

Martin C. Jonikas, Ph.D.

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VISION

My group seeks to advance our basic understanding of cell biology by developing game-changing tools. We are focused on photosynthetic organisms because they play central roles in nearly every aspect of our lives, from producing all the food that we eat to driving global energy and nutrient cycles. We are developing community resources for the unicellular green alga *Chlamydomonas* as a model system for photosynthetic organisms. We are advancing the molecular understanding of the pyrenoid, a phase-separated organelle that plays a central role in the global carbon cycle. My group also seeks to nurture and train future world-leading scientists.

EDUCATION

- 2004 B.S., Aerospace Engineering, Massachusetts Institute of Technology
- 2009 Ph.D., Biochemistry and Molecular Biology, University of California, San Francisco. Research advisors: Dr. Jonathan Weissman and Dr. Peter Walter

PROFESSIONAL POSITIONS

- 2010-2016 Young Investigator (faculty position equivalent to Assistant Professor), Department of Plant Biology, Carnegie Institution for Science, Stanford, CA
- 2011-2016 Assistant Professor by courtesy, Department of Biology, Stanford University, Stanford, CA
- 2016-present Assistant Professor, Department of Molecular Biology, Princeton University, Princeton, NJ

AWARDS AND HONORS

- 2002 1st place, MIT 2.007 Robotics Competition
- 2005 National Science Foundation Graduate Research Fellowship

2009	Harvard Bauer Fellowship (<i>declined</i>)
2010	Air Force Office of Scientific Research Young Investigator Award
2015	National Institutes of Health Director's New Innovator Award
2016	HHMI-Simons Faculty Scholar Award

TEACHING

2012-2016	Stanford BIO 214 Advanced Cell Biology
2014	Stanford BIOC 223 Open Problems in Biology (MOOC)
2017-present	Princeton MOL 380 Microbiology

DEPARTMENTAL AND UNIVERSITY SERVICE

2010	Member, Carnegie Department of Plant Biology website committee
2011, 2012	Co-wrote NSF Major Research Instrumentation (MRI) proposals for the Carnegie Department of Plant Biology
2011-2016	Co-organizer, Carnegie Department of Plant Biology seminar series
2012-2016	Member, Carnegie Plant Biology/Global Ecology Joint IT Committee
2014	Co-organizer, Carnegie Plant Biology retreat at Fallen Leaf Lake
2017-2018	Member, Princeton Molecular Biology Cryo Electron Microscopy Search Committee
2017-present	Chair, Princeton Molecular Biology Postdoctoral Career Development
2018	Speaker, Princeton China Executive Summit Program
2019	Member, Princeton Molecular Biology Cryo Electron Microscopy Search Committee
2019	Member, Princeton Molecular Biology Graduate Committee

PROFESSIONAL SERVICE

- 2010-present Reviewer for *Nature*, *Cell*, *Nature Biotechnology*, *Nature Microbiology*, *Nature Communications*, *Proceedings of the National Academy of Sciences*, *The Plant Cell*, *Plant Physiology*, *The Plant Journal*, and other journals.
- 2013-present Reviewer for the U.S. National Science Foundation, U.S. Department of Energy and the Gordon and Betty Moore Foundation.
- 2017-present Member, Advisory Board, Merck KGaA
- 2018 Panelist, DOE BER Workshop on Breaking the Bottleneck of Genomes
- 2018 Panelist, Academic Career Panel, Rutgers University

OUTREACH

In collaboration with songwriter Jonathan Mann, the Jonikas laboratory has produced three outreach music videos:

- 2015 Sammy the Chlamy (>2,600 views)
<https://www.youtube.com/watch?v=f1F4lxKF41g&feature=youtu.be>
A puppet music video about an alga helping crops do better photosynthesis. This video was the subject of an ASCB article:
<http://www.ascb.org/ascb-post/sammy-chlamy-superhero-environment/>
- 2016 The Photosynthesis Song (>7,300 views)
<https://www.facebook.com/Jonathanmann/videos/10153653902265741/?l=578396365785804152>
A song of fun facts about photosynthesis.
- 2016 The Jonikas Lab Song (>1,400 views)
<https://www.youtube.com/watch?v=fKncJDUNAIU>
A song about our lab.

PUBLICATIONS

Haass FA, **Jonikas M**, Walter P, Weissman JS, Jan YN, Jan LY, & Schuldiner M. 2007. Identification of yeast proteins necessary for cell-surface function of a potassium channel. *Proceedings of the National Academy of Sciences U S A.* 104: 18079-18084. PMID: PMC2084299

Jonikas MC, Collins SR, Denic V, Oh E, Quan EM, Schmid V, Weibezahn J, Schwappach B, Walter P, Weissman JS, & Schuldiner M. 2009. Comprehensive characterization of genes required for protein folding in the endoplasmic reticulum. *Science.* 323: 1693-1697. PMID: PMC2877488

Vembar SS, **Jonikas MC**, Hendershot LM, Weissman JS, & Brodsky JL. 2010. J domain co-chaperone specificity defines the role of BiP during protein translocation. *Journal of Biological Chemistry.* 285: 22484-22494. PMID: PMC2903355

Battle A, **Jonikas MC**, Walter P, Weissman JS, & Koller D. 2010. Automated identification of pathways from quantitative genetic interaction data. *Molecular Systems Biology.* 6: 379. PMID: PMC2913392

*Zhang R, *Patena W, Armbruster U, Gang SS, Blum SR, & **Jonikas MC**. 2014. High-Throughput Genotyping of Green Algal Mutants Reveals Random Distribution of Mutagenic Insertion Sites and Endonucleolytic Cleavage of Transforming DNA. *The Plant Cell.* 26: 1398-1409. PMID: PMC4036561. *equal contribution

Avasthi P, Onishi M, Karpiak J, Yamamoto R, Mackinder L, **Jonikas MC**, Sale WS, Shoichet B, Pringle JR, & Marshall WF. 2014. Actin is required for IFT regulation in *Chlamydomonas reinhardtii*. *Current Biology.* 24: 2025-2032. PMID: PMC4160380

Li X, Umen JG, & **Jonikas MC**. 2014. Waking sleeping algal cells. *Proceedings of the National Academy of Sciences U S A.* 111: 15610-15611. PMID: PMC4226088

Yang W, Catalanotti C, D'Adamo S, Wittkopp TM, Ingram-Smith CJ, Mackinder L, Miller TE, Heuberger AL, Peers G, Smith KS, **Jonikas MC**, Grossman AR, & Posewitz MC. 2014. Alternative Acetate Production Pathways in *Chlamydomonas reinhardtii* during Dark Anoxia and the Dominant Role of Chloroplasts in Fermentative Acetate Production. *The Plant Cell.* 26: 4499-4518. PMID: PMC4277214

Armbruster U, Carrillo LR, Venema K, Pavlovic L, Schmidtman E, Kornfeld A, Jahns P, Berry JA, Kramer DM, & **Jonikas MC**. 2014. Ion antiport accelerates photosynthetic acclimation in fluctuating light environments. *Nature Communications.* 5: 5439. PMID: PMC4243252

Terashima M, Freeman ES, Jinkerson RE, & **Jonikas MC**. 2015. A fluorescence-activated cell sorting-based strategy for rapid isolation of high-lipid *Chlamydomonas* mutants. *The Plant Journal*. 81: 147-59. PMID: PMC4280329

Jinkerson RE & **Jonikas MC**. 2015. Molecular techniques to interrogate and edit the *Chlamydomonas* nuclear genome. *The Plant Journal*. 82: 393–412. PMID: 25704665

Atkinson N, Feike D, Mackinder LC, Meyer MT, Griffiths H, **Jonikas MC**, Smith AM, & McCormick AJ. 2015. Introducing an algal carbon-concentrating mechanism into higher plants: location and incorporation of key components. *Plant Biotechnology Journal*. 14: 1302-15. PMID: 26538195

*Yang W, *Wittkopp TM, Li X, Warakanont J, Dubini A, Catalanotti C, Kim RG, Nowack EC, Mackinder LC, Aksoy M, Page MD, D'Adamo S, Saroussi S, Heinnickel M, Johnson X, Richaud P, Alric J, Boehm M, **Jonikas MC**, Benning C, Merchant SS, Posewitz MC, & Grossman AR. *equal contribution. 2015. Critical role of *Chlamydomonas reinhardtii* ferredoxin-5 in maintaining membrane structure and dark metabolism. *Proceedings of the National Academy of Sciences U S A*. 112: 14978-83. PMID: 26627249

*Li X, *Zhang R, *Patena W, Gang SS, Blum SR, Ivanova N, Yue R, Robertson JM, Lefebvre P, Fitz-Gibbon ST, Grossman AR, & **Jonikas MC**. *equal contribution. 2016. An indexed, mapped mutant library enables reverse genetics studies of biological processes in *Chlamydomonas reinhardtii*. *The Plant Cell*. 28: 367-87. PMID: 26764374

Li X & **Jonikas MC**. 2016. High-throughput genetics strategies for identifying new components of lipid metabolism in the green alga *Chlamydomonas reinhardtii*. Chapter 10 in *Lipids in Plant and Algae Development*, Y. Nakamura, Y. Li-Beisson (eds.), Springer. PMID: 27023238

Armbruster U, Leonelli L, Correa Galvis V, Strand D, Quinn EH, **Jonikas MC**, & Niyogi KK. 2016. Regulation and Levels of the Thylakoid K⁺/H⁺ Antiporter KEA3 Shape the Dynamic Response of Photosynthesis in Fluctuating Light. *Plant Cell Physiology*. 57: 1557-1567. PMID: 27335350

Mackinder LC, Meyer MT, Mettler-Altmann T, Chen VK, Mitchell MC, Caspari O, Freeman Rosenzweig ES, Pallesen L, Reeves G, Itakura A, Roth R, Sommer F, Geimer S, Mühlhaus T, Schroda M, Goodenough U, Stitt M, Griffiths H, & **Jonikas MC**. 2016. A repeat protein links Rubisco to form the eukaryotic carbon-concentrating organelle. *Proceedings of the National Academy of Sciences U S A*. 113: 5958-63. PMID: 27166422

Freeman Rosenzweig ES, Xu B[†], Kuhn Cuellar L[†], Martinez-Sanchez A, Schaffer M, Strauss M, Cartwright HN, Plitzko JM, Förster F, Wingreen NS*, Engel BD*, Mackinder LCM[‡], & **Jonikas MC^{‡*}**. [†]These authors contributed equally to this work. [‡]These authors contributed equally to

this work. *Corresponding authors. 2017. The eukaryotic CO₂ concentrating organelle is liquid-like and exhibits dynamic reorganization. *Cell*. 171:148-162. PMID: 28938114
Highlighted on the cover of Cell.

Mackinder LCM, Chen C, Leib RD, Patena W, Blum SR, Rodman M, Ramundo S, Adams CM, & **Jonikas MC**. 2017. A spatial interactome reveals the anatomy of the algal CO₂ concentrating mechanism. *Cell*. 171:133-147. PMID: 28938113
Highlighted in a Cell Preview by Jean-David Rochaix.

Shurtleff MJ, Itzhak DN, Hussmann JA, Schirle Oakdale NT, Costa EA, **Jonikas M**, Weibezahn J, Popova KD, Jan CH, Sinitcyn P, Vembar SS, Hernandez H, Cox J, Burlingame AL, Brodsky JL, Frost A, Borner GH, & Weissman JS. 2018. The ER membrane protein complex interacts cotranslationally to enable biogenesis of multipass membrane proteins. *eLife*. doi: 10.7554/eLife.37018. PMID: 29809151

Küken A, Sommer F, Yaneva-Roder L, Mackinder LC, Höhne M, Geimer S, **Jonikas MC**, Schroda M, Stitt M, Nikoloski Z, & Mettler-Altmann T. 2018. Effects of microcompartmentation on flux distribution and metabolic pools in *Chlamydomonas reinhardtii* chloroplasts. *eLife*. doi: 10.7554/eLife.37960. PMID: 30306890

Li X, Patena W, Fauser F, Jinkerson RE, Saroussi S, Meyer MT, Ivanova N, Robertson JM, Yue R, Zhang R, Vilarrasa-Blasi J, Wittkopp TM, Ramundo S, Blum SR, Goh A, Laudon M, Srikumar T, Lefebvre PA, Grossman AR, & **Jonikas MC**. 2019. A genome-wide algal mutant library reveals a global view of genes required for eukaryotic photosynthesis. *Nature Genetics*. doi: 10.1038/s41588-019-0370-6.

BOOK

Fauser F & **Jonikas M**, editors. 2018. *Plant Chemical Genomics: Methods and Protocols. Methods in Molecular Biology*. Springer. ISBN 978-1-4939-7874-8.

PATENTS AND PATENT APPLICATIONS

Armbruster U, Niyogi KK, & **Jonikas MC**. 2015. Photosynthetic Acclimation and Increased Biomass Production in Fluctuating Light Environments.

Mackinder LCM, Meyer MT, Mettler-Altmann T, Pallesen L, Stitt M, Griffiths H, & **Jonikas MC**. 2016. Algal Components of the Pyrenoid's Carbon Concentrating Mechanism.

Mackinder LCM & **Jonikas MC**. 2017. Spatial Interactome Reveals the Anatomy of the Algal CO₂ Concentrating Mechanism.

SEMINARS PRESENTED

- 2009 Center for Systems Biology, Harvard, Cambridge, MA
- 2009 Department of Plant Biology, Carnegie Institution for Science, Stanford, CA
- 2011 Invited talk, Donald Danforth Plant Sciences Center, St. Louis, MO
- 2012 15th International Conference on the Cell & Molecular Biology of Chlamydomonas, Potsdam, Germany
- 2012 Student-Invited Seminar, Michigan State University, East Lansing, MI
- 2013 Session Chair, 22nd Western Photosynthesis Conference, Asilomar, CA
- 2013 Invited Seminar, Plant Biology Graduate Group, UC Davis, Davis, CA
- 2013 16th International Congress on Photosynthesis, St Louis, MO
- 2013 Invited Seminar, Arizona State University, Tempe, AZ
- 2014 23rd Western Photosynthesis Conference, Asilomar, CA
- 2014 Invited Speaker, UC San Diego Food & Fuel for the 21st Century Symposium, San Diego, CA
- 2014 Invited Speaker, Gordon Research Conference on Photosynthesis, West Dover, VT
- 2014 Keynote Speaker, Harvard Medical School Systems Biology Ph.D. Program Retreat, Woods Hole, MA
- 2015 Invited Speaker and Session Chair, 24th Western Photosynthesis Conference, Asilomar, CA
- 2015 Invited Speaker, ASCB Bay Area Meeting on Organelle Biology 2015, San Francisco, CA
- 2015 Co-chair and Speaker, Organelle Minisymposium, ASCB 2015 Meeting, San Diego, CA
- 2016 Department of Molecular Biology, Princeton University, Princeton, NJ
- 2016 Plant Research Laboratory, Michigan State University, East Lansing, MI
- 2016 ChEM-H Institute, Stanford University, Stanford, CA

- 2016 17th International Conference on the Cell and Molecular Biology of *Chlamydomonas*, Kyoto, Japan
- 2016 Invited Speaker, 17th International Congress on Photosynthesis Research, Maastricht, Netherlands
- 2016 HHMI Faculty Scholars Orientation, Chevy Chase, MD
- 2017 Invited Speaker, Gordon Research Conference on Chloroplast Biotechnology, Ventura, CA
- 2017 Invited Speaker, Gordon Research Conference on CO₂ Assimilation in Plants from Genome to Biome, Lucca, Italy
- 2017 Invited Speaker, Chloroplast Metabolism and Photosynthesis Symposium, Neuchâtel, Switzerland
- 2017 Invited Speaker, ETH Zurich Plant Sciences Symposium, Zurich, Switzerland
- 2017 Invited Seminar, Department of Embryology, Carnegie Institution for Science, Baltimore, MD
- 2018 Invited Speaker, Plant and Animal Genome Conference, San Diego, CA
- 2018 Invited Seminar, Department of Plant Biology and Pathology, Rutgers University, NJ
- 2018 Invited Speaker, HHMI Science Meeting, Ashburn, VA
- 2018 Invited Seminar, J. Craig Venter Institute, La Jolla, CA
- 2018 Invited Seminar, Nature Publishing Group, New York, NY
- 2018 Invited Seminar, Rockefeller University, New York, NY
- 2018 EMBO/EMBL Symposium: Cellular Mechanisms Driven by Liquid Phase Separation, EMBL, Heidelberg, Germany
- 2018 Invited Speaker, 18th International Conference on the Cell and Molecular Biology of *Chlamydomonas*, Washington, DC
- 2018 Invited Speaker, Society for Experimental Biology Annual Meeting, Florence, Italy
- 2018 Invited Speaker, Mitochondria and Chloroplasts Gordon Research Conference, Lucca, Italy

- 2019 Plenary Speaker, Phase Separation in Biology and Disease, New York Academy of Sciences, New York, NY
- 2019 Invited Seminar, Department of Geosciences, Princeton University, Princeton, NJ
- 2019 Invited Seminar, Department of Plant Biology, Carnegie Institution for Science, Stanford, CA
- 2019 Keynote Speaker, Eastern Regional Photosynthesis Conference, Woods Hole, MA
- 2019 Invited Seminar, John Innes Centre, Norwich, England
- 2019 Invited Speaker, Centre for Organismal Studies Symposium, Heidelberg University, Heidelberg, Germany

RESEARCH FUNDING

- 2010-2013 Air Force Office of Scientific Research Young Investigator Award
"Novel Genetic Tools to Accelerate our Understanding of Photosynthesis and Lipid Accumulation." (PI)
\$421,591 (*total direct + indirect*)
- 2011 Air Force Office of Scientific Research Defense University Research Instrumentation Award
"Photobioreactors to Transform our Understanding of Photosynthesis." (PI)
\$104,177
- 2011-2014 NSF Surpassing Evolution: Transformative Approaches to Enhance the Efficiency of Photosynthesis
"CAPP: Combining Algal and Plant Photosynthesis." (PI)
\$719,927
- 2012-2017 National Science Foundation Molecular and Cell Biology
"A mutant resource to transform reverse genetics in *Chlamydomonas*." (PI)
\$2,502,749
- 2014-2017 National Science Foundation Surpassing Evolution: Transformative Approaches to Enhance the Efficiency of Photosynthesis
"CAPP2: Combining Algal and Plant Photosynthesis." (PI)
\$779,334
- 2015-2020 National Institutes of Health Director's New Innovator Award
"Transforming our understanding of eukaryotic gene functions through chemical genetics in the green alga *Chlamydomonas reinhardtii*." (PI)
\$2,475,000
- 2016-2021 Howard Hughes Medical Institute-Simons Faculty Scholar Award
"Foundations for enhancing photosynthesis: a systems approach." (PI)
\$600,000

RESEARCH SUPERVISION

Staff Awards:

Ellen Brindle-Clark, my faculty assistant, was selected for a Princeton Tiger Award in 2017 in recognition for going above and beyond her normal job responsibilities in helping my laboratory move from Stanford to Princeton.

Elizabeth (Betsy) Hart, a graduate teaching assistant for my MOL380 class, won the Graduate Student Teaching Award in 2018.

Trainee Awards:

Ute Armbruster, Ph.D., a postdoctoral fellow in my laboratory, won a postdoctoral fellowship from the DFG German Research Foundation in 2011 (~\$90,000 over 2 years).

Mia Terashima, Ph.D., a postdoctoral fellow in my laboratory, won a postdoctoral fellowship from the Agriculture and Food Research Initiative in 2011 (~\$90,000 over 2 years).

Luke Mackinder, Ph.D., a postdoctoral fellow in my laboratory, was awarded a Carnegie McClintock Fellowship in 2014 (~\$60,000 over one year).

Robert Jinkerson, Ph.D., a postdoctoral fellow in my laboratory, won a postdoctoral fellowship from the Simons Foundation through the Life Science Research Foundation in 2014 (~\$160,000 over 3 years).

Augustine Chemparathy, a high school student, was a Finalist in the 2015 Intel Science Talent Search competition as a result of his project in my laboratory.

Elizabeth Freeman Rosenzweig, a graduate student in my laboratory, won a 2014-2015 Achievement Rewards for College Students Scholarship (~\$40,000).

Vivian Chen, a graduate student in my laboratory, won an NSF Graduate Research Fellowship in 2015 (~\$120,000 over 3 years).

Friedrich Fauser, Ph.D., a postdoctoral fellow in my laboratory, won a postdoctoral fellowship from the DAAD German Academic Exchange Service in 2015 (~\$30,000 over 2 years).

Moshe Kafri, Ph.D., a postdoctoral fellow in my laboratory, won postdoctoral fellowships from the European Molecular Biology Organization (~\$110,000 over 2 years) and from the Human Frontiers Science Program (~\$180,000 over 3 years) in 2018.

High School Trainees:

2013-2014	Augustine Chemparathy
2014	Zoe Friedberg
2014-2015	Shriya Ghosh

Undergraduate Trainees:

2012	Graciela Watrous
2012	Elisabeth Schmidtman
2012	Rachel Purdon
2013	Jason Middleton
2013	John Nguyen
2014	Jessie Bacha
2014	Rachel Vasquez
2014	Matthew Rodman
2014-2015	Chris Chen
2015-2016	Kyssia Mendoza
2016	Jackie Osaki
2016	Matthew Millican
2016	Matthew Nemeth
2016	Charlotte Philp
2017	Katie Kavanaugh
2017	Bradley Spicher
2017	Michael Hill-Oliva
2018	Toluwalase Olusola
2018	Izabela Szymanski
2018-2019	Kelly Van Baalen
2018-2019	Yihua Xie
2019-present	Alexandra Wilson
2019-present	Sophia Gavrilenko

Predoctoral Trainees:

2012-2017	Elizabeth Freeman Rosenzweig. Now Law Student, U.C. Berkeley.
2012-2017	Matthew Prior (was joint with Wolf Frommer). Now Postdoctoral Fellow, U.C. Riverside.
2012	Madeline Mitchell (visiting Ph.D. student). Now Postdoctoral Fellow, CSIRO, Canberra, Australia.
2013	Oliver Caspari (visiting Ph.D. student). Now Molecular Biologist at CNRS, Paris, France.
2014-2016	Alan Itakura (transferred to Dan Jarosz lab due to our move to Princeton).
2014-2016	Vivian Chen (NSF Fellow, transferred to Gavin Sherlock lab due to our move to Princeton).
2017-present	Guanhua He (joint with Ned Wingreen).
2018-present	Jessica Hennacy
2019-present	Eric Franklin

Postdoctoral Trainees:

- 2010-2016 **Ru Zhang, Ph.D.** Now Principal Investigator, Donald Danforth Plant Sciences Center.
- 2011-2014 **Ute Armbruster, Ph.D.** Now Group Leader, Max Planck Institute for Molecular Plant Physiology.
- 2011-2013 **Mia Terashima, Ph.D.** Now Assistant Professor, Hokkaido University, Japan.
- 2011-2015 **Leif Pallesen, Ph.D.** Now Instructor, Foothill College, CA.
- 2012-2016 **Luke Mackinder, Ph.D.** Now Assistant Professor, University of York, England.
- 2012-2018 **Xiaobo Li, Ph.D.** Now Assistant Professor, Westlake Institute for Advanced Studies, Hangzhou, China.
- 2014-2017 **Robert Jinkerson, Ph.D.** Now Assistant Professor, U.C. Riverside, CA.
- 2015-2017 **Friedrich Fauser, Ph.D.** Now Scientist II, Sangamo Therapeutics.
- 2016-present **Shan He, Ph.D.**
- 2017-present **Moritz Meyer, Ph.D.**
- 2017-present **Lianyong Wang, Ph.D.**
- 2017-present **Moshe Kafri, Ph.D.**

Technical staff:

- 2010-2012 **Spencer Gang.** Now Ph.D. Student, U.C. Los Angeles.
- 2011-present **Weronika Patena.**
- 2011-2013 **Sean Blum.** Now Ph.D. student, U.C. Santa Cruz.
- 2012-2016 **Nina Ivanova.** Now Nursing student, U.C. San Francisco.
- 2013 **Saman Parsa.** Now Enologist, Sonoma-Cutrer Vineyards, California.
- 2013-2014 **Gregory Reeves.** Now Ph.D. student, Cambridge University, England.
- 2013-2015 **Rebecca Yue.** Now Technical Staff Member, Augmedix, Inc., San Francisco.
- 2015-2016 **Jacob Robertson.** Now Ph.D. student, U.C. San Diego.
- 2016 **Chris Chen.** Now Research Associate, Caltech.
- 2016 **Ana Benveniste.** Now Laboratory Assistant, Carnegie Institution for Science.
- 2016-present **Audrey Goh.**