THOMAS D. SHARKEY

University Distinguished Professor
Michigan State University
MSU DOE Plant Research Laboratory
Plant Resilience Institute
Department of Biochemistry and Molecular Biology

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EDUCATION

Michigan State University	Biology, Lyman Briggs College	B.S. 1974
Michigan State University	Botany and Plant Pathology	Ph. D. 1980
Australian National University	Environmental Biology	Post-doctoral Fellow

ACADEMIC POSITIONS

5/17 to present - member of the MSU-DOE Plant Research Laboratory
6/15 to present University Distinguished Professor
2/08 to present Professor, Department of Biochemistry and Molecular Biology
3/21 to 6/23 – Interim Director of the Plant Resilience Institute, MSU
4/18 to 2/21 Associate Director of the Plant Resilience Institute, MSU
2/08 to 4/17 Chair, Department of Biochemistry and Molecular Biology
6/04 to 1/08 Director, Institute for Cross-college Biology Education, UW-Madison
1/93 to 5/04 Director, UW-Madison Biotron
9/92 to 6/94 Chair of Department of Botany, University of Wisconsin-Madison
9/91 to 1/08 Professor, Department of Botany, University of Wisconsin-Madison
9/88 to 8/91 Associate Professor, Department of Botany, University of Wisconsin-Madison
8/87 to 8/88 Assistant Professor, Department of Botany, University of Wisconsin-Madison
8/86 to 5/87 Adjunct Associate Professor, Biology Department, University of Nevada-Reno
11/82 to 8/87 Assist. -Assoc. Director/ Assist. -Assoc. Research Professor, Biological Sciences Center, Desert Research Institute, Reno, Nevada

MEMBERSHIPS

American Association for the Advancement of Science (AAAS)
American Society for Biochemistry and Molecular Biology
American Society of Plant Biologists (ASPB)
International Society of Photosynthesis Research

AWARDS

Kellet Mid-Career Award for Research 1999, UW-Madison ($60,000 research prize)
Fellow of ASPB, 2007 (inaugural class)
Fellow of AAAS, 2011
Outstanding Faculty Award, College of Natural Science, 2014
Beal Outstanding Faculty Award, MSU, 2014
University Distinguished Professor, 2015
ASPB Pioneer Member Award 2022
Anton Lang Lecturer 2022

PROFESSIONAL ACTIVITY

Research

I study the biochemistry and biophysics that underlie plant-atmosphere interactions, especially photosynthesis and isoprene emission from plants. Significant accomplishments related to photosynthesis include

- measurement of carbon dioxide concentration inside leaves
- measurement of the biophysical resistance to carbon dioxide diffusion within leaves
- explored the use of light-emitting diodes as a light source for photosynthesis research
- elucidation of the biochemical feedback chain that explains how limitations in starch and sucrose synthesis reduce the efficiency of photosynthesis (triose phosphate utilization limitation)
- demonstration that maltose is the primary metabolite exported from chloroplasts at night
- described how oxidative pentose phosphate pathways can bypass the non-oxidative pentose phosphate reactions of the Calvin-Benson-Bassham cycle

Significant accomplishments related to isoprene biosynthesis and emissions from plants include

- measurement of the concentration of isoprene in membranes
- analysis of the evolution of isoprene synthases and enzymes that make the precursor to isoprene
- genomic and transcriptomic analyses related to isoprene in plants,
- analysis of phosphoproteome changes in response to isoprene
- elucidation of the metabolic cause of CO_2 suppression of isoprene emission
- discovered cryptic isoprene emission of members of the bean family of plants

https://bmb.natsci.msu.edu/faculty/thomas-d-sharkey/sharkey-lab/
https://prl.natsci.msu.edu/people/faculty/thomas-d-sharkey/
https://en.wikipedia.org/wiki/Thomas_D._Sharkey

Activities related to research

- **Current:**
- Editorial Board member of *Photosynthesis Research* 1992–present, Editorial Board *Planta*
- ASPB Kettering Award Committee 2021-2026
- ASPB Environmental and Ecological Plant Physiology section advisor

- **Past:**
- Area Representative for the International Society of Photosynthesis Research (ISPR) (2016-2024)
- Series Co-Editor for volumes 31 to 47 (with Govindjee, founding series editor, now with Julian Eaton-Rye), Advances in Photosynthesis and Respiration *Including Bioenergy and Related Processes* Volume 47 was published in 2021 by SpringerNature
- *Plant, Cell and Environment* Associate Editor 1992–2001, Senior Editor 2002–2020
- Scientific Advisory Board for the biofuels group at Synthetic Genomics (2018 to 2020)
- Organizer for the between-Congress ISPR meeting "Photosynthesis from Light to Life: an ISPR Meeting Held in Conjunction with Plant Biology 2018" in Montreal, Canada
- Scientific Advisory Board for *International Flavors and Fragrances*, 2011-2016
- Founding Chair, Gordon Research Conference on Biogenic Hydrocarbons and the Atmosphere, 2000
- Gordon Research Conference on Temperature Stress of Plants, Co-Vice-Chair 1999, Co-Chair 2001
- Program committee for International Congress on Photosynthesis, 2004, 2010, 2013
- *Plant Physiology*, Monitoring Editor 1993–1997, 2000–2001

- Editorial Board Member: Photosynthesis Research, Current; *Journal of Experimental Botany*, 1994–2011; *Plant Physiology*, 1986–1992
- ASPB Kettering Award Committee 2021-2026
- Panel Member, NSF Physiological Processes, 1988–1991; DOE Equipment, 1994; USDA, Photosynthesis, 1999; DOE Energy Biosciences, 2000; USDA Biochemistry, 2002, 2004, and 2005; NSF Ecological and Evolutionary Physiology, 2003, 2004; NSF Global Change Biology, 2010, DOE ARPA-E, 2011; NSF Plant Processes, Structure and Integrity, 2012; USDA AFRI Biological Mechanisms for Plant Production, 2013, DOE-BES-Biosciences Virtual Panel, 2014; USDA Photosynthetic Efficiency and Nutrient Utilization, 2014, 2017, 2018
- Public Affairs Committee, American Society of Plant Biologists, 1999–2004, Chair 2002–2004
- International Review Committee, Research School of Biological Sciences, Australian National University, 1999–2001, External Reviewer 2009-2010
- International Scientific Advisory Board, Max Planck Institute for Molecular Plant Physiology, 2000–2012

Post-Doctoral Associates, current position
Rowan Sage, Prof., Univ. Toronto
Terry Vassey, Golf Course Superintendent, Anaheim CA
Francesco Loreto, Director, Department of Biology, Agriculture, and Food Sciences, CNR, Italy
Charles Delwiche, Professor, Univ. Maryland
Jürgen Schleucher, Professor, Dept. Medical Biochemistry and Biophysics, Umeå, Sweden
Barry Micallef, Assoc. Prof., Univ. Guelph
Marianne Laporte, Assoc. Prof., Eastern Mich. Univ.
Deming Gong, Project Manager, Health Research Council, New Zealand
Xiuyin Chen, Scientist, The New Zealand Institute for Plant and Food Research Limited, New Zealand
Tanya Falbel, Associate Scientist, UW-Madison
Dennis Gray, Deceased
Ziru (James) Li, Actuarial
Sean Weise, Assistant Professor FT, Biochemistry and Molecular Biology, MSU
Linus Gog, Analytical Chemist, Green Thumb Industries
Thomas Wieloch, Dept. Medical Biochemistry and Biophysics, Umeå, Sweden
James Santiago, Assistant Professor, University of Illinois, Urbana
Sarathi Weraduwage, Associate Professor, Bishop's University, Quebec
Stephanie Schmiege, Assistant Professor, Union College
Mohammad G. Mostofa, Assistant Professor, SUNY, Syracuse
Abira Sahu, Scientist, University of Alabama

Teaching

I have a keen interest in teaching at all levels from Freshmen to PhD students. I was among the first adopters of a classroom response system (Clickers) in introductory biology at the University of Wisconsin-Madison. This helped increase the learning experience because the students felt part of a community and took responsibility for the class progress in understanding. It also allowed a shift in focus to deeper understanding by encouraging group discussions during lectures. I also taught fourth-year plant physiology and graduate-level plant biochemistry in Wisconsin. Upon moving to MSU I taught in the fourth-year biochemistry for major's course and then biochemistry for non-majors in order to gain a clear understanding of the teaching in large courses in the department. I then taught in introductory biology for undergraduates to gain insights for my efforts in curriculum reform. Currently I teach biology for non-scientists. In graduate teaching I have taught plant biochemistry and "Plant Biotechnology for Health and Sustainability." In all of my teaching I emphasize competency in disciplinary knowledge, competency in the practice

of science, and scientific communication. I use 'clickers' in larger lecture courses and more interactive methods in small graduate courses.

In addition to teaching, I have been deeply involved in curriculum reform at both UW-Madison and MSU. At UW-Madison I was instrumental in establishing a Biology Major that grew to be the second largest major in the University. I was co-chair of the major and Director of the Cross-College Institute for Biology Education that served as the home for the major. At MSU I have been involved in reforming the introductory biology sequence. To be sure I understood student needs I rearranged my teaching duties to teach in this course. These efforts led to the creation of the College of Natural Science BioInitiative, which was successful in getting over $3MM in new funding for undergraduate biology teaching.

At MSU I have served on 31 PhD committees and hosted 56 undergraduates for research in my laboratory

Activities related to teaching and service

MSU:

- Bioinitiative Executive Committee, 2014-2017
- Bioinitiative Oversight Committee, 2014-2016
- Active participant in "Plant Genomics" an NSF-funded REU program that brings undergraduate students from around the country to campus for summer research experiences. The program has been very successful in bringing in students from underrepresented groups.
- Active participant in "Plant Biotechnology for Health and Sustainability", an NIH-funded training program (T32) to prepare graduate students for careers in biotechnology.
- Scientific Co-PI of MSU Michigan Translational Research and Commercialization program, a cooperative venture between MSU and the Michigan Economic Development Corporation to accelerate commercial development of university discoveries ($2MM total budget) 2013-2016.
- Search Committee (Chair) for Chair of the Department of Microbiology and Molecular Genetics, 2013-2014
- Department of Physiology Chair search Committee, 2011-2012
- College of Natural Science Dean search committee, 2016-2017
- Other search committees PRL Assist. Prof. 2016-2017; PRI/BMB Assist/Assoc. Prof. 2017-8; PRI/PLB Assist Prof. 2017-8

UW-Madison:

- Information Technology Committee, member, 2004–2008
- Council of Associate Deans, member, 2004–2008
- Teaching and Learning Council, member 2004–2008
- Co-Chair, Intercollege Biology Major, 1999–2003
- Member, Tenure Committee of the Biological Sciences Division, 2002–2004
- Member, University Committee (executive committee of the Faculty Senate), 1999–2001, Chair 2000–2001
- Biological Sciences Strategic Planning Committee, 1996–1999, chair 1996–1998
- Chair, Undergraduate Biology Education Committee, 1992–1996
- Co-Chair, Administrative Council for Academic Advising, 1997–1999
- Member, University Academic Advising Committee, 1993–1994
- Member, Executive Committee, Center for Biology Education, 1992–1996

Graduate Students, degree, and current position
Barry Micallef, PhD 1994, Assoc. Prof., Univ. Guelph
Daniel Tennessen, PhD 1994, Consultant
Marianne Laporte, PhD 1997, Assoc. Prof., Eastern Mich. Univ.
Eric Singsaas, PhD 1997, Director for Materials and Bioeconomy, University of Minnesota Duluth
David Hanson, (Co-Advisor) PhD 1999, Prof., Univ. New Mexico
Sansun Yeh, PhD 2003, Patent Attorney, Novartis Institutes for Biomedical Research
Sean Weise, PhD 2005, Assistant Professor, Mich. State Univ.
Yan Lu, PhD 2005, Assoc. Prof. Western Michigan University.
Stephen Schrader, PhD 2005, Senior Scientist, Corteva
Eunsoo Kim, (Co-Advisor) PhD 2006, Professor, Ewha Woman's University, South Korea
Amy Wiberly, PhD 2008, Research Plant Physiologist, USDA, Madison WI
Ru Zhang, PhD 2009, Assistant Member and PI, Donald Danforth Plant Science Center
Ziru (James) Li, PhD, 2012, Actuarial
Aparajita Banerjee, PhD, 2015, Technical Support Scientist, Twist Bioscience
Chris Harvey, PhD, 2015, Post-doc, Univ. Illinois
Alexandra Lantz, PhD, 2019, KBI Biopharma
Alyssa Preiser, PhD, 2020 Biology Teacher, Charlotte Christian School
Alan McClain, PhD, 2022
Bianca Serda, PhD, anticipated 2025

EXTERNAL RESEARCH GRANTS

(PI except as noted, current support italicized and in green)

Funding from DOE for work on photosynthesis

84–90	DOE	$372,000	Gas Exchange Characteristics of Leaves (two 3-year grants)
90–99	DOE	$797,000	Feedback Regulation of Photosynthetic Processes (three 3-year grants)
99–04	DOE	$440,000	Starch Conversion to Sucrose in Plant Leaves
04–09	DOE	$490,000	Maltose Metabolism and Transport in Plant Leaves
12–15	DOE	$510,000	Improved Efficiency of Energy Capture and Conversion by Regulating the Interaction between ATP Synthesis and End Product Synthesis
15–17	DOE	$350,000	The Calvin-Benson Cycle Glucose 6-phosphate Shunt (folded into the PRL grant below as of 2017)
13–26	DOE/PRL	$1,205,943	Photosynthetic Energy Capture, Conversion and Storage: From Fundamental Mechanisms to Modular Engineering (funds from the PRL core grant to my lab. Total PRL funding $17,100,000)

Other grants related to photosynthesis

84–86	NSF	$89,000	Metabolic Limitations of Photosynthesis During Water Stress
84–86	USDA	$100,000	Nitrogen Use Efficiency in Photosynthesis: Responses to Irradiance and Water Stress (PI: CB Osmond)
85	NSF	$3,000	Phosphate in Chloroplasts (travel grant)
85–87	USDA	$ 89,000	Stress Effects on the Functioning and Efficiency of CO_2 Fixation (CoPI)
87–90	DOE	$140,000	Measurement of Metabolically Active Inorganic Phosphate in Plants
93	Calgene	$6,600	Measurement of Yield of Transgenic Tomatoes
01–04	Monsanto	$153,000	Photosynthetic Manipulation for Yield Enhancement
07–10	DOE	$440,000	GLBRC-1 Manipulation of starch metabolism for biofuels

Funding from NSF for isoprene studies

90–92	NSF	$75,000	A Study of Isoprene Emissions from Plants
91–97	NSF	$489,000	Physiology of Isoprene Emission from Plants (two 3-year grants)
99–01	NSF	$223,000	Regulation of the Capacity for Isoprene Synthesis
02–05	NSF	$390,405	Molecular Regulation of Isoprene Emission from Plants
07-14	NSF	$1,030,625	Physiology of Isoprene Emission from Plants (two 3-year grants)
20-24	*NSF*	*$898,946*	*IOS - IEP: Isoprene Emission from Plants: An Evolutionary Balancing Act*

Other isoprene and related grants

89–90	DOE, NSF	$28,000	Workshop on Trace Gas Emissions from Leaves
92–92	LADCo	$74,000	Hydrocarbon Emissions from Corn
92–92	EPA	$48,000	Improved Isoprene Emission Inventory
93–93	EPA	$50,000	Oxygenated Hydrocarbons from Plants
94–98	EPA	$416,000	Isoprene Emission Inventory Studies
98	NSF	$11,000	Conference: Biogenic Hydrocarbons and the Atmosphere (PI: J. Fuentes)
98–00	USDA	$112,000	Temperature and Light Effects on Basal Isoprene Emission Rate
99–00	NSF, EPA	$23,000	Gordon Conference on Biogenic Hydrocarbons and the Atmosphere
10	DOD	$25,000	Cloning hemiterpene synthases (pass through from UW-Stevens Point)
11–14	ZuvaChem	$95,000	Generation of Novel Isoprene Synthases
15–18	SPG	$478,000	Engineering Cellular Nanoreactors and Three-dimensional Scaffolds for Isoprene Production (Co-PI, Cheryl Kerfeld PI)
17–21	DOE	$559,213	GLBRC-2 Evaluate and optimize the production of common terpene bioproducts in crops and microbes (Aim 4)(PI Tim Donohue)

Funding for work on heat stress

98–99	NSF	$70,000	Interaction of the Small Chloroplast Heat-Shock Protein with Photosystem II
00–01	NSF	$10,000	Gordon Conference on Temperature Stress in Plants
02–04	USDA	$167,500	Role of ATP Status in Heat Stress Effects on Photosynthesis
04-10	USDA	$410,000	The Sensing and Signaling of Heat Stress in Chloroplasts
18-21	MSU-PRI	$205,639	Heat Tolerance of Common Bean Yield

Institutional grants

86–87	NSF	$100,000	Stimulation of Competitive Research in Biological Sciences at the Desert Research Institute (part of $1.4M EPSCoR Nevada proposal)
88	NSF	$95,000	Department of Botany Plant Growth Chamber Facility
93	NSF	$50,000	Experimental Lighting in the UW Biotron (Written by Ted Tibbitts)
94–98	HHMI	$1,000,000	Biology Education at UW-Madison (PI, CoPI Doug Maxwell)
13–16	MEDC	$2,443,000	Michigan Translational Research and Commercialization (M-TRAC)

Abbreviations: EPA, Environmental Protection Agency; GLBRC, Great Lakes Bioenergy Research Center; HHMI, Howard Hughes Medical Institute; LADCo, Lake Michigan Air Directors Consortium; MEDC, Michigan Economic Development Corporation; PRL, MSU-DOE Plant Research Laboratory; MSU-PRI, Plant Resilience Institute; SPG Strategic Partnership Grants from the MSU Foundation

PATENT PUBLICATIONS

Gray D. & Sharkey T.D. (2016) Methyl Butenol Synthase. Patent no. US 9,284,578

Sharkey T.D. & Aspland, S.E. (2013) High Efficiency Isoprene Synthases Produced by Protein Engineering. WO/2013/016591

Sharkey T.D. & Weise S.E. (2012) High Starch Accumulation in Plants. US 2012/0054914 A1

Singsaas E L; Wiberley A E; Sharkey T D. (2011) Producing Isoprene Usefully e.g. to Produce Rubber, Comprises Obtaining a Host Transgenic Microorganism Comprising Transgenes Encoding e.g. Isopentenyl Diphosphate Isomerase, and Observing the Production of Isoprene. US2011039323-A1

PUBLICATIONS

Journal and other publications by year - Books listed at the end

ORCID 0000-0002-4423-3223; Citation analysis at http://scholar.google.com/citations?user=sstSgW8AAAAJ, Web of Science/Publons Researcher ID B-4032-2009; ISI H-index = 92 Google Scholar H index = 111, > 47,000 citations to my work.

2025

Original research papers

Bellucci M, Mostofa MG, Benucci GMN, Kabir AH, Kahn I, Lombardi ,Locato V, Bonito G, Loreto F, Sharkey TD. (submitted) *New Phytologist*

Wilhelmina van de Ven, M. Hur, M. F. G. Méndez, H. Ke, **T. D. Sharkey**, K. Dehesh, (submitted) Mechanistic insights into MEP pathway feedback control of isoprenoid biosynthesis under stress..

Xu Y, Schmiege SC, **Sharkey TD** (2025) Time-resolved targeted metabolomics shows an abrupt switch from Calvin- Benson-Bassham cycle to tricarboxylic acid cycle when the light is turned off *Photosynthesis Research* doi.org/10.1007/s11120-025-01173-2

Sharkey TD, Xu Y (2025) Carbon dioxide release during photosynthesis: Connecting gas exchange behavior with biochemistry. *Plant Cell & Environment* DOI: 10.22541/au.175022848.87886138/v1

Mostofa MG, Sahu A, Yuan X, Insiya B, Doron l, Lefrancois V, **Sharkey TD**. (2025) Cryptic isoprene emission of soybeans. *Proceedings of the National Academy of Science* 10.1073/pnas.2502360122.

Sahu A, Mostofa MG, Xu Y, Serda, B, O'Keefe J, **Sharkey TD** (2025) Isoprene deters insect herbivory by priming plant hormone responses *Science Advances* 11: eadu4637 DOI: 10.1126/sciadv.adu4637

Xu Y, Kaste JAM, Weise SE, Shachar-Hill Y, **Sharkey TD** (2025) The effects of photosynthetic rate on respiration in light, starch/sucrose partitioning, and other metabolic fluxes within photosynthesis. *Scientific Reports* 15:88389. DOI: 10.1038/s41598-025-88574-4

Zuo Z, Weraduwage SM, Huang T, **Sharkey TD** (2025) How volatile isoprenoids improve plant thermotolerance. *Trends Plant Sci*., doi.org/10.1016/j.tplants.2025.05.004

Walters J, Fisher R, **Sharkey TD**, Rufus I, Santiago JP (2025) Extreme heat affects blueberry pollen nutrition: consequences for bee health and plant fertilization. *Scientific Reports* 15: 6249 doi.org/ 0.1038/s41598-025-90676-y

Reviews, chapters, commentaries (peer reviewed)

Christopher Vincent; Courtney P. Leisner; Anna M. Locke; Elena Pelech; Stephanie C. Schmiege; **Thomas D. Sharkey;** Mauricio Tejera-Nieves; Dorcas Olufunke Alade; Amanda A. Cardoso; Ahram Cho; Kithmee De Silva; Nicole Dziedzic; Alison R. Gill; Ravneet Kaur; Sarah L. Lane; Gillian Zeng Michalczyk; Atinder Singh; Demissew Tesfaye Teshome (2025) Importance of measuring and reporting environmental conditions across plant science subdisciplines. *Plant Physiology* doi.org/10.1093/plphys/kiaf405

2024

Original research papers

Evans SE, Xu Y, Bergman ME, Ford SA, Liu Y, **Sharkey TD**, Phillips MA (2024) Rubisco supplies pyruvate for the 2-C-methyl-D-erythritol-4-phosphate pathway. *Nature Plants* 2024 Oct;10(10):1453-1463. doi: 10.1038/s41477-024-01791-z. Epub 2024 Oct 4. PMID: 39367254

Bellucci M, Mostofa MG, Weraduwage SM, Xu Y, Abdelrahman M, De Gara L, Loreto F and **Sharkey TD** (2024) The effect of constitutive root isoprene emission on root phenotype and physiology under control and salt stress conditions. *Plant Direct* 8: e617. https://doi.org/10.1002/pld3.617

Xu Y, Schmiege SC, **Sharkey TD** (2024) The oxidative pentose phosphate pathway in photosynthesis: A tale of two shunts. *New Phytologist* DOI: 10.1111/nph.19730

Bibik J, Sahu A, Kim B, Unda F, Andersen T, Mansfield S, Maravelias C, **Sharkey TD**, Hamberger B (2024) Engineered poplar for bioproduction of the triterpene squalene. *Plant Biotechnology Journal* 22, 2301-2311 DOI 10.1111/pbi.14345

Zhang Y, Kaiser E, Dutta S, **Sharkey TD**, Leo F.M. Marcelis LFM, Li T (2024) Short-term salt stress reduces photosynthetic oscillations under triose phosphate utilization limitation in tomato. *Journal of Experimental Botany* 75, 2994-3008 DOI 10.1093/jxb/erae089

Weraduwage SM, Whitten D, Kulke M, Sahu A, Vermaas J, **Sharkey TD** (2024) The isoprene-responsive phosphoproteome provides new insights into the putative signaling pathways and novel roles of isoprene. *Plant, Cell & Environment* 47, 1099–1117 DOI 10.1111/pce.14776

Xu Y, Koroma AA, Weise SE, Fu X, **Sharkey TD**, Shachar-Hill Y (2024) Daylength variation affects growth, photosynthesis, leaf metabolism, partitioning, and metabolic fluxes. *Plant Physiology* 194, 475-490 DOI 10.1093/plphys/kiad507

Sharkey TD (2024) The end game(s) of photosynthetic carbon metabolism. *Plant Physiology* 195: 67-78 DOI 10.1093/plphys/kiad601

Reviews, chapters, commentaries (peer reviewed)

Walker BJ, Schmiege SC, **Sharkey TD** (2024) Re-evaluating the energy balance of the many routes of carbon flow through and from photorespiration. *Plant Cell & Environment* 47, 3365-3374 10.1111/pce.14949

Original papers, not peer reviewed

Govindjee G, **Sharkey TD**, Melis A (2024) Honoring Hartmut Karl Lichtenthaler, innovative pioneer of photosynthesis, on his 90th Birthday. *Photosynthetica* DOI 10.32615/ps.2024.017

Xu Y, Fu X, **Sharkey TD** and Walker BJ (2024) Combining gas exchange and rapid quenching of leaf tissue for mass spectrometry analysis directly in gas exchange cuvette. *Photorespiration: Methods and Protocols, Methods in Molecular Biology* 2792: 209-219 10.1007/978-1-0716-3802-6_17

Schmiege SC, Walker BJ and **Sharkey TD** (2024) Using gas exchange to study CO_2 release during photosynthesis with steady-and nonsteady-state approaches. *Photorespiration: Methods and Protocols, Methods in Molecular Biology* 2792: 143-161. 10.1007/978-1-0716-3802-6_12

Sahu A, Mostofa MG, Xu Y, Serda B, O'Keefe J, **Sharkey TD** (2024) Isoprene deters insect herbivory by priming plant hormone responses. *bioRxiv*:2024.2011.2001.621578. doi:10.1101/2024.11.01.621578

2023

Original research papers

Stallknecht EJ, Herrera CK, **Sharkey TD**, Lunt RR, Runkle ES (2023) Growth of snapdragon under simulated transparent photovoltaic panels for greenhouse applications. *Journal of Environmental Horticulture* 41, 170-179

Sahu A, Mostofa MG, Weraduwage SM, **Sharkey TD** (2023) Hydroxymethylbutenyl diphosphate accumulation reveals MEP pathway regulation for high CO_2-induced suppression of isoprene emission. *Proceedings of the National Academy of Science USA* 120, e2309536120 DOI 10.1073/pnas.2309536120.

Kulke M, Weraduwage SM, **Sharkey TD**, Vermaas JV (2023) Nanoscale simulation of the thylakoid membrane response to extreme temperatures. *Plant Cell & Environment* 46, 2419-2431. DOI 10.1111/pce.14609

Schmiege, SC, **Sharkey TD**, Walker B, Hammer, J, Way DA (2023) Laisk measurements in the non-steady-state: two tests in plants exposed to warming and variable CO_2 concentrations. *Plant Physiology*, 193, 1045-1057 DOI 10.1093/plphys/kiad305

Khana D, Tatli1M, Vazquez J, Weraduwage SM, Stern N, Hebert AS, Trujillo EA, Coon JJ, **Sharkey TD**, Amador-Noguez D (2023) Systematic analysis of metabolic bottlenecks in the methylerythritol 4-phosphate (MEP) pathway of *Zymomonas mobilis. mSystems* 8 (2), e00092-23 DOI 10.1128/msystems.00092-23

McClain AM, **Sharkey TD** (2023) Rapid CO_2 changes cause oscillations in photosynthesis that implicate PSI acceptor-side limitations. *Journal of Experimental Botany* 74, 3163-3173. doi.org/10.1093/jxb/erad084

Stallknecht EJ, Herrera CK, Yang C, King I, **Sharkey TD**, Lunt RR, Runkle ES (2023) Design of plant-transparent agrivoltaics. *Scientific Reports* 13, 1903. DOI 10.1038/s41598-023-28484-5

Weraduwage SM, Sahu A, Kulke M, Vermaas J, **Sharkey TD** (2023) Characterization of promoter elements of isoprene-responsive genes, and the ability of isoprene to bind START domain transcription factors. *Plant Direct*, 7, e483. DOI 10.1002/pld3.483

McClain AM, Cruz JA, Kramer DM. **Sharkey TD** (2023) The time course of acclimation to the stress of triose phosphate use limitation. *Plant, Cell & Environment* 46, 64-75. DOI 10.1111/pce.14476

Reviews, chapters, commentaries (peer reviewed)

Bellucci M, Locato V, **Sharkey TD**, De Gara L, Loreto F (2023) Isoprene emission by plants in polluted environments. *Journal of Plant Interactions.* DOI 10.1080/17429145.2023.2266463

Sharkey TD (2023) The discovery of rubisco. *Journal of Experimental Botany* 74, 510-519 DOI 10.1093/jxb/erac254

Sharkey TD (2023) Maximising the efficiency of RuBP (ribulose bisphosphate) regeneration to optimise photosynthesis in crops. In: Understanding and Improving Crop Photosynthesis (ed R. Sharwood) Chapter 9 pp 223-248, ISBN 978-1-80146-129-0. Burleigh Dodds Science Publishing Limited. https://shop.bdspublishing.com/store/bds/detail/product/3-190-9781801467650

2022

Original research papers

Weraduwage SM, Frame MK, **Sharkey TD** (2022) Role of guard cell- or mesophyll cell-localized phytochromes in stomatal responses to blue, red, and far-red light. *Planta* 256, 55. DOI 10.1007/s00425-022-03967-3

Bibik J, Weraduwage SM, Banerjee A, Robertson Ks, Espinoza Corral R, **Sharkey TD**, Lundquist P, Hamberger B (2022) Pathway engineering, re-targeting, and synthetic scaffolding improves production of squalene in plants. *ACS Synthetic Biology* 11: 2121-2133. doi.org/10.1021/acssynbio.2c00051

Wieloch T, **Sharkey TD** (2022) Compartment-specific energy requirements of photosynthetic carbon metabolism in *Camelina sativa* leaves. *Planta* 255:103 doi.org/10.1007/s00425-022-03884-5

Xu Y, Wieloch T, Kaste JAM, Shachar-Hill Y, **Sharkey TD** (2022) Reimport of carbon from cytosolic and vacuolar sugar pools into the Calvin-Benson cycle explains photosynthesis labeling anomalies. *Proceedings of the National Academy USA* 119: e2121531119 doi:10.1073/pnas.2121531119

Wieloch T, **Sharkey TD**, Werner RA, Schleucher J (2022) Intramolecular carbon isotope signals reflect metabolite allocation in plants. *Journal of Experimental Botany* https://doi.org/10.1093/jxb/erac028

Dani KGS, Pollastri S, Pinosio S, Reichelt M, **Sharkey TD**, Schnitzler, J-P, Loreto, F (2022) Isoprene enhances leaf cytokinin metabolism and induces early senescence. *New Phytologist* 234(3): 961-974 DOI 10.1111/nph.17833

Reviews, chapters, commentaries (peer reviewed)

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Books

Editor

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Tcherkez, G. Ghashghaie, J. eds. *Plant Respiration: Metabolic Fluxes and Carbon Balance*, **Vol 43** of Advances in Photosynthesis and Respiration, Govindjee and **T.D. Sharkey** Series eds. Springer International Publishing AG, Cham, Switzerland, 2018

Hikosaka, K. Niinemets, Ü. Anten, N.P.R. eds. *Canopy Photosynthesis: From Basics to Applications,* **Vol 42** of Advances in Photosynthesis and Respiration, Govindjee and **T.D. Sharkey** Series eds. Springer Academic Publications, Dordrecht, 2016

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Zannoni, D. De Phillipis, R. eds. *Microbial BioEnergy: Hydrogen Production*, **Vol 38** of Advances in Photosynthesis and Respiration, Govindjee and **T.D. Sharkey** Series eds. Springer Academic Publications, Dordrecht, 2014

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Biswal, B., Krupinska, K., Biswal, U.C. eds. *Plastid Development in Leaves during Growth and Senescence*, **Vol 36** of Advances in Photosynthesis and Respiration, Govindjee and **T.D. Sharkey** Series eds. Springer Academic Publications, Dordrecht, 2013

Bock, R. and V. Knoop eds. *Genomics of Chloroplasts and Mitochondria*, **Vol 35** of Advances in Photosynthesis and Respiration, Govindjee and **T.D. Sharkey** Series eds. Springer Academic Publications, Dordrecht, 2013

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SEMINARS AND PRESENTATIONS (last 10 years)

11/24 "Three Pentose Phosphate Pathways during Photosynthetic Carbon Metabolism" Keynote speaker at the Crop Science Society of America Multidisciplinary Symposium, San Antonio, Texas

8/23 "Regulatory mechanisms of the methyl erythritol pathway discovered during isoprene research" Terpnet, Davis California

7/23 "Cytosolic carbon metabolism pathways that support the Calvin-Benson-Bassham cycle" Plenary Speaker, 11th International Conference of Photosynthesis and Hydrogen Energy Research for Sustainability, Istanbul, Turkey

7/22 "Isoprene and the environment" Keynote speaker, Annual Meeting of the Phytochemical Society of North America, Virginia Tech, Blacksburg Virginia

6/22 Discussion leader Emerging Sources and Sinks, Gordon Research Conference on Biogenic Hydrocarbons and the Atmosphere, Oxnard California

6/22 "Hydrocarbon Emissions from Plants: At the Interface of Biochemistry and Ecology" Presentation at the Research Experiences for Undergraduates Program Michigan State University

5/22 "Isoprene signaling and plant resilience to climate change", Interdisciplinary Plant Group Symposium, University of Missouri

4/22 "Isoprene signaling and plant resilience to climate change" Cornell School of Integrative Plant Science Plenary Seminar

3/21 "Photosynthetic carbon metabolism: Roles of gluconeogenesis and pentose phosphate pathways", 1 hr lecture, Istanbul University 18th Winter School

2/21 "Shining light on the dark reactions of photosynthesis" Texas Tech University (by Zoom)

11/19 "Will global climate change affect isoprene emission from plants?" Institut für Bio- und Geowissenschaften, Jülich

11/19 "Will global climate change affect isoprene emission from plants?" Heinrich-Heine-Universität Düssedorf

10/19 "Will global climate change affect isoprene emission from plants? Western University, London, Ontario

9/19 "How will global climate change affect isoprene emission from plants?", John Innes Centre, Norwich

8/19 "Isoprene emission affects growth-defense tradeoffs in plants" ASPB, San Jose

3/19 "Recent Insights into the Calvin-Benson Cycle and Related Metabolism of Photosynthesis" Invited Seminar, Dept. Horticulture, MSU

9/18 "Auxiliary pathways of the Calvin-Benson cycle", Estonian University of Life Sciences

7/18 "Elaborations of the Calvin-Benson cycle: Historical concerns and new insights", International Society of Photosynthesis Research 2018 meeting, Montreal

1/18 "Elaborations of the Calvin-Benson Cycle: Historical Concerns and New Insights", Western Photosynthesis Conference, Biosphere2, Arizona

11/17 "What Gas Exchange Measurements Tell Us About Photosynthesis Metabolism", Invited talk, Washington State University

10/17 "Carbon Export from the Calvin-Benson Cycle", Invited talk, Greenhouse Gas Flux Workshop, Potsdam, Germany

10/17 "Carbon Export from the Calvin-Benson Cycle", Invited talk, Max Planck Institute for Molecular Plant Physiology, Golm, Germany

6/16 Diversity of Sources, Sinks, and Impacts of Atmospheric Organics, Keynote session discussion leader, Gordon Research Conference, Girona, Spain

10/16 "The Calvin-Benson Cycle in a Stochastic Light Environment", 25 min talk, Montana State University, USDA NC1200 project report

11/15 "The Calvin-Benson Cycle of photosynthesis: historical insights and new hypotheses", Seminar, Western Michigan University

6/15 "The glucose 6-phosphate shunt around the Calvin-Benson Cycle". Invited talk, Steven Long symposium, University of Essex, Colchester, UK

6/15 "Building toward an understanding of the mechanism of action of isoprene" Invited talk, Terpnet 2015, Vancouver, Canada
4/15 "Isopentenyl Diphosphate Inhibition of Thiamin Diphosphate Enzymes, Especially Deoxyxylulose 5-Phosphate Synthase" Invited talk, ASBMB national meeting, Boston, MA
3/15 "The glucose 6-phosphate shunt around the Calvin-Benson Cycle: Connecting carbon metabolism and cyclic photophosphorylation." Invited seminar, Univ. Illinois
10/14 "When photosynthesis becomes insensitive to CO_2 – what triose-phosphate-use tells us about photosynthetic metabolism", Invited speaker, PRL Retreat
7/14 "Exploring chloroplast terpene metabolism using metabolomics of isoprene synthesis" Third International Conference on Plant Metabolism, Xiamen, China
7/14 "Why plants make so much isoprene?" Invited seminar, Nanjing University
6/14 "Control of Carbon metabolism", Gordon Conference,
5/14 "Molecular and metabolic understanding of isoprene emission from trees" Molecular and Environmental Plant Sciences Symposium. TAMU College Station Texas
6/13 "Isoprene Synthase Genes Form a Monophyletic Clade of Acyclic Terpene Synthases in the Tps-B Terpene Synthase Family" Terpnet, Crete
3/13 "Recent Insights into Isoprene Synthesis" Eurovol Conference on Plant Terpenoids, Florence
11/12 "Engineering End Products of Photosynthesis To Increase Yield and Efficiency" AgBioResearch Brazil workshop, East Lansing
10/12 "High Temperature Effects on Photosynthesis and Protection by Isoprene" Academia Sinica, Tapei, Taiwan
5/12 "Omics of Isoprene Emission from Plants" Interdisciplinary Plant Group, Univ. Missouri, Columbia
12/11 "Novel Isoprene Synthases" ZuvaChem presentation, Baltimore, MD
5/11 "Optimizing End Products of Photosynthesis To Increase Yield and Efficiency" Gordon Research Conference, Les Diableret, Switzerland
8/10 "Leaf Starch Metabolism in C_3, C_4, and CAM Plants and Molecular Approaches to Engineering" Invited talk, International Photosynthesis Congress, Beijing
8/10 "Biology and Chemistry of Isoprene" Chinese Academy of Science, Shanghai
5/10 "BVOC Research: Past, Present, and Future" Gordon Research Conference *Biogenic Hydrocarbons and the Atmosphere*. Switzerland
1/10 "Improved Isoprene Synthases" Invited talk, ZuvaChem Inc. Baltimore MD
11/09 "Isoprene and Methyl Butenol: Biology, Biochemistry, and Molecular Biology" Invited seminar, Genencor, Palo Alto CA
8/09 "The frustrating biology underlying isoprene emission models" Talk at Gordon Conference on Atmospheric Chemistry
5/09 "The Evolution of Methylbutenol Emission in Pinus" Poster at Terpnet meeting, Tokyo, Japan
5/09 "Increasing the Yield of Starch and other Easily Degraded Polymers in Leaves" Invited talk at GLBRC retreat
2/09 "Leaf Starch Mobilization" Invited seminar, Washington State University