On the Cover: The composite image shows the submergence response found in flood-tolerant Rumex spp. and a ribbon model of the receiver domain from the ETHYLENE RESPONSE1 (ETR1) ethylene receptor of Arabidopsis (Arabidopsis thaliana). Rumex spp. escape from submerged conditions by fast elongation of petioles. This cell elongation process is initiated by the accumulation of ethylene inside the submerged plant tissues, related to the slow diffusion of gases in water. Subsequently, other plant hormones, along with regulators of photomorphogenesis, mediate this growth response, leading to the stimulation of target processes such as cell wall loosening. After the leaf tips emerge into the atmosphere, oxygen can diffuse into the plant to ensure survival. In the ribbon model of the ETR1 receiver domain, amino acids that are important for various traits described by Bakshi et al. (pp. 219–232) are shown in space-filling structures. Mutation of three amino acid residues (gray carbons) results in a receptor that cannot stimulate nutational bending in response to ethylene. Mutation of two residues in the γ loop (white carbons) results in a receptor that inhibits germination on salt more effectively than wild-type ETR1, whereas mutation of two residues just prior to the γ loop (black carbons) results in a receptor that cannot inhibit germination on salt. The model of the ETR1 receiver domain was generated by Molecular Operating Environment (version 2012.10) based on the receiver domain crystal structure (Protein Data Bank 1DCF). Cover image credits: Ole Pedersen, Freshwater Biological Laboratory, University of Copenhagen (Rumex spp. submergence response); and Brad M. Binder, Department of Biochemistry, Cellular, and Molecular Biology, University of Tennessee, Knoxville (ETR1 receiver domain). Cover layout by Diane McCauley.
Producing the Ethylene Signal: Regulation and Diversification of Ethylene Biosynthetic Enzymes. Matthew A. Booker and Alison DeLong

Posttranslational modifications control the stability of a key family of biosynthetic enzymes, and phylogenetic analysis indicates recent specialization of this enzyme family in seed plants.

Ethylene and the Regulation of Physiological and Morphological Responses to Nutrient Deficiencies. María José García, Francisco Javier Romera, Carlos Lucena, Esteban Alcántara, and Rafael Pérez-Vicente

Physiological and morphological responses to increase the mobilization and uptake of nutrients from the soil are subject to regulation by ethylene.

Ethylene and Hormonal Cross Talk in Vegetative Growth and Development. Bram Van de Poel, Dajo Smet, and Dominique Van Der Straeten

Recent insights into the role of ethylene in regulating plant growth and development highlight interactions with other hormones.

Role of Ethylene and Its Cross Talk with Other Signaling Molecules in Plant Responses to Heavy Metal Stress. Nguyễn Phuong Thao, M. Iqbal R. Khan, Nguyễn Bình Anh Thu, Xuan Lan Thi Hoang, Mohd Asgher, Nafees A. Khan, and Lam-Son Phan Tran

Ethylene regulates plant responses to heavy metal stress through the interaction with other signaling molecules.

Mechanistic Insights in Ethylene Perception and Signal Transduction. Chuanli Ju and Caren Chang

New insights into the ethylene signaling pathway, including dynamic regulatory mechanisms, provide a more comprehensive view of ethylene perception and signal transduction.

RESEARCH ARTICLES

[[OPEN]] Tobacco Translationally Controlled Tumor Protein Interacts with Ethylene Receptor Tobacco Histidine Kinase1 and Enhances Plant Growth through Promotion of Cell Proliferation. Jian-Jun Tao, Yang-Rong Cao, Hao-Wei Chen, Wei Wei, Qing-Tian Li, Biao Ma, Wan-Ke Zhang, Shou-Yi Chen, and Jin-Song Zhang

Translationally-controlled tumor protein binds with a class of ethylene receptors at the endoplasmic reticulum and affects protein degradation.


A mutation that impairs ethylene response in pea reveals an interaction of light and ethylene signaling in the control of leaf expansion during deetiolation.

[[OPEN]] Roles of Ethylene Production and Ethylene Receptor Expression in Regulating Apple Fruitlet Abscission. Giulia Eccher, Maura Begheldo, Andrea Boschetti, Benedetto Ruperti, and Alessandro Botton

The balance between the ethylene produced by the fruit and cell-specific expression of ethylene receptor genes in the seed affects the determinism of apple fruitlet abscission.

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Recent advances highlight the roles and mechanisms of the plant-specific VQ-motif-containing protein family in regulating stress and developmental processes.

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[OPEN] Transcription Factor Arabidopsis Activating Factor1 Integrates Carbon Starvation Responses with Trehalose Metabolism. Prashanth Garapati, Regina Feil, John Edward Lunn, Patrick Van Dijck, Salma Balazadeh, and Bernd Mueller-Roeber

A transcription factor regulates trehalase expression and induces a carbon starvation transcriptome and metabolome.

[OPEN] TRANSPARENT TESTA GLABRA1 Regulates the Accumulation of Seed Storage Reserves in Arabidopsis. Mingxun Chen, Bin Zhang, Chengxiang Li, Harikrishna Kavalerasingam, Fook Tim Chew, and Hao Yu

An Arabidopsis transcription factor regulates the accumulation of seed storage reserves, including storage proteins and fatty acids.

[OPEN] MUCILAGE-RELATED10 Produces Galactoglucomannan That Maintains Pectin and Cellulose Architecture in Arabidopsis Seed Mucilage. Cătălin Voiniciuc, Maximilian Heinrich-Wilhelm Schmidt, Adeline Berger, Bo Yang, Berit Ebert, Henrik V. Scheller, Helen M. North, Björn Usadel, and Markus Günl

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Half-of-the-Sites Reactivity of the Castor Δ9-18:0-Acyl Carrier Protein Desaturase. Qin Liu, Jin Chai, Martin Moche, Jodie Guy, Ylva Lindqvist, and John Shanklin

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Mutations in the Prokaryotic Pathway Rescue the fatty acid biosynthesis1 Mutant in the Cold. Jinpeng Gao, James G. Wallis, and John Browse

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Bioinformatics Reveal Five Lineages of Oleosins and the Mechanism of Lineage Evolution Related to Structure/Function from Green Algae to Seed Plants. Ming-Der Huang and Anthony H.C. Huang

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Sequence Motifs in Transit Peptides Act as Independent Functional Units and Can Be Transferred to New Sequence Contexts. Dong Wook Lee, Seungjin Woo, Kyoung Rok Geem, and Inhwan Hwang

Various sequence motifs in diverse transit peptides act as independent functional units and can be transferred to new sequence contexts with the possibility of a change in their functionality.


Pollen tube arrival at a synergid cell promotes its degeneration, and cytoplasmic discharge from the tube completes the process.

A Critical Role of Lyst-Interacting Protein5, a Positive Regulator of Multivesicular Body Biogenesis, in Plant Responses to Heat and Salt Stresses. Fei Wang, Yan Yang, Zhe Wang, Jie Zhou, Baofang Fan, and Zhixiang Chen

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Extra-Large G Proteins Expand the Repertoire of Subunits in Arabidopsis Heterotrimeric G Protein Signaling. David Chakravorty, Timothy E. Gookin, Matthew J. Milner, Yunqing Yu, and Sarah M. Assmann

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Overexpression of a poplar apyrase gene enhances vesicular trafficking and cold tolerance in Arabidopsis.

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Facing the Future: Effects of Short-Term Climate Extremes on Isoprene-Emitting and Nonemitting Poplar. The ability to emit isoprene does not protect poplar trees from realistic short-term and periodic drought and heat waves under proposed future conditions.


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Abscisic Acid Is a General Negative Regulator of Arabidopsis Axillary Bud Growth. The plant hormone abscisic acid functions as a general negative regulator of branching and may contribute to the effects of other hormones and proteins that control the process.

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Allelic variation in a blue-light photoreceptor modulates temperature sensitivity.

Elevation of Pollen Mitochondrial DNA Copy Number by WHIRLY2: Altered Respiration and Pollen Tube Growth in Arabidopsis. Qiang Cai, Liang Guo, Zhao-Rui Shen, Dan-Yang Wang, Quan Zhang, and Sodmergen

A DNA-binding protein affects mitochondrial DNA copy number in pollen vegetative cells, resulting in decreased mitochondrial respiration and pollen tube growth.

Genome Structure of the Heavy Metal Hyperaccumulator Noccaea caerulescens and Its Stability on Metalliferous and Nonmetalliferous Soils. Terezie Mandáková, Vasantika Singh, Ute Krämer, and Martin A. Lysak

Evolution of an alpine genome involved an unusually high number of pericentric inversions, plausibly facilitating the evolution of heavy metal-related traits.

Cell Type-Specific Gene Expression Analyses by RNA Sequencing Reveal Local High Nitrate-Triggered Lateral Root Initiation in Shoot-Borne Roots of Maize by Modulating Auxin-Related Cell Cycle Regulation. Peng Yu, Kai Eggert, Nicolaus von Wirén, Chunjian Li, and Frank Hochholdinger

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Mapping of a Cellulose-Deficient Mutant Named dwarf1-1 in Sorghum bicolor to the Green Revolution Gene gibberellin20-oxidase Reveals a Positive Regulatory Association between Gibberellin and Cellulose Biosynthesis. Carloalberto Petti, Ko Hirano, József Stork, and Seth DeBolt

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Regulation of Orange Carotenoid Protein Activity in Cyanobacterial Photoprotection. Adrien Thurotte, Rocio Lopez Igual, Adjéle Wilson, Léa Comelet, Céline Bourcier de Carbon, Fugui Xiao, and Diana Kirilovsky

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Abscisic acid-activated protein kinases interact with each other and with protein phosphatases that modulate abscisic acid responses.


A cytoplasmic calcineurin-like-dependent protein kinase affects salt and osmotic stress responses by preferentially localizing to the vacuolar membrane under stress.

Pseudomonas syringae Effector Avirulence Protein E Localizes to the Host Plasma Membrane and Down-Regulates the Expression of the NONRACE-SPECIFIC DISEASE RESISTANCE1/HARPIN-INDUCED1-LIKE13 Gene Required for Antibacterial Immunity in Arabidopsis.  Xiu-Fang Xin, Kinya Nomura, Xinhua Ding, Xujun Chen, Kun Wang, Kyaw Aung, Francisco Uribe, Bruce Rosa, Jian Yao, Jin Chen, and Sheng Yang He

A major plant plasma membrane-targeted bacterial virulence protein is linked to reduced expression of an Arabidopsis gene required for innate immunity.


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A Constitutively Active Allele of Phytochrome B Maintains Circadian Robustness in the Absence of Light.  Matthew Alan Jones, Wei Hu, Suzanne Litthauer, J. Clark Lagarias, and Stacey Lynn Harmer

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The Arabidopsis Mediator Complex Subunit16 Is a Key Component of Basal Resistance against the Necrotrophic Fungal Pathogen Sclerotinia sclerotiorum. Chenggang Wang, Jin Yao, Xuezhu Du, Yanping Zhang, Yijun Sun, Jeffrey A. Rollins, and Zhonglin Mou

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