

BERKLEY J. WALKER

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RESEARCH IMPACT STATEMENT

My interests are in understanding fluxes of carbon and energy through central metabolism to better model plant responses to climate change and design improvement strategies. In recent work with formal metabolic flux analysis, I have used $^{13}\text{CO}_2$ labeling to map fluxes through central metabolism in illuminated leaves. This work helped resolve the biochemical source for a major loss of CO_2 during metabolism that reduces the total amount of CO_2 taken up by a leaf during photosynthesis. Additional work from my lab demonstrates that photorespiration does not operate as a “closed” cycle, with ~30% of the carbon leaving the cycle as serine. Currently, I use mass flux analysis to determine the links between photorespiration and one-carbon metabolism. In addition to tracking carbon, I am also interested in integrating which mechanisms balance the supply of energy from the light reactions of photosynthesis with demand from central metabolism. I have determined that some processes (like cyclic electron flow) dominate in energy balancing under high rates of flux. I am currently investigating what other processes are involved in energy balancing under long and short-term changes in energy demand. In addition to biochemical scales, I also work at field and regional scales. For example, my work indicates that photosynthetic inefficiencies like photorespiration lose ~80 times more energy than human-applied energy during food production, highlighting the potential impact of improving photosynthesis to increasing the sustainability of agriculture.

EDUCATION

Ph.D., Molecular Plant Sciences, 2013, Washington State University, Pullman WA. Dissertation: [“Determining the response of leaf photosynthetic carbon metabolism and energy balance to changes in temperature, \$\text{CO}_2\$ and nitrogen form”](#)
B.S., Microbiology, 2007, Brigham Young University, Provo UT.

PROFESSIONAL EXPERIENCE

2018 -	Assistant Professor, Michigan State University, Plant Biology/Plant Research Lab
2016-2018	Humboldt-Bayer Research Fellow, University of Düsseldorf
2013-2015	Research Plant Physiologist, USDA/ARS, University of Illinois, Urbana IL
2008-2013	Research/Teaching Assistant, Washington State University, Pullman WA
2007-2008	Product Manager, Decagon Devices Inc., Pullman WA
1998-2007	Founder/Owner, BerkleyBars SP, Portland OR and Provo UT

PUBLICATIONS: (Google Scholar)

Refereed:

1. Xinyu Fu, Berkley J Walker (2023). [Dynamic Response of Photorespiration in Fluctuating Light Environments](#), *Journal of Experimental Botany*, 74(2) 600-611.
2. Anne K Steensma, Yair Shachar-Hill, **Berkley Walker** (2023). [The carbon-concentrating mechanism of the extremophilic red microalga *Cyanidioschyzon merolae*](#). *Photosynth Res* (2023). <https://doi.org/10.1007/s11120-023-01000-6>
3. Xiaotong Jiang, **Berkley Walker**, Sheng Yang He, Jianping Hu (2023). [The role of photorespiration in plant immunity](#). *Frontiers in Plant Science*. 14.

4. Deserah D. Strand and **Berkley Walker** (2023). [Energetic Considerations to Engineering Novel Biochemistries in Photosynthetic Organisms](#). *Frontiers in Plant Science*. 14.
5. Mauricio Tejera-Nieves, Michael Abraha, Jiquan Chen, Stephen K. Hamilton, G. Philip Robertson and **Berkley Walker** (2023). [Seasonal decline in leaf photosynthesis in perennial switchgrass explained by sink limitations and water deficit](#). *Frontiers in Plant Science*. 13. **This paper was highlighted with an MSU Today article** and featured in several news outlets; i.e. [woodTV8](#).
6. Xinyu Fu, Luke M. Gregory, Sean E. Wiese, **Berkley Walker** (2022). [Integrated flux and pool size analysis in plant central metabolism reveals unique roles of glycine and serine during photorespiration](#). *Nature Plants*. 9, 169–178 (2023) **This paper was highlighted with an MSU Today article**.
7. Chih-Li Sung, Beau Barber, **Berkley Walker** (2022). [Calibration of inexact computer models with heteroscedastic errors](#). *SIAM/ASA Journal on Uncertainty Quantification*, **10**, 4, 1733-1752. **This paper was highlighted with a departmental article**.
8. Amit K. Singh, María Santos-Merino, Jonathan K. Sakkos, **Berkley J. Walker**, Daniel C. Ducat (2022). [Rubisco regulation in response to altered carbon status in the cyanobacterium *Synechococcus elongatus* PCC 7942](#). *Plant Physiology*. 189 (2) 874-888. **This paper was highlighted in a Plant Physiology News and Views article**.
9. Han Bao, Matt Morency, Winda Rianti, Sompop Saeheng, Sanja Roje, Andreas P.M. Weber, and **Berkley J. Walker** (2021). [Catalase protects against non-enzymatic decarboxylations during photorespiration in *Arabidopsis thaliana*](#). *Plant Direct*. DOI: 10.1002/pld3.366. **A Top Cited Article 2021-2022 in Plant Direct**
10. Heather Roney and **Berkley J. Walker** (2021). [Photon to plate: a holistic view of photosynthetic and anthropogenic energy fluxes](#). *Food and Energy Security*. DOI: 10.1002/fes/3.348. **This paper was highlighted in Faculty Opinions**
11. Luke M. Gregory, Alan M. McClain, David M. Kramer, Jeremy D. Pardo, Kaila E. Smith, Oliver L. Tessmer, **Berkley J. Walker**, Leonardo G. Ziccardi, and Thomas D. Sharkey (2021). [The triose phosphate utilization limitation of photosynthetic rate: Out of global models but important for leaf models](#). *Plant, Cell & Environment*, **44**, 3223-3226.
12. Matthew E. Bergman, Diego González-Cabanelas, Louwrence P. Wright, **Berkley J. Walker**, Michael A. Phillips. (2021) [Isotope ratio-based quantification of carbon assimilation highlights the role of plastidial isoprenoid precursor availability in photosynthesis](#). *Plant Methods* **17**, 32.
13. Yuan Xu, Xinyu Fu, Thomas D. Sharkey, Yair Shachar-Hill, **Berkley J. Walker** (2021). [The metabolic origins of non-photorespiratory CO₂ release during photosynthesis: A metabolic flux analysis](#). *Plant Physiology* **186**, 297-314. **This paper was highlighted in Faculty Opinions**
14. Isaac Osei-Bonsu, Alan M. McClain, **Berkley J. Walker**, Thomas D. Sharkey, David M. Kramer (2021). [The roles of photorespiration and alternative electron acceptors in the responses of photosynthesis to elevated temperatures in cowpea](#). *Plant, Cell & Environment* **44** (7), 2290-2307.
15. Kim S. Ely, Alistair Rogers, *et al.* (author 74 of 83) (2021) [A reporting format for leaf-level gas exchange data and metadata](#). *Ecological Informatics*, **61**, 101232.
16. Shirin Zamani-Nuor, Hsiang-Chun Lin, **Berkley J. Walker**, Tabea Mettler-Altmann, Roxana Khoshravesh, Shanti Karki, Efren Bagunu, Tammy L. Sage, W. Paul Quick, Andreas P.M. Weber (2021). [Overexpression of the chloroplastic oxoglutarate/malate transporter in rice disrupts carbon and nitrogen homeostasis](#). *Journal of Experimental Botany*. **72** (1), 137–152.
17. **Berkley J. Walker***, David M. Kramer, Nicholas Fisher, Xinyu Fu (2020). [Flexibility in the energy balancing network of photosynthesis enables safe operation under changing environmental conditions](#). *Plants*, **9** (3), 301.
18. Silke C. Gerlich, **Berkley J. Walker**, Stephan Krueger and Stanislav Kopriva (2018). [Sulfate metabolism in *C4 Flaveria* species is controlled by the root and connected to serine biosynthesis](#). *Plant Physiology*. **178** (2), 565-582
19. **Berkley J. Walker**, Andy VanLoocke, Rebecca A. Slattery, Darren Drewry and Donald R. Ort (2018). [Chlorophyll can be reduced in crop canopies with little penalty to crop photosynthesis](#). *Plant Physiology*,

- 176 (2), 1215-1232. This paper was cited in the “Deeper Dive” section of [an article](#) in **Knowable Magazine**.
20. Mara L. Schuler, Olga V. Sedelnikova, **Berkley J. Walker**, Peter Westhoff, Jane A. Langdale (2018). [Ectopic SHORTROOT1 expression in rice reveals a molecular link between veins and stomatal patterning](#). *Plant Physiology*, **176** (1), 757-772.
 21. Rebecca A. Slattery, **Berkley J. Walker**, Andreas P. M. Weber and Donald R. Ort. (2018) [The impacts of light on crop performance](#). *Plant Physiology*, **176** (2), 990-1003.
 22. **Berkley J. Walker**, Douglas Orr, Elizabete Carma-Silva, Martin Parry, Carl Bernacchi and Donald R. Ort. (2017) [Uncertainty in a major biochemical parameter and its impact to models of leaf photosynthesis](#). *Photosynthesis Research* **132** (3), 245-255.
 23. Paul F. South, **Berkley J. Walker**, Vivian Roland, Murray Badger and Donald R. Ort. (2017) [Bile acid sodium symporter BASS6 can transport glycolate and is involved in photorespiratory metabolism in *Arabidopsis thaliana*](#). *The Plant Cell* **26** (4), 808.
 24. Peng-Fei Xia, Guo-Chang Zhang, **Berkley J. Walker**, Seung-Oh Seo, Suryang Kwak, Jing-Jing Liu, Heejin Kim, Donald R. Ort, Shu-Guang Wang and Yong-Su Jin. (2016) [Recycling carbon dioxide during xylose fermentation by engineered *Saccharomyces cerevisiae*](#). *American Chemical Society Synthetic Biology*. **6** (2), 276-283.
 25. **Berkley J. Walker**, Andy VanLoocke, Carl J. Bernacchi and Donald R. Ort. (2016) [The costs of photorespiration to food production now and in the future](#). *Annual Review of Plant Biology* **67**, 107-129.
 26. Ahmad Zia, **Berkley J. Walker**, Hui Min Olivia Oung, Dana Charuvi, Peter Jahns, Asaph B. Cousins, Jill M. Farrant, Ziv Reich and Helmut Kirchhoff. (2016) [Protection of the photosynthetic apparatus against dehydration stress in the resurrection plant *Craterostigma pumilum*](#). *The Plant Journal* **87** (6), 664-680.
 27. ***Berkley J. Walker**, Paul F South and Donald R. Ort. (2016) [Physiological evidence for plasticity in glycolate/glycerate transport during photorespiration](#). *Photosynthesis Research* **129** (1), 93-103.
 28. **Berkley J. Walker**, Dane Skabelund, Florian Busch and Donald Ort. (2016) [An improved approach for measuring the impact of multiple CO₂ conductances on the apparent photorespiratory CO₂ compensation point](#). *Plant, Cell & Environment* **39** (6), 1198-1203.
 29. Marco Betti, Hermann Bauwe, Florian Busch, Alisdair Fernie, Oliver Keech, Myles Levey, Donald Ort, Martin Parry, Rowan Sage, Stefan Timm, **Berkley J. Walker** and Andreas Weber. (2016) [Manipulating photorespiration to increase plant productivity: recent advances and perspectives for crop improvement](#). *Journal of Experimental Botany* **67** (10), 2977-2988.
 30. Sang Kim, Kyle Bender, **Berkley J. Walker**, Raymond Zielinski, Martin Spalding, Donald Ort, Steven Huber. (2016) [The plastid casein kinase 2 phosphorylates Rubisco activase at the Thr-78 site but is not essential for regulation of Rubisco activation state](#). *Frontiers in Plant Science* **7**, 404.
 31. **Berkley Walker** and Donald R. Ort. (2015) [Improved method for measuring the apparent CO₂ photocompensation point resolves the impact of multiple internal conductances to CO₂ to net gas exchange](#). *Plant, Cell & Environment* **38** (11), 2462-2474.
 32. **Berkley Walker**, Deserah D. Strand, David M. Kramer, Asaph B. Cousins. (2014) [The response of cyclic electron flow around photosystem I to changes in photorespiration and nitrate assimilation](#). *Plant Physiology* **165** (1), 453-462.
 33. Wei Sun, Nerea Ubierna, Jian-Ying Ma, **Berkley Walker**, David M. Kramer, Asaph B. Cousins. (2014) [The coordination of C₄ photosynthesis and the CO₂ concentrating mechanism in *Zea mays* and *Miscanthus x giganteus* in response to transient changes in light quality](#). *Plant Physiology* **165** (1), 453-462.
 34. **Berkley Walker**, Lorenzo Ariza, Sarah Kaines, Murray Badger, Asaph Cousins. (2013) [Comparison of Rubisco in vivo kinetics and mesophyll conductance between *Arabidopsis thaliana* and *Nicotiana tabacum*](#). *Plant, Cell & Environment* **36** (12), 2108-2119.
 35. **Berkley Walker**, Asaph Cousins. (2013) [Influence of temperature on measurements of the CO₂ compensation point: Differences between the Laisk and O₂ exchange methods](#). *Journal of Experimental Botany* **64** (7), 1893-1905.

36. Asaph Cousins, **Berkley Walker**, Itsara Pracharoenwattana, Steven M Smith and Murray R. Badger. (2011) [Peroxisomal hydroxypyruvate reductase is not essential for photorespiration in Arabidopsis but its absence causes an increase in the stoichiometry of photorespiratory CO₂ release](#). *Photosynthesis Research* 108 (2-3), 91-100.

Book Chapters:

1. Xinyu Fu, Kaila Smith, Luke Gregory, Ludmila Roze and **Berkley Walker**. (2022) [Modifying photorespiration to optimize crop performance. Understanding and improving crop photosynthesis](#). Robert Sharwood. (editor), Understanding and improving crop photosynthesis, Burleigh Dodds Science Publishing, Cambridge, UK, 2023 (ISBN: 978 1 80146 129 0; www.bdspublishing.com)
2. ***Berkley Walker**, Florian Busch, Steven Driever, Johannes Kromdijk and Tracy Lawson. (2018) [Survey of tools for measuring in vivo photosynthesis from culture to canopy](#). Photosynthesis: Methods and Protocols. Methods in Molecular Biology, Springer Press.

Book Editor:

1. Berkley Walker (Release in 2023-2024) Photorespiration – Methods and Protocols. Lab Protocol series in Methods in Molecular Biology, Springer Nature.

Refereed Conference Proceedings:

1. Philip E. Paré, Justin McGrath, **Berkley Walker** and Carolyn Beck. Modeling and Accelerated CO₂ Control for Photosynthesis Measurements. Accepted as regular paper for the 2017 IEEE Conference on Control Technology and Applications.
2. Philip E. Paré, **Berkley Walker** and Justin McGrath. [Feedback linearization control methods for accurate leaf photosynthesis measurements](#). American Control Conference 2017. 801-806.

Non-refereed:

1. **Berkley Walker**. (2010) [A new look at friction fires, thermocoupling ancient practice with modern technique](#). *The Bulletin of Primitive Technology* 38, 70-73.
2. **Berkley Walker**. (2005) [The antimicrobial effects of honey against H. pylori](#). *ORCA Journal of Undergraduate Research*

Patents/Invention Disclosures:

1. Donald Ort, Paul South and **Berkley Walker**. (2018) [Plants with Increased Photorespiration Efficiency](#). US Patent App 15/913,395

GRANTS AND AWARDS

As MSU Faculty:

Funding:

1. Plant Genomics @ Michigan State University, NSF Research Experience for Undergrads, PI: Cornelius Barry, Co-PI: Dan Chitwood, Senior Personnel: Patrick Edger, Eva Farre, Bjoern Hamberger, Emily Josephs, Beronda Montgomery, Chad Niederhuth, Alejandra Rougon, Addie Thompson, Robert VanBuren and **Berkley Walker**. \$374,498, 3/01/2022-2/28/2025
2. Supplemental to: Collaborative Research: Investigating the Role of Cytosolic One-carbon Metabolism in Photorespiration, NSF-MCB Systems and synthetic biology. One year of research support for an under-represented Post-Baccalaureate student. PI: Berkley Walker. \$53,529 to MSU, 7/01/2020-6/30/2023
3. Collaborative Research: Improving plant productivity and models of carbon exchange by resolving mechanisms of excess carbon release in photorespiration, NSF - Division of Integrative Organismal Systems, MSU PI: Berkley Walker, Eastern Michigan University PI: Aaron Liepman. \$983,763 total with \$848,771 to MSU, 3/1/2021-2/28/2025

4. Role of arbuscular mycorrhizal fungal hyphae on soil water flux and switchgrass-water relations under drought, Pacific Northwest National Lab, Environmental Molecular Sciences Laboratory, User grant for 880 hours of facility and personnel time, PI: Binod Basyal, Co-PI: Berkley Walker. 11/01/2020-10/31/2021
5. Collaborative Research: Investigating the Role of Cytosolic One-carbon Metabolism in Photorespiration, NSF-MCB Systems and synthetic biology. MSU PI: Berkley Walker, Washington State University PI: Sanja Roje. \$1,471,673 total with \$681,481 to MSU, 7/01/2020-6/30/2023
6. Photosynthetic Energy Capture Conversion and Storage: From Fundamental Mechanisms to Modular Engineering (Co-PI with 11 others). Department of Energy – Basic Energy Sciences. \$12,600,000, 4/1/2020 – 3/31/2023
7. Optimizing the thermotolerance of photorespiration in higher plants through robust parameterization of pathway kinetics and in planta validation - Joint Genome Institute, Community Science Program DNA synthesis, PI: Berkley Walker, Co-PI: Aaron Liepman – Eastern Michigan University. 12/20/2019 - 12/19/2022 (160 kb DNA synthesis)
8. Photosynthetic Energy Capture Conversion and Storage: From Fundamental Mechanisms to Modular Engineering (Co-PI with 11 others). Department of Energy – Basic Energy Sciences. 4/1/2017 – 3/31/2020 \$11,000,000 total, \$469,040 to Walker lab
9. Great Lakes Bioenergy Research Center (Co-PI with >20 others). Department of Energy – Biological and Environmental Research. 1/15/2020 – 1/14/2025 \$25,000,000 total, \$445,123 to Walker lab (through 2022).

Awards and honors:

1. Robert Rabson Award from the American Society of Plant Biology (2022)
2. Awarded the Laboratory Safety Certificate of Recognition from MSU Environmental Health and Safety for our lab's commitment to promoting a culture of safety (2022)

Awards from those I mentored:

1. Anne Steensma
 - a. NIH Plant Biotechnology for Health and Sustainability Fellowship (2020-2021)
2. Kaila Smith
 - a. NSF Graduate Research Fellowship Honorable Mention (2022-2024)
 - b. NIH Plant Biotechnology for Health and Sustainability Fellowship (2021-2023)

Previous to MSU:

Alexander von Humboldt-Bayer Research Fellowship (starting 2016, Hosts Andreas Weber and Peter Westhoff, University of Dusseldorf). €107K over two years
 Travel Support to second annual PROMICS meeting in Germany (2015)
 WSU Graduate and Professional Student Travel Grant (2012)
 NASA Space Grant Fellowship in Science and Engineering (2011) \$2.5K
 National Science Foundation Graduate Research Fellowship Honorable Mention (2010)
 Global Plant Science Initiative (2008) \$10K
 ARCS Foundation Fellowship (2008-2011) \$17K
 ORCA undergraduate research grant (2005) \$1.5K
 Mind Your Business Scholarship (2005) \$3.5K

ORAL PRESENTATIONS

As MSU Faculty:

1. Integrating fluxes through photorespiration with photosynthesis and central metabolism. iGRAD-Plant Symposium 2023. Heinrich Heine University, Düsseldorf, Germany (2/15/2023).
2. Integrating photorespiration with photosynthesis and central metabolism. Photosynthesis Working Group Seminar. University of California-Berkeley (1/6/2023).
3. Fluxes through Photorespiration. NC1200: Regulation of Photosynthetic Processes Annual Retreat, Virtual (11/19/2022).

4. Multiscale fluxes through Photosynthesis from potatoes to peroxisomes. Michigan State University Cell and Molecular Biology Research Forum (11/2/2022).
5. Re-Imagining Fluxes through Photorespiration. Rubisco Oxygenase Symposium, University of Illinois (8/20/2022).
6. The physiology and fluxes of the bioenergy crop switchgrass. Learning Lunch Series, Environmental Molecular Sciences Laboratory, Pacific Northwest National Laboratory. Richland, WA (8/9/2022)
7. Rethinking photorespiratory fluxes. NextPlant retreat. Michigan State University (6/23/2022)
8. Switchgrass water relations and source/sink capacity constrain growth and inform biofuel improvement strategies. All Scientists Meeting of the Great Lakes Bioenergy Center. Lake Geneva Wisconsin (5/18/2022)
9. Multiscale fluxes through Photosynthesis from potatoes to peroxisomes. Brigham Young University Genetics seminar series (3/11/2022).
10. Multiscale fluxes through photorespiration from potatoes to peroxisomes. Walla-Walla University Department of Biological Sciences Colloquium Series (3/2/2022).
11. Multiscale fluxes through photorespiration from potatoes to peroxisomes. Plant Science Group Seminar Series. University of Essex, United Kingdom (12/2/2021).
12. Photon to Plate: A Holistic View of Photosynthetic and Anthropogenic Energy Fluxes during French Fry Production. American Society of Agronomy, Crop Science Society of America, and the Soil Science Society of America Annual Meeting (11/9/2021)
13. Recent advances in improving photosynthesis and photorespiration and their role in biocapture and biosequestration. Second Biocapture and Biosequestration of Carbon Workshop. Sponsored by Exxon and Spruce Capitol Partners (11/2/2021)
14. Optimizing the thermotolerance of photorespiration in higher plants through robust parameterization of pathway kinetics and *in planta* validation. Joint Genome Institute Genomics of Energy and Environment annual user meeting (9/1/2021)
15. Multiscale fluxes through photorespiration from potatoes to peroxisomes. International Graduate Program for Plant Biology Seminar Series, Heinrich-Heine University, Düsseldorf Germany (4/12/2021).
16. Why you should care about photorespiration, other fluxes of carbon and energy...and come to WSU for graduate school. Molecular Plant Sciences Annual Retreat, Washington State University (2/22/2021).
17. Fluxes of carbon through photorespiration. Faculty of Agriculture, Universitas Padjadjaran, Indonesia, Virtual (11/18/2020).
18. Quantifying sources of CO₂ release from photosynthesis. NC1200: Regulation of Photosynthetic Processes Annual Retreat, Virtual (11/14/2020).
19. How does photorespiration link to plant nitrogen uptake and assimilation? American Society of Agronomy, Crop Science Society of America and Soil Science Society of America annual meeting, Oral Presentation, Virtual (11/9/2020).
20. The Top 10 things you can do as a plant scientist in training to ensure you get the job you want (Co-Presented with Robin Buell), Molecular Plant Sciences Seminar Series, Michigan State University (9/10/2020).
21. CO₂ release from photorespiration can increase following alternative non-enzymatic decarboxylations in a catalase mutant. American Society for Plant Biology Annual Meeting, Oral Poster, Washington DC (2020)*.
22. Fluxes of carbon through photorespiration. Experimental Plant Sciences Graduate School Program (Serves 7 Universities in the Netherlands), organized by Utrecht University, Virtual (7/8/2020).
23. Why we should care about photorespiration. School of Biological Sciences Graduate Symposium, Washington State University (2/29/2020).
24. The importance of photorespiratory fluxes to plant performance and metabolism. Invited keynote address. GROE Camelina Spring Meeting, MSU (5/15/2019).
25. Why we should care about photorespiration. Student-invited B.W. Wells Seminar, North Carolina State University (4/30/2019).

* Postponed/Cancelled due to COVID-19 pandemic

Previous to MSU:

26. Catalase protects photorespiration from excess carbon loss. American Society for Plant Biology Annual Meeting, Montreal Canada (2018).
27. Regional US yield losses due to photorespiration and mitigation strategies from a modeling perspective. Bayer Crop Science Division. Ghent BE (2016).
28. What are the current and future costs of photorespiration to crop production? 17th International Congress on Photosynthesis Research. Maastricht, NL (2016).
29. How much does photorespiration cost? Lancaster Environment Centre. Lancaster University, UK (2016)
30. Rethinking the efficiency of photorespiration under elevated temperature. Wageningen Centre for Crop Systems Analysis. Wageningen NL (2016)
31. How not to be a victim of your postdoc. Molecular Plant Science Graduate Program, Washington State University, Pullman WA (2015)
32. Determining the efficiency of photorespiratory recycling and the impact to net CO₂ assimilation using gas exchange. Plant Biology 2015, Minneapolis MN (2015)
33. The Sounds of Science collaboration between plant biologists and music composition students. Plant Biology 2015, Minneapolis MN (2015)
34. Using gas exchange to probe the efficiency of photorespiratory recycling of fixed carbon. Second International Conference on Photorespiration – Key to Better Crops, Warnemünde Germany (2015)
35. What limits photosynthetic growth in crops and what we can do about it. Department of Agronomy, Iowa State University, IA (2015)
36. Measuring *in vivo* Rubisco kinetics using CO₂ gas exchange across species. Plant Biology and Crop Science Departmental Seminar, Rothamsted Research, Harpenden, Hertfordshire, UK (2015)
37. Why your calculator is more efficient than a leaf at harnessing sunlight and some things we can do about it. Physiological and Molecular Plant Biology departmental seminar series, University of Illinois, Urbana-Champaign, IL (2015)
38. Improving biochemical models of C₃ photosynthesis by considering inter-species differences in physiology. Environmental Geology and Geochemistry Seminar Lecture Series, Princeton University, NJ (2014)
39. Physiological evidence for additional glycolate/glycerate transporters critical for photorespiration. Gordon Research Seminar, CO₂ Assimilation in Plants: Genome to Biome, Waterville Valley, NH (2014)
40. The response of cyclic electron flux around photosystem I to changes in ATP and NADPH demand. 16th International Photosynthesis Congress, St. Louis, MO (2013)
41. The temperature response of *in vivo* Rubisco kinetics and mesophyll conductance to CO₂ in *Arabidopsis thaliana* and *Nicotiana tabacum*. Western Photosynthesis Conference, Asilomar CA (2013)
42. Increases in photorespiratory CO₂ release under high temperature and oxygen. Western Photosynthesis Conference, Asilomar CA (2011)
43. Altered photorespiratory carbon metabolism in *Arabidopsis*. Western Section Meeting for the American Society of Plant Biologists, Pullman WA (2011)

LEADERSHIP AND SERVICE

As MSU Faculty:

Member of the Plant Science Excellence committee to prepare an administrative-level report on the future of plant science research at MSU for the next five to ten years (2021-2022)

Faculty representative to the GLBRC Annual Science Meeting Planning Committee (2020-2021)

Trainer within the Plant Biotechnology for Health and Sustainability program (2019-current)

Search committee member for Plant Research Laboratory Assistant Professor (2019/2020)

Molecular Plant Sciences Seminar Committee Member and Vice Chair (2019-Current)

Invited reviewer for Plant Physiology (10), Plant, Cell and Environment (8), The New Phytologist (4), Proceedings of the National Academy of Sciences (2), Journal of Experimental Botany (3), Photosynthesis research (3), Plant Direct (1), Global Change Biology (2), Scientific Reports (2), Food and Energy (1), The Plant Journal (3) Plant Biotechnology (3), *in silico* Plants (1), Plant Science (2), ELife (2), Communications Biology (1), Physiologia Plantarum (1), and Frontiers in Plant Science (2)

Editorial Review Board Member: Plant, Cell & Environment (2021- Current)

Panel Reviewer for Department of Energy, Biological and Environmental Research (1, 2019)
 Panel Reviewer for the Joint Genome Institute Community Science Program-Functional Genomics Call (1, 2020)
 Ad-hoc reviewer for Department of Energy (2, 2019; 1, 2020)
 National Science Foundation Panel Reviewer (2021, 2022)
 Ad-hoc reviewer for National Science Foundation (1, 2019)
 Ad-hoc reviewer for Saclay Plant Sciences network (France) (2022)
 Lead organizer for the MSU Quantitative Analysis of Photosynthetic Systems working group which has resulted in
 >7 high-impact publications (2018-2023)

Previous to MSU:

Ad hoc reviewer for National Science Foundation (2)
 Invited Reviewer for Plant Cell and Environment (12), Photosynthesis Research (7), PLOS ONE (3), Journal of
 Experimental Botany (1), Physiologia Plantarum (2), Plant Physiology (2), Plant and Cell Physiology (2), Annals
 of Botany (2), Bioinformatics (1), Bioenergy Research (1), American Journal of Botany (1), Plant Science (1)
 Plant Methods (1), Agricultural and Forest Meteorology (1) and Plants (1)
 Chair for Gordon Research Symposium "CO₂ assimilation in Plants" (2017)
 Member of the American Society for Plant Biology (2010-current)
 Member of the International Society of Photosynthesis Research (2009-current)
 Member of the Crop Science Society of America (2020-2022)

TEACHING AND GUEST LECTURES

As MSU Faculty:

Courses

Plant Physiology (PLB415, 3 credits) Each Spring Semester (2019-Current). Co-instructor teaching 15 lectures
 Co-led a 10-week professional development workshop for MSU REU students (2021-Current)
 Led a [Coursera Bioinformatics course](#) working group during COVID pandemic for 20 graduate students and
 postdocs (2020)
 Molecular Plant Sciences Seminar (PLB-800) Fall (2019, 2020).
 Metabolic Modeling Workshop, Spring (2019). Co-instructor for a week-long course on modeling metabolic fluxes

Guest Lectures (Lecture numbers)

Advanced topics in photosynthetic research. (4 hours total) Faculty of Agriculture, Universitas Padjadjaran,
 Indonesia, Virtual (2022)
 PLB 801 (1) "The Top 10 things you can do as a plant scientist in training to ensure you get the job you want",
 Michigan State University (2022)
 Agronomy 180 (1) Global Agriculture in a Changing World, Iowa State University (2020)
 HRT 361 (1) Applied Plant Physiology, Michigan State University (2020)

Previous to MSU:

Gas exchange and chlorophyll fluorescence lab week, Photosynthesis: From light absorption to biomass production
 (Heinrich-Heine University Düsseldorf, M-Module 4426, 2017, 2016)
 Guest Lectures on Chlorophyll fluorescence, principles of gas exchange and biochemical models of photosynthesis;
 Photosynthesis: Challenges in the 21st Century (University of Illinois, BIOP 432/CPSC 489/IB 421, 2015)
 Guest Lecture on photosynthesis; Forest Ecosystem Processes (University of Idaho, For 330, 2014)
 Teaching assistant, Introductory biology for majors and non-majors (Washington State, Bio 102 and 106, 2009-
 2011)

CONTRIBUTIONS TO DIVERSITY, EQUITY, AND INCLUSION

Department of Plant Biology Diversity, Equity and Inclusion committee member (2020-Current)

- To better connect undergraduates with research opportunities, established an [undergraduate researcher directory](#). While registration is open to all students, a special effort is being made to register students from underrepresented groups. (2021-current)

- Helped draft and advocated for a revision to the mentoring bylaws to ensure an equitable distribution of teaching assignments to departmental faculty (2022)
- Advocated for transparent Workload Dashboards for faculty, an evidence-based practice to minimize structural inequality in work assignment and compensation

Participant in the MSU Anti-Racist Path, Stepping Stone 1: an interactive 5-week curriculum designed to challenge racism and take actionable steps towards improvement (2021)

Recipient of supplemental NSF funds (see awards) to provide a mentored one-year research experience for an underrepresented recent graduate to prepare for graduate school

Incorporated a two-day component into PLB415 that encourages career exploration built around the biography of Percy Lavon Julian (1899-1975), a prominent (and now almost forgotten) plant biochemist

PUBLIC OUTREACH

As MSU Faculty:

Job Market Interview for Recent Graduates: [Experts Weigh in on Current Job Market Trends](#) (2020)

MSU College of Natural Science Virtual Event: [How will future climates change the ability of plants to harness the sun for growth?](#) (Summer 2020)

Recipient of the MSU Academic Communications Fellowship (Spring 2020)

A multi-day communications training program including narrative training by a national science communication training company (COMPASS), Social Media use by AAAS and On-camera Media Training with science journalists

Founder of the [Sounds of Science Collaboration](#) (2014-current)

Writing for General Audiences:

[Berkley Walker: Beneath the Ski Mask](#) MSU Faculty Voice (2019)

In the news:

[Can crops become more efficient?](#) MSU today (2021)

[NSF-funded project explores plant metabolism links to climate change, human nutrition](#) College of Natural Science, MSU (2020)

[MSU Mystery Skier unmasked](#) NBC 25 News (2019)

Guest blog posts:

["Where did all my donuts go?"](#), CEPLAS website (2017)

["The Sound of Science"](#), Global Plant Council (2015)

["Returning to the Sun"](#), Silvercrown Mountain Outdoor School (2011)

In the news:

["Newly Characterized protein has potential to save U.S. farmers millions annually"](#) University of Illinois College of Liberal Arts and Sciences website (2017)

["Does photorespiration depend on climate?"](#) (translated from German) Heinrich Heine University website (2016)

MENTORSHIP AND ADVISING

As MSU Faculty:

Postdoctoral Advisor:

Stephanie Schmiege (Co-Advised with Tom Sharkey, 2021- current)

Kelem Gashu (2021 – Current)

Deserah Strand (2021 - Current)

Ludmila Roze (2021 - Current)

Arif Ahmed (2021, Currently at [Molecular Research Inc.](#))

Binod Basyal (2020 - Current)

Mauricio Tejera (2019 - Current)

Xinyu Fu (2019 - Current)

Han Bao (2019 – 2021, Currently at Thermo Fisher Scientific)

Yuan Xu (2019 - 2020)

PhD Advisor:

Anne Steensma (Co-Advised with Yair Shachar-Hill, 2022-)

Luke Gregory (2019-)

Kaila Smith (2019-)

PhD Committee Member:

Qiuyi Fu (2022-)

Brandon Webster (2022)

Jenny Schuster (2022-)

Alan McClain (2022)

Brianna Brown (2021-)

Josh Temple (2021-2022)

Rees Rillema (2021-)

Xiaotong Jiang (2019-)

Alexandra Lantz (2018- 2019)

Masters Committee Member:

Mair Edwards (Eastern Michigan University) (2022-)

External PhD Mentor:

Tim Nies (Heinrich-Heine University, Duesseldorf, (2022-)

Marvin van Aalst (Heinrich-Heine University, Duesseldorf, (2021-)

Undergraduate/Post-baccalaureate Research Advisor:

Faith Twinaamani (summer of 2022, REU student)

Aikaari Ryce (2022, Currently working as a cultivation technician)

Daniel Seong (2021-2022, Currently a Master's student)

Heather Roney (2020-2021, Currently a PhD student)

Matthew Morency (2019-2021, Currently Research and Development for Cultivation Lead at Holistic Industries)

Mitchell Alekman (2019-2019)

Previous to MSU:

Graduate Mentees:

Winda Rianti (Masters Student at Wageningen University)

Undergraduate Mentees:

Cody Jones (Graduate Student in Plant Biology, University of Illinois)

Jessica Ayers (Lab Technician at the Fred Hutchinson Cancer Center)

Beau Barber (Graduate Student in Agricultural Engineering, University of Illinois)

Elliot Brazil (Director of Pricing Strategy at NFI Industries)

Gordon Stack (Technical Specialist at RheoSense Inc.)

Conor Bollinger-Smith (Completed Masters Degree in Biological Sciences, Washington State University)

Lorenzo Stroud Ariza (co-author on a publication, Doctoral Candidate in Crop Sciences, Washington State University)

Thomas Sexton (Doctoral Candidate in Crop Sciences, Washington State University)

High School Mentees:

Andrew Donelick (Electrical Engineer at United Launch Alliance, Colorado)

