

On the Cover: Scan of a living seedling of *Noccaea caerulea* (a hyperaccumulator) showing Zn (green), K (red), and Ca (blue) examined using synchrotron-based X-ray fluorescence microscopy (XFM). The cover image was created by Antony van der Ent, Martin D. de Jonge, Guillaume Echevarria, Rachel Mak, Peter D. Erskine, Jolanta Mesjasz-Przybylowicz, Wojciech J. Przybylowicz, and Hugh H. Harris. The data was acquired on the X-Ray Fluorescence Microscopy (XFM) beamline of the Australian Synchrotron, ANSTO, Australia. This work was supported by the Multi-modal Australian ScienceS Imaging and Visualisation Environment (MASSIVE) and analyzed with GeoPIXE software.

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[OPEN]Synchrotron-Based X-Ray Fluorescence Microscopy as a Technique for Imaging of Elements in Plants. Peter M. Kopittke, Tracy Punshon, David J. Paterson, Ryan V. Tappero, Peng Wang, F. Pax C. Blamey, Antony van der Ent, and Enzo Lombi

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[OPEN]Plant Phenotyping: An Active Vision Cell for Three-Dimensional Plant Shoot Reconstruction. Jonathon A. Gibbs, Michael Pound, Andrew P. French, Darren M. Wells, Erik Murchie, and Tony Pridmore

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A farnesyl diphosphate-preferring aromatic prenyltransferase plays a key role in the biosynthetic pathway of daurichromenic acid, an anti-HIV meroterpenoid, in Rhododendron dauricum. 535

[OPEN]Identification of a Hexenal Reductase That Modulates the Composition of Green Leaf Volatiles. Toshiyuki Tanaka, Ayana Ikeda, Kaori Shiojiri, Rika Ozawa, Kazumi Shiki, Naoko Nagai-Kunihiro, Kenya Fujita, Koichi Sugimoto, Katsuyuki T. Yamato, Hideo Dohra, Toshiyuki Ohnishi, Takao Koeduka, and Kenji Matsui

NADPH-dependent cinnamaldehyde and hexenal reductase affects the composition of green leaf volatiles and is involved in indirect plant defenses. 552

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[^{OPEN}] Sulfate Metabolism in *C₄ Flaveria* Species Is Controlled by the Root and Connected to Serine Biosynthesis. Silke C. Gerlich, Berkley J. Walker, Stephan Krueger, and Stanislav Kopriva

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[^{CC-BY}] Configuration of Ten Light-Harvesting Chlorophyll *a/b* Complex I Subunits in *Chlamydomonas reinhardtii* Photosystem I. Shin-Ichiro Ozawa, Till Bald, Takahito Onishi, Huidan Xue, Takunori Matsumura, Ryota Kubo, Hiroko Takahashi, Michael Hippler, and Yuichiro Takahashi

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[^{OPEN}] The Photosystem II Repair Cycle Requires FtsH Turnover through the EngA GTPase. Yusuke Kato, Kiwamu Hyodo, and Wataru Sakamoto

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Metabolome Analysis of Multi-Connected Biparental Chromosome Segment Substitution Line Populations. Jie Chen, Jilin Wang, Wei Chen, Wenqiang Sun, Meng Peng, Zhiyang Yuan, Shuangqian Shen, Kun Xie, Cheng Jin, Yangyang Sun, Xianqing Liu, Alisdair R. Fernie, Sibin Yu, and Jie Luo

Multi-biparental populations generate a large set of metabolite QTL (mQTL), and consolidation of a metabolic pathway may confer plant disease resistance activity.

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CELL BIOLOGY

[^{OPEN}] SMALL AUXIN UP RNA62/75 Are Required for the Translation of Transcripts Essential for Pollen Tube Growth. Siou-Luan He, Hsu-Liang Hsieh, and Guang-Yuh Jauh

SAUR62 and SAUR75 regulate pollen tube growth through physical interaction with ribosome subunits to affect translation of cell wall and actin cytoskeleton remodeling-related transcripts.

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Synaptotagmin-Associated Endoplasmic Reticulum-Plasma Membrane Contact Sites Are Localized to Immobile ER Tubules. Kazuya Ishikawa, Kentaro Tamura, Haruko Ueda, Yoko Ito, Akihiko Nakano, Ikuko Hara-Nishimura, and Tomoo Shimada

SYNAPTOTAGMIN1-associated endoplasmic reticulum (ER)-plasma membrane contact sites are localized to immobile ER tubules in Arabidopsis thaliana and contribute to tubular ER network formation.

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[^{OPEN}] Physio-Genetic Dissection of Dark-Induced Leaf Senescence and Timing Its Reversal in Barley.

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[^{OPEN}] Specialized Plastids Trigger Tissue-Specific Signaling for Systemic Stress Response in Plants.

Jesús Beltrán, Yashitola Wamboldt, Robersy Sanchez, Evan W. LaBrant, Hardik Kundariya, Kamaldeep S. Viridi, Christian Elowsky, and Sally A. Mackenzie

Small plastids within the epidermis and vascular tissues modulate tissue-specific redox, chromatin and stress-responsive pathways.

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A Cycloheximide-Sensitive Step in Transverse Microtubule Array Patterning. *Andrew Elliott and Sidney L. Shaw*

Formation of transverse cortical microtubule array patterns in Arabidopsis hypocotyl cells requires the active suppression of longitudinal polymers.

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[OPEN] Components of Water Use Efficiency Have Unique Genetic Signatures in the Model C₄ Grass *Setaria*. *Max J. Feldman, Patrick Z. Ellsworth, Noah Fahlgren, Malia A. Gehan, Asaph B. Cousins, and Ivan Baxter*

Both water-dependent and water-independent processes controlled by unique genetic components regulate plant growth in the model C₄ grass Setaria.

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[OPEN] Retrotransposon Insertion and DNA Methylation Regulate Aluminum Tolerance in European Barley Accessions. *Miho Kashino-Fujii, Kengo Yokosho, Naoki Yamaji, Miki Yamane, Daisuke Saisho, Kazuhiro Sato, and Jian Feng Ma*

Aluminum tolerance in European barley is affected by retrotransposon insertion in the upstream sequence of the major aluminum tolerance gene HvAACT1 and its DNA methylation status.

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[OPEN] Estimating Mesophyll Conductance from Measurements of C¹⁸OO Photosynthetic Discrimination and Carbonic Anhydrase Activity. *Jérôme Ogée, Lisa Wingate, and Bernard Genty*

A new model based on the relationship between C¹⁸OO photosynthetic discrimination and carbonic anhydrase activity estimates mesophyll conductance in C₃ and C₄ plants.

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[OPEN] ZmbZIP4 Contributes to Stress Resistance in Maize by Regulating ABA Synthesis and Root Development. *Haizhen Ma, Can Liu, Zhaoxia Li, Qijun Ran, Guangning Xie, Baomei Wang, Shuang Fang, Jinfang Chu, and Juren Zhang*

A bZIP transcription factor enables maize to grow better under stress by promoting root growth and the expression of stress-related genes.

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[OPEN] An Ancestral Allele of *Pyrroline-5-carboxylate synthase1* Promotes Proline Accumulation and Drought Adaptation in Cultivated Barley. *Shumaila Muzammil, Asis Shrestha, Said Dadshani, Klaus Pillen, Shahid Siddique, Jens Léon, and Ali Ahmad Naz*

*Allelic variation of *Pyrroline-5-carboxylate synthase1* underlies sequence divergence across the promoter in the cultivated and wild barley which modulates its drought-inducible transcriptional activity.*

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[OPEN] Mobility of Antiflorigen and PEBP mRNAs in Tomato-Tobacco Heterografts. *Nien-Chen Huang, Kai-Ren Luo, and Tien-Shin Yu*

Long-distance movement of tobacco NsCET1 and PEBP mRNAs suggests that acquisition of RNA mobility is an early evolutionary event.

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The Coumarin Glucoside, Esculin, Reveals Rapid Changes in Phloem-Transport Velocity in Response to Environmental Cues. *Kirsten Knox, Andrea Paterlini, Simon Thomson, and Karl Oparka*

Esculin, used as a sucrose mimic, shows that the velocity of phloem transport is regulated by environmental cues, changes in sucrose levels, and the expression of the sucrose transporter AtSUC2.

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[^{OPEN}] EIN3-LIKE1, MYB1, and ETHYLENE RESPONSE FACTOR3 Act in a Regulatory Loop That Synergistically Modulates Ethylene Biosynthesis and Anthocyanin Accumulation. *Jian-Ping An, Xiao-Fei Wang, Yuan-Yuan Li, Lai-Qing Song, Ling-Ling Zhao, Chun-Xiang You, and Yu-Jin Hao*

MdEIL1 directly activates MdMYB1 expression to promote anthocyanin accumulation, and MdMYB1 directly activates MdERF3 to promote ethylene production. 808

[^{OPEN}] INDETERMINATE SPIKELET1 Recruits Histone Deacetylase and a Transcriptional Repression Complex to Regulate Rice Salt Tolerance. *Xiliu Cheng, Shaoxuan Zhang, Weichun Tao, Xiangxiang Zhang, Jie Liu, Jiaqiang Sun, Haiwen Zhang, Li Pu, Rongfeng Huang, and Tao Chen*

An EAR-motif-containing AP2/ERF transcription factor IDS1 recruits a transcriptional repression complex to negatively regulate rice salt tolerance. 824

[^{OPEN}] Red Light-Induced Phosphorylation of Plasma Membrane H⁺-ATPase in Stomatal Guard Cells. *Eigo Ando and Toshinori Kinoshita*

Red light induces photosynthesis-dependent phosphorylation of plasma membrane H⁺-ATPase in guard cells to promote stomatal opening in whole leaves. 838

Transcriptome Analysis Identifies a Zinc Finger Protein Regulating Starch Degradation in Kiwifruit. *Ai-di Zhang, Wen-qiu Wang, Yang Tong, Ming-jun Li, Donald Grierson, Ian Ferguson, Kun-song Chen, and Xue-ren Yin*

An ethylene responsive C2H2-type zinc finger transcription factor, AdDof3, regulates starch degradation in kiwifruit via trans-activation of the AdBAM3L promoter. 850

[^{OPEN}] Three Auxin Response Factors Promote Hypocotyl Elongation. *Jason W. Reed, Miin-Feng Wu, Paul H. Reeves, Charles Hodgens, Vandana Yadav, Scott Hayes, and Ronald Pierik*

Three Auxin Response Factors control hypocotyl elongation in Arabidopsis under environmental conditions that require rapid growth. 864

[^{OPEN}] GhCPK33 Negatively Regulates Defense against *Verticillium dahliae* by Phosphorylating GhOPR3. *Qin Hu, Longfu Zhu, Xiangnan Zhang, Qianqian Guan, Shenghua Xiao, Ling Min, and Xianlong Zhang*

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[^{OPEN}] The Nitrate-Responsive Protein MdbT2 Regulates Anthocyanin Biosynthesis by Interacting with the MdMYB1 Transcription Factor. *Xiao-Fei Wang, Jian-Ping An, Xin Liu, Ling Su, Chun-Xiang You, and Yu-Jin Hao*

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[^{OPEN}] The MAPK Kinase Kinase GmMEKK1 Regulates Cell Death and Defense Responses. *Hui-Yang Xu, Chi Zhang, Zhen-Chao Li, Zhi-Rong Wang, Xu-Xu Jiang, Ya-Fei Shi, Sheng-Nan Tian, Edward Braun, Yu Mei, Wen-Li Qiu, Sen Li, Bo Wang, Juan Xu, Duroy Navarre, Dongtao Ren, Ninghui Cheng, Paul A. Nakata, Michelle A. Graham, Steven A. Whitham, and Jian-Zhong Liu*

GmMEKK1 regulates cell death and defense responses independent of activation of GmMPK4 and possibly by differentially regulating GmMPK3 and GmMPK6 via distinct downstream GmMKs in soybean. 907

^[OPEN]A Cytosolic Triosephosphate Isomerase Is a Key Component in XA3/XA26-Mediated Resistance.
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Triosephosphate isomerase, a cytosolic glycolytic enzyme, plays an important role in XA3/XA26-mediated innate immunity by modulating the reactive oxygen species level in rice.

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Hydrogen Sulfide Disturbs Actin Polymerization via S-Sulphydration Resulting in Stunted Root Hair Growth. Jisheng Li, Sisi Chen, Xiaofeng Wang, Cong Shi, Huaxin Liu, Jun Yang, Wei Shi, Junkang Guo and Honglei Jia

Hydrogen sulfide-induced S-sulphydration affects actin dynamics and root hair growth in Arabidopsis.

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