

T H E P L A N T C E L L

Volume 28 Number 7 July 2016

The electronic form of this issue, available at www.plantcell.org, is the journal of record.

ON THE COVER



It is now widely accepted that the plastids of green plants evolved from an endosymbiotic cyanobacterium. Although most free-living bacteria have peptidoglycans in their cell walls, it is believed that the plastids of green plants lost the endosymbiotic peptidoglycan during evolution. However, in the moss *Physcomitrella patens*, Hirano et al. (pages 1521–1532) show that knockout transformants for a homolog of the bacterial peptidoglycan-synthetic gene encoding D-alanine (D-Ala):D-Ala ligase display disrupted chloroplast division, and the normal phenotype is recovered by the addition of D-Ala-D-Ala. The cover photo shows a reconstructed three-dimensional image of apical (lower right) and subapical protonemal cells. Using a sensitive metabolic labeling method for peptidoglycan with a D-Ala-D-Ala dipeptide probe and click chemistry, the authors reveal that the plastid peptidoglycan (green) completely surrounded the chloroplasts (magenta) of the moss. These findings suggest that the plastids of basal land plants have a peptidoglycan wall containing D-amino acids.

IN BRIEF

- Invisible No Longer: Peptidoglycan in Moss Chloroplasts** [OPEN](#) 1505
Nancy R. Hofmann
- Shape-Shifters: How Strigolactone Signaling Helps Shape the Shoot** [OPEN](#) 1506
Jennifer Lockhart
- Divide and Conquer: Introducing a Novel Player in Cell Plate Formation** [OPEN](#) 1508
Kathleen L. Farquharson

PERSPECTIVE

- Advancing Crop Transformation in the Era of Genome Editing** [OPEN](#) 1510
Fredy Altpeter, Nathan M. Springer, Laura E. Bartley, Ann E. Blechl, Thomas P. Brutnell, Vitaly Citovsky, Liza J. Conrad, Stanton B. Gelvin, David P. Jackson, Albert P. Kausch, Peggy G. Lemaux, June I. Medford, Martha L. Orozco-Cárdenas, David M. Tricoli, Joyce Van Eck, Daniel F. Voytas, Virginia Walbot, Kan Wang, Zhanyuan J. Zhang, and C. Neal Stewart Jr.

BREAKTHROUGH REPORT

- Moss Chloroplasts Are Surrounded by a Peptidoglycan Wall Containing D-Amino Acids** [OPEN](#) 1521
Takayuki Hirano, Koji Tanidokoro, Yasuhiro Shimizu, Yutaka Kawarabayasi, Toshihisa Ohshima, Momo Sato, Shinji Tadano, Hayato Ishikawa, Susumu Takio, Katsuaki Takechi, and Hiroyoshi Takano

LARGE-SCALE BIOLOGY ARTICLES

- Evolutionarily Distinct BAHD N-Acyltransferases Are Responsible for Natural Variation of Aromatic Amine Conjugates in Rice** [OPEN](#) 1533
Meng Peng, Yanqiang Gao, Wei Chen, Wensheng Wang, Shuangqian Shen, Jian Shi, Cheng Wang, Yu Zhang, Li Zou, Shouchuang Wang, Jian Wan, Xianqing Liu, Liang Gong, and Jie Luo

EDITORIAL BOARD

Editor in Chief

Sabeeha Merchant

Senior Editors

Sebastian Bednarek

James Birchler

Ralph Bock

George Coupland

Pascal Genschik

Jean Greenberg

Joseph Kieber

Daniel J. Kliebenstein

Barry Pogson

Reviewing Editors

Michael Axtell

Magdalena Bezanilla

Siobhan Brady

Robin Buell

XiaoFeng Cao

Kent Chapman

Clint Chapple

Sean Cutler

Dean Della Penna

Xinnian Dong

Herman R. Hofte

Inwhan Hwang

Regine Kahmann

Ute Kraemer

Barbara Kunkel

J. Clark Lagarias

Zach Lippman

Tesfaye Mengiste

Blake Meyers

Harvey Millar

Ortrun Mittelsten Scheid

Giles E. Oldroyd

Naomi Ori

Markus Pauly

Eugenia (Jenny) Russinova

Dale Sanders

Karin Schumacher

Keiko Sugimoto

Tai-ping Sun

Marja Timmermans

Michael Udvardi

Andreas Weber

Guest Editors

Alice Barkan

Andrea Barta

Judy Callis

Ram Dixit

Elizabeth Haswell

Liwen Jiang

Jinsheng Lai

Jim Leebens-Mack

Yonghua Li-Beisson

Damon Lisch

Hongtao Liu

Peter Nagy

Erik Nielsen

Michael Palmgren

Hitoshi Sakakibura

David Smyth

Klaas van Wijk

Jeanmarie Verchot

Dan Voytas

Sam Zeeman

Xiaoyu Zhang

Consulting Editors

Volker Brendel

Erin Connolly

A Sorghum Mutant Resource as an Efficient Platform for Gene Discovery in Grasses ^{OPEN} 1551

Yinping Jiao, John Burke, Ratan Chopra, Gloria Burow, Junping Chen, Bo Wang, Chad Hayes, Yves Emendack, Doreen Ware, and Zhanguo Xin

RESEARCH ARTICLES

The Slicer Activity of ARGONAUTE1 Is Required Specifically for the Phasing, Not Production, of *Trans*-Acting Short Interfering RNAs in Arabidopsis ^{OPEN} 1563

Laura Arribas-Hernández, Antonin Marchais, Christian Poulsen, Bettina Haase, Judith Hauptmann, Vladimir Benes, Gunter Meister, and Peter Brodersen

SMAX1-LIKE7 Signals from the Nucleus to Regulate Shoot Development in Arabidopsis via Partially EAR Motif-Independent Mechanisms ^{OPEN} 1581

Yueyang Liang, Sally Ward, Ping Li, Tom Bennett, and Ottoline Leyser

CLAUSA Is a MYB Transcription Factor That Promotes Leaf Differentiation by Attenuating Cytokinin Signaling 1602

Maya Bar, Alon Israeli, Matan Levy, Hadas Ben Gera, José M. Jiménez-Gómez, Stepan Kouril, Petr Tarkowski, and Naomi Ori

Circadian Stress Regimes Affect the Circadian Clock and Cause Jasmonic Acid-Dependent Cell Death in Cytokinin-Deficient Arabidopsis Plants ^{OPEN} 1616

Silvia Nitschke, Anne Cortleven, Tim Iven, Ivo Feussner, Michel Havaux, Michael Riefler, and Thomas Schmülling

Global Regulation of Plant Immunity by Histone Lysine Methyl Transferases 1640

Sanghun Lee, Fuyou Fu, Siming Xu, Sang Yeol Lee, Dae-Jin Yun, and Tesfaye Mengiste

Arabidopsis HOOKLESS1 Regulates Responses to Pathogens and Abscisic Acid through Interaction with MED18 and Acetylation of WRKY33 and ABI5 Chromatin 1662

Chao-Jan Liao, Zhibing Lai, Sanghun Lee, Dae-Jin Yun, and Tesfaye Mengiste

Biosynthesis of 8-O-Methylated Benzoxazinoid Defense Compounds in Maize 1682

Vinzenz Handrick, Christelle A.M. Robert, Kevin R. Ahern, Shaoqun Zhou, Ricardo A.R. Machado, Daniel Maag, Gaetan Glauser, Felix E. Fernandez-Penny, Jima N. Chandran, Eli Rodgers-Melnik, Bernd Schneider, Edward S. Buckler, Wilhelm Boland, Jonathan Gershenzon, Georg Jander, Matthias Erb, and Tobias G. Köllner

The Arabidopsis Malectin-Like/LRR-RLK IOS1 Is Critical for BAK1-Dependent and BAK1-Independent Pattern-Triggered Immunity 1701

Yu-Hung Yeh, Dario Panzeri, Yasuhiro Kadota, Yi-Chun Huang, Pin-Yao Huang, Chia-Nan Tao, Milena Roux, Hsiao-Chiao Chien, Tzu-Chuan Chin, Po-Wei Chu, Cyril Zipfel, and Laurent Zimmerli

Arabidopsis CSLD5 Functions in Cell Plate Formation in a Cell Cycle-Dependent Manner ^{OPEN} 1722

Fangwei Gu, Martin Bringmann, Jonathon R. Combs, Jiyan Yang, Dominique C. Bergmann, and Erik Nielsen

Alisdair Fernie
Oliver Jensen
Nathan Nelson
Scott Peck
Pam Soltis
Frances-Andre Wollman

Senior Features Editor
Nancy A. Eckardt

Features Editor
Mary Williams

Science Editors
Greg Bertoni
Kathleen L. Farquharson
Nancy R. Hofmann
Jennifer Lockhart
Jennifer M. Mach

Managing Editor
Patti Lockhart

Issue Manager
Felicia Dadak

Production Manager
Susan L. Entwistle

Manuscript Manager
Annette Kessler

Publications Director
Nancy A. Winchester

Publisher
American Society of
Plant Biologists
Executive Director,
Crispin Taylor

Editorial Office
15501 Monona Drive
Rockville, Maryland 20855-2768
Telephone: 301/296-0908
Online at www.plantcell.org

**Multiple Calmodulin-Binding Sites Positively and Negatively
Regulate Arabidopsis CYCLIC NUCLEOTIDE-GATED
CHANNEL12**

1738

Thomas A. DeFalco, Christopher B. Marshall, Kim Munro,
Hong-Gu Kang, Wolfgang Moeder, Mitsuhiro Ikura,
Wayne A. Snedden, and Keiko Yoshioka

CORRECTION

1752

Khozai, M., Fisk, S., Lawson, T., Gibon, Y., Sulpice, R., Stitt, M.,
Lefebvre, S.C., and Raines, C.A. (2015). Overexpression of plastid
transketolase in tobacco results in a thiamine auxotrophic phenotype.
Plant Cell 27: 432–447. [OPEN](#)

[OPEN](#) Articles can be viewed without a subscription.



© 2016 American Society of Plant
Biologists. All rights reserved.

The Plant Cell (eISSN 1532-298X) is published monthly (one volume per year) by the American Society of Plant Biologists, 15501 Monona Drive, Rockville, MD 20855-2768, and is produced by Dartmouth Journal Services, Waterbury, VT. The institutional subscription price is based on type of institution; contact institution@aspb.org. Members of the American Society of Plant Biologists may subscribe to *The Plant Cell* for \$240. Nonmember individuals may subscribe for \$500. Students may subscribe for \$165. For matters regarding subscriptions, contact Suzanne Cholwek, ASPB, 15501 Monona Drive, Rockville, MD 20855-2768; telephone 301/296-0926; fax 301/251-6740; e-mail scholwek@aspb.org. Send all inquiries regarding display advertising to FASEB AdNet, 9650 Rockville Pike, Bethesda, MD 20814-3998; telephone 301/634-7791; fax 301/634-7153; e-mail adnet@faseb.org. The online version of *The Plant Cell* is available at www.plantcell.org.

Permission to Reprint: Permission to make digital or hard copies of part or all of a work published in *The Plant Cell* is granted without fee for personal or classroom use provided that copies are not made or distributed for profit or commercial advantage and that copies bear the full citation and the following notice on the first page: "Copyright American Society of Plant Biologists." For all other kinds of copying, request permission in writing from Nancy A. Winchester, Publications Director, ASPB headquarters.

This information is current as of October 24, 2020

Permissions	https://www.copyright.com/ccc/openurl.do?sid=pd_hw1532298X&issn=1532298X&WT.mc_id=pd_hw1532298X
eTOCs	Sign up for eTOCs at: http://www.plantcell.org/cgi/alerts/ctmain
CiteTrack Alerts	Sign up for CiteTrack Alerts at: http://www.plantcell.org/cgi/alerts/ctmain
Subscription Information	Subscription Information for <i>The Plant Cell</i> and <i>Plant Physiology</i> is available at: http://www.aspb.org/publications/subscriptions.cfm