris* against the Herbivore *Phyllotreta nemorum* by an Ecometabolomic Approach. Vera Kuzina, Claus Thorn Ekström, Sven Bode Andersen, Jens Kvist Nielsen, Carl Erik Olsen, and Søren Bak 1977
- [W]The Ectomycorrhizal Fungus *Laccaria bicolor* Stimulates Lateral Root Formation in Poplar and Arabidopsis through Auxin Transport and Signaling. Judith Felten, Annegret Kohler, Emmanuelle Morin, Rishikesh P. Bhalerao, Klaus Palme, Francis Martin, Franck A. Ditengou, and Valérie Legué 1991
- [C][W][OA]An ABC Transporter Mutation Alters Root Exudation of Phytochemicals That Provoke an Overhaul of Natural Soil Microbiota. Dayakar V. Badri, Naira Quintana, Elie G. El Kassis, Hye Kyong Kim, Young Hae Choi, Akifumi Sugiyama, Robert Verpoorte, Enrico Martinoia, Daniel K. Manter, and Jorge M. Vivanco 2006
- [OA]Native Plant and Microbial Contributions to a Negative Plant-Plant Interaction. Gurdeep Bains, Amutha Sampath Kumar, Thimmaraju Rudrappa, Emily Alff, Thomas E. Hanson, and Harsh P. Bais 2145
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- ^[C]^[W]^[OA]DkMyb4 Is a Myb Transcription Factor Involved in Proanthocyanidin Biosynthesis in Persimmon Fruit. *Takashi Akagi, Ayako Ikegami, Tomoyuki Tsujimoto, Shozo Kobayashi, Akihiko Sato, Atsushi Kono, and Keizo Yonemori* 2028
- ^[W]^[OA]The Phytochrome-Interacting Factor PIF7 Negatively Regulates *DREB1* Expression under Circadian Control in Arabidopsis. *Satoshi Kidokoro, Kyonoshin Maruyama, Kazuo Nakashima, Yoshiyuki Imura, Yoshihiro Narusaka, Zabta K. Shinwari, Yuriko Osakabe, Yasunari Fujita, Junya Mizoi, Kazuo Shinozaki, and Kazuko Yamaguchi-Shinozaki* 2046
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