

On the Cover: In the course of evolution, about 4,000 flowering plant species adapted a parasitic lifestyle. These parasitic angiosperms have worldwide distribution and diverse adaptations, including lack of leaves, stems, roots, and the ability to photosynthesize. Of the approximately 20 families of parasitic plants, Orobanchaceae, to which *Striga* spp. belong, has the largest number of parasitic plant species. *Striga* spp., including *Striga hermonthica*, are of high economic importance, especially in sub-Saharan Africa, where they affect the production of maize (*Zea mays*), sorghum (*Sorghum bicolor*), and rice (*Oryza sativa*), resulting in losses of up to \$1 billion (U.S. dollars) annually. Because developing resistance in host species is one of the most viable methods of control, Mutuku et al. (pp. 1152–1163) examined host resistance response against *S. hermonthica* parasitism. The authors show that the gene *WRKY45* positively regulates the salicylic acid/benzo-1,2,3-thiadiazole-7-carbothioic acid *S*-methyl ester and jasmonic acid signaling pathways. The cover image shows the beautiful flowers of *S. hermonthica* growing in a maize field in Kisumu, Western Kenya. Image credits: J. Musembi Mutuku and Ken Shirasu (RIKEN Center for Sustainable Resource Science, Yokohama, Japan).

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The High Life: Alpine Dwarfism in Arabidopsis. Kirsten Bomblies

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Posttranslational Modifications of Chloroplast Proteins: An Emerging Field. Nina Lehtimäki, Minna M. Koskela, and Paula Mulo

Chloroplast proteins are targets of numerous posttranslational modifications that allow precise regulation of chloroplast metabolism during environmental changes and challenges.

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BREAKTHROUGH TECHNOLOGIES

^[OPEN]Binary 2in1 Vectors Improve in Planta (Co)localization and Dynamic Protein Interaction Studies. Andreas Hecker, Niklas Wallmeroth, Sébastien Peter, Michael R. Blatt, Klaus Harter, and Christopher Grefen

The combination of new generation fluorescent proteins with the 2in1-cloning technique improves (co)localization and protein interaction analyses in vivo.

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The Petunia GRAS Transcription Factor ATA/RAM1 Regulates Symbiotic Gene Expression and Fungal Morphogenesis in Arbuscular Mycorrhiza. Mélanie K. Rich, Martine Schorderet, Laure Bapaume, Laurent Falquet, Patrice Morel, Michiel Vandenbussche, and Didier Reinhardt

A petunia transcription factor affects symbiotic gene expression and is required for arbuscule development and restriction of fungal colonization in the root tip.

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^[OPEN]Evidence That Chlorinated Auxin Is Restricted to the Fabaceae But Not to the Fabaeae.

Hong Kiat Lam, Scott A.M. McAdam, Erin L. McAdam, and John J. Ross

The range of species containing chlorinated auxin is extended to the genera Trifolium, Melilotus, and Medicago and is important in seed development.

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SCIENTIFIC CORRESPONDENCE

Extreme Aridity Pushes Trees to Their Physical Limits. Maximilian Larter, Tim J. Brodribb, Sebastian Pfautsch, Régis Burllett, Hervé Cochard, and Sylvain Delzon

An Australian desert tree species displays record drought tolerance, bringing it remarkably close to the practical limit for liquid water transport in vascular plants.

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Low Sugar Is Not Always Good: Impact of Specific O-Glycan Defects on Tip Growth in Arabidopsis.

Silvia M. Velasquez, Eliana Marzol, Cecilia Borassi, Laercio Pol-Fachin, Martiniano M. Ricardi, Silvina Mangano, Silvina Paola Denita Juarez, Juan D. Salgado Salter, Javier Gloazzo Dorosz, Susan E. Marcus, J. Paul Knox, Jose R. Dinnyeny, Norberto D. Iusem, Hugo Verli, and José M. Estevez

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BIOCHEMISTRY AND METABOLISM

^[OPEN]Mutant Allele-Specific Uncoupling of PENETRATION3 Functions Reveals Engagement of the ATP-Binding Cassette Transporter in Distinct Tryptophan Metabolic Pathways. Xunli Lu, Jan Dittgen, Mariola Piślewska-Bednarek, Antonio Molina, Bernd Schneider, Aleš Svatoš, Jan Doubský, Korbinian Schneeberger, Detlef Weigel, Paweł Bednarek, and Paul Schulze-Lefert

A specific mutation in the gene encoding Arabidopsis PEN3 ATP-binding cassette transporter indicates diverse tryptophan metabolites as PEN3 substrates.

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^[OPEN]Quantitative Multilevel Analysis of Central Metabolism in Developing Oilseeds of Oilseed Rape during in Vitro Culture. Jörg Schwender, Inga Hebbelmann, Nicolas Heinzl, Tatjana Hildebrandt, Alistair Rogers, Dhiraj Naik, Matthias Klapperstück, Hans-Peter Braun, Falk Schreiber, Peter Denolf, Ljudmilla Borisjuk, and Hardy Rolletschek

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Metabolomics analysis of P450 tandem gene double mutants leads to a new model for the defense-related tryptophan metabolic network.

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Knocking Down of Isoprene Emission Modifies the Lipid Matrix of Thylakoid Membranes and Influences the Chloroplast Ultrastructure in Poplar. Violeta Velikova, Constanze Müller, Andrea Ghirardo, Theresa Maria Rock, Michaela Aichler, Axel Walch, Philippe Schmitt-Kopplin, and Jörg-Peter Schnitzler

Isoprene emission in plants is correlated with structural organization and function of plastidic membranes.

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[OPEN] Cellulose-Pectin Spatial Contacts Are Inherent to Never-Dried Arabidopsis Primary Cell Walls: Evidence from Solid-State Nuclear Magnetic Resonance. *Tuo Wang, Yong Bum Park, Daniel J. Cosgrove, and Mei Hong*

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[OPEN] Lipid Peroxide-Derived Short-Chain Carbonyls Mediate Hydrogen Peroxide-Induced and Salt-Induced Programmed Cell Death in Plants. *Md. Sanaullah Biswas and Jun'ichi Mano*

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[OPEN] Salinity Is an Agent of Divergent Selection Driving Local Adaptation of Arabidopsis to Coastal Habitats. *Silvia Busoms, Joana Teres, Xin-Yuan Huang, Kirsten Bomblies, John Danku, Alex Douglas, Detlef Weigel, Charlotte Poschenrieder, and David E. Salt*

Differences in soil salinity underlie the divergent selection that drives the evolution of coastally adapted populations of Arabidopsis. 915

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[OPEN] Variation in Adult Plant Phenotypes and Partitioning among Seed and Stem-Borne Roots across *Brachypodium distachyon* Accessions to Exploit in Breeding Cereals for Well-Watered and Drought Environments. *Vincent Chochois, John P. Vogel, Gregory J. Rebetzke, and Michelle Watt*

A model grass identifies phenotypes associated with mature root and shoot for genetic improvement of well-watered and drought-stressed cereals. 953

[^{OPEN}] Evolutionary Dynamics of the Cellulose Synthase Gene Superfamily in Grasses. Julian G. Schwerdt, Katrin MacKenzie, Frank Wright, Daniel Oehme, John M. Wagner, Andrew J. Harvey, Neil J. Shirley, Rachel A. Burton, Miriam Schreiber, Claire Halpin, Jochen Zimmer, David F. Marshall, Robbie Waugh, and Geoffrey B. Fincher

Variable selection pressure in the cellulose synthase gene superfamily reveals positions of amino acids under selection and unexpected evolutionary histories for key genes.

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[^{OPEN}] MicroRNA167-Directed Regulation of the Auxin Response Factors *GmARF8a* and *GmARF8b* Is Required for Soybean Nodulation and Lateral Root Development. Youning Wang, Kexue Li, Liang Chen, Yanmin Zou, Haipei Liu, Yinping Tian, Dongxiao Li, Rui Wang, Fang Zhao, Brett J. Ferguson, Peter M. Gresshoff, and Xia Li

The microRNA miR167 contributes to the nodulation of soybean via auxin response factors.

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TANG1, Encoding a Symplekin_C Domain-Contained Protein, Influences Sugar Responses in Arabidopsis. Leiying Zheng, Li Shang, Xing Chen, Limin Zhang, Yan Xia, Caroline Smith, Michael W. Bevan, Yunhai Li, and Hai-Chun Jing

A unique gene is involved in sugar-related responses in Arabidopsis.

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The Arabidopsis GAGA-Binding Factor BASIC PENTACYSTEINE6 Recruits the POLYCOMB-REPRESSIVE COMPLEX1 Component LIKE HETEROCHROMATIN PROTEIN1 to GAGA DNA Motifs. Andreas Hecker, Luise H. Brand, Sébastien Peter, Nathalie Simoncello, Joachim Kilian, Klaus Harter, Valérie Gaudin, and Dierk Wanke

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[^{OPEN}] Down-Regulating the Expression of 53 Soybean Transcription Factor Genes Uncovers a Role for SPEECHLESS in Initiating Stomatal Cell Lineages during Embryo Development. John Danzer, Eric Mellott, Anhthu Q. Bui, Brandon H. Le, Patrick Martin, Meryl Hashimoto, Jeanett Perez-Lesher, Min Chen, Julie M. Pelletier, David A. Somers, Robert B. Goldberg, and John J. Harada

An RNA interference screen of 53 transcription factor mRNAs that accumulate specifically during soybean seed development identified a homolog of an epidermal factor required to initiate stomatal cell lineages during embryo development.

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Transcriptional Activity of the MADS Box ARLEQUIN/TOMATO AGAMOUS-LIKE1 Gene Is Required for Cuticle Development of Tomato Fruit. Estela Giménez, Eva Dominguez, Benito Pineda, Antonio Heredia, Vicente Moreno, Rafael Lozano, and Trinidad Angosto

A ripening-related transcription factor regulates the cuticle development of tomato fruit as part of the reproductive developmental program.

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Germination Potential of Dormant and Nondormant Arabidopsis Seeds Is Driven by Distinct Recruitment of Messenger RNAs to Polysomes. Isabelle Basbous-Serhal, Ludivine Soubigou-Taconnat, Christophe Bailly, and Juliette Leymarie

The dynamic association of specific transcripts with polysomes participates in the regulation of seed germination by dormancy.

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[OPEN] Leaf Variegation of *Thylakoid Formation1* Is Suppressed by Mutations of Specific σ -Factors in *Arabidopsis*. *Fenhong Hu, Ying Zhu, Wenjuan Wu, Ye Xie, and Jirong Huang*

Loss-of-function mutations in specific plastidic transcriptional factors suppress leaf variegation.

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MEMBRANES, TRANSPORT, AND BIOENERGETICS

[OPEN] The Rice High-Affinity Potassium Transporter1;1 Is Involved in Salt Tolerance and Regulated by an MYB-Type Transcription Factor. *Rong Wang, Wen Jing, Longyun Xiao, Yakang Jin, Like Shen, and Wenhua Zhang*

A rice potassium transporter contributes to salt tolerance and is regulated by a transcription factor.

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Multiple Interactions between Glucose and Brassinosteroid Signal Transduction Pathways in *Arabidopsis* Are Uncovered by Whole-Genome Transcriptional Profiling. *Aditi Gupta, Manjul Singh, and Ashverya Laxmi*

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An Overdose of the *Arabidopsis* Coreceptor BRASSINOSTEROID INSENSITIVE1-ASSOCIATED RECEPTOR KINASE1 or Its Ectodomain Causes Autoimmunity in a SUPPRESSOR OF BIR1-1-Dependent Manner. *Ana Domínguez-Ferreras, Marta Kiss-Papp, Anna Kristina Jehle, Georg Felix, and Delphine Chinchilla*

*Accumulation of an immune coreceptor or its ectodomain leads to detrimental effects on *Arabidopsis* growth and constitutive activation of immunity.*

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[OPEN] Transcription Factor ATAF1 in *Arabidopsis* Promotes Senescence by Direct Regulation of Key Chloroplast Maintenance and Senescence Transcriptional Cascades. *Prashanth Garapati, Gang-Ping Xue, Sergi Munné-Bosch, and Salma Balazadeh*

*A transcription factor from *Arabidopsis* antagonistically controls regulators of senescence and photosynthesis.*

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[OPEN] WHIRLY1 Functions in the Control of Responses to Nitrogen Deficiency But Not Aphid Infestation in Barley. *Gloria Comadira, Brwa Rasool, Barbara Kaprinska, Belén Márquez García, Jennifer Morris, Susan R. Verrall, Micha Bayer, Peter E. Hedley, Robert D. Hancock, and Christine H. Foyer*

A protein that has a role in the control of photosynthetic gene expression and protection against low nitrogen-induced stress.

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[OPEN] The WRKY45-Dependent Signaling Pathway Is Required For Resistance against *Striga hermonthica* Parasitism. *J. Musembi Mutuku, Satoko Yoshida, Takafumi Shimizu, Yasunori Ichihashi, Takanori Wakatake, Akira Takahashi, Mitsunori Seo, and Ken Shirasu*

*Resistance against *Striga hermonthica* parasitism in rice is modulated by WRKY45, which regulates salicylic acid/benzo-1,2,3-thiadiazole-7-carbothioic acid S-methyl ester and jasmonic acid defense pathways.*

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SYSTEMS AND SYNTHETIC BIOLOGY

[OPEN] Network Analyses Reveal Shifts in Transcript Profiles and Metabolites That Accompany the Expression of *SUN* and an Elongated Tomato Fruit. *Josh P. Clevenger, Jason Van Houten, Michelle Blackwood, Gustavo Rubén Rodríguez, Yusuke Jikumaru, Yuji Kamiya, Miyako Kusano, Kazuki Saito, Sofia Visa, and Esther van der Knaap*

High expression of a gene that controls tomato shape is accompanied by dramatic shifts in gene expression and metabolite and hormone accumulation during the early stages of fruit development.

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Quantifying Protein Synthesis and Degradation in Arabidopsis by Dynamic $^{13}\text{CO}_2$ Labeling and Analysis of Enrichment in Individual Amino Acids in Their Free Pools and in Protein. *Ishihara H., Obata T., Sulpice R., Fernie A.R., and Stitt M.*

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Leaf Responses to Mild Drought Stress in Natural Variants of Arabidopsis. *Clauw P., Coppens E., De Beuf K., Dhondt S., Van Daele T., Maleux K., Storme V., Clement L., Gonzalez N., and Inzé D.*

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