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# J. MASON HEBERLING

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## EDUCATION

- 2015            **Ph.D.** in Biology, Syracuse University, Syracuse, NY  
*Functional traits and resource-use strategies of native and invasive plants in Eastern North American forests*  
Advisor: Jason Fridley
- 2010            **B.S.** in Biology (Statistics minor), Penn State University, University Park, PA  
Mentor: Katriona Shea
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## APPOINTMENTS

- 2019-present    **Assistant Curator of Botany** & Co-Chair of Collections,  
Carnegie Museum of Natural History, Pittsburgh, PA, USA
- 2020-present    Adjunct Assistant Professor, Department of Biological Sciences, University of  
Pittsburgh, Pittsburgh, PA, USA
- 2019-present    Adjunct Research Scientist, Hunt Institute for Botanical Documentation,  
Carnegie Mellon University, Pittsburgh, PA, USA
- 2017-2021       Research Assistant Professor, Ecology and Evolutionary Biology  
University of Tennessee Knoxville
- 2017-2018       NSF Postdoctoral Fellow, Carnegie Museum of Natural History  
Sponsors: Stephen J. Tonsor & Susan Kalisz
- 2016-2019       Research Associate, Botany, Carnegie Museum of Natural History
- 2015-2016       Postdoctoral Research Associate, Ecology and Evolutionary Biology  
University of Tennessee Knoxville  
Mentor: Susan Kalisz
- 2014-2016       Visiting Scholar, Dept. of Biological Sciences, University of Pittsburgh
- 2008-2010       Undergraduate Research Assistant, Department of Biology, Penn State

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## RESEARCH GRANTS & FELLOWSHIPS

- 2020-2023 NSF Division of Environmental Biology, Population and Community Ecology  
*Collaborative Research: Phenological mismatch between trees and wildflowers mediated by climate change and plant invasions*. DEB-1936971; Lead PI, with co-PIs Sara Kuebbing (University of Pittsburgh/Yale University), Richard Primack (Boston University), \$ 244,739 (CMNH award, including travel supplement for collaboration through European Research Council and supplement for Research Experience for Post-Baccalaureate Students)
- 2020 Systematic Review of the GBIF-mediated Scientific Literature, Global Biodiversity Information Facility (GBIF) Secretariat, Copenhagen, Denmark; Sole PI (fixed-term contract).
- 2018-2021 NSF Advancing Digitization of Biodiversity Collections (ADBC)  
*Digitization PEN: Connecting Rust Belt dynamics to the Mid-Atlantic Megalopolis Project utilizing the Carnegie Museum herbarium* (DBI-1612079; PI with co-PI B.L. Isaac), \$173,614
- 2019-2020 Pennsylvania Department of Conservation and Natural Resources (DCNR)  
Wild Resource Conservation Program: *Measuring Long-Term Ecological Change in Rare Plants of Pennsylvania* (co-PI with PI B.L. Isaac) \$27,081.
- 2017-2018 NSF Postdoctoral Research Fellowship in Biology,  
Research using Collections track (DBI-1801022, sole PI)  
*Leveraging centuries of herbarium data to track invasion processes: functional trait shifts, local adaptation, and rapid evolution* \$138,000
- 2012-2015 NSF Graduate Research Fellowship
- 2010-2012 Syracuse University Graduate Fellowship
- 2009-2010 Morrow Family Endowed Prize, Penn State Eberly College of Science

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## AWARDS

- 2020 George Mercer Award, Ecological Society of America
- 2016 Alexander Gourevitch Memorial Award, Syracuse University
- 2015 All University Doctoral Prize, Syracuse University

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## PUBLICATIONS (peer-reviewed; published, in press, or in review only)

- In review Miller, T.K., **Heberling, J.M.**, Kuebbing, S.E., & Primack, R.B. Phenological mismatch among native and non-native trees, shrubs, and wildflowers across the Eastern Deciduous Forest of North America. Target: *Journal of Ecology*
- Teixera-Costa, L., **Heberling, J.M.**, Wilson, C.A., & Davis, C.C. Parasitic plant specimens embody the extended specimen. Target: *Methods in Ecology and Evolution*

- In review Heberling, J.M. & Isaac, B.L. The Extended Specimen. In: *The Herbarium Handbook, Fourth Edition* (Edited by Clare Drinkell, Nina Davis, Timothy Utteridge). Published by Royal Botanic Gardens, Kew: London, UK. [anticipated Fall 2022]
- 2022 31. Fridley, J.D., Bauerle, T.L., Craddock, A., Ebert, A.R., Frank, D.A., **Heberling, J.M.**, Hinman, E.D., Jo, I., Martinez, K.A., Smith, M.S., Woolhiser, L.J., & Yin, J. Fast but steady: woody invader syndrome in North America evades leaf economic tradeoffs. *Ecology Letters*, in press.
30. **Heberling, J.M.** Herbaria as big data sources of plant traits. *International Journal of Plant Sciences*, in press. <https://doi.org/10.1086/717623> [\*featured on cover of Feb 2022 issue] [2022 Coulter Review]
29. Reeb, R.A., N. Aziz, Lapp, S.M., Kitzes, J., **Heberling, J.M.**, & Kuebbing, S.E. Using convolutional neural networks to efficiently extract immense phenological data from community science images. *Frontiers in Plant Science*, in press.
- 2021 28. Gallinat, A.S., Ellwood, E.R., **Heberling, J.M.**, Miller-Rushing, A.J., Pearse, W.D., Primack, R.B. Macrophenology: insights into the broad-scale patterns, drivers, and consequences of phenology. *American Journal of Botany*, 108:2112–2126.
27. Gorchov, D.L., Blossey, B., Averill, K.M., Dávalos, A., **Heberling, J.M.**, Jenkins, M.A., Kalisz, S., McShea, W.J., Morrison, J., Nuzzo, V., Webster, C.R., & Waller, D.M. Differential and interacting impacts of invasive plants and white-tailed deer in eastern U.S. forests. *Biological Invasions* 23:1711-2727.
26. **Heberling, J.M.**, Miller, J., Noesgaard, D., Weingart, S. & Schigel, D.S. Data integration enables global biodiversity synthesis. *Proceedings of the National Academy of Sciences USA*, 118(6): e2018093118. [recommended article on *Faculty Opinions*]
- 2020 25. **Heberling, J.M.** Museum specimens are more than meet the eye. *Current Biology* 30:R1368-R1370.
24. Perez, T.M., Rodriguez, J. & **Heberling, J.M.** Herbarium specimens reliably estimate three functional traits. *American Journal of Botany* 107:1457-1464.
23. Reeb, R.A., Acevedo, I., **Heberling, J.M.**, Isaac, B.L. & Kuebbing, S. Nonnative old-field species inhabit early-season phenological niches and exhibit unique sensitivity to climate. *Ecosphere* 11(18):e03217.
22. Pearson, K.D., Nelson, G., Aronson, M., Bonnet, P., Brenskelle, L., Davis, C.C., Denny, E.G., Ellwood, E.R., Goëau, H., **Heberling, J.M.**, Joly, A., Lorieul, T., Mazer, S.J., Meineke, E.K., Stucky, B., Sweeney, P., White, A.,

- Soltis, P.S. Machine learning using digital herbarium specimens to accelerate phenological research. *BioScience* 70:610-620.
21. Shouman, S., Mason, N.W.H., **Heberling, J.M.**, Kichey, T., Closset-Kopp, D., Kobeissi, A. & Decocq, G. Leaf functional traits at home and abroad: a community perspective of sycamore maple invasion. *Forest Ecology & Management* 464:118061.
20. Hedrick, B. P., **Heberling, J. M.\***, Meineke, E.\*, Turner, K. G.\*, Grassa, C. J., Park, D., Kennedy, J., Clarke, J., Cook, J., Edwards, S. V., Davis, C. The future of natural history collection digitization. *BioScience* 70:243-251.  
\*denotes equal contributors (see *PeerJ Preprints* 7:e27859v1)
19. Kattge, J., Bönisch, G., Díaz, S., Lavorel, S., Prentice, I.C., Leadley, P., Tautenhahn, S., Werner, G., ...[data paper with 715 additional co-authors including **Heberling, J.M.**]... and Wirth, C. TRY plant trait database - enhanced coverage and open access. *Global Change Biology* 26:119-188.
- 2019 18. **Heberling, J.M.**, Prather L.A. & Tonsor, S.J. The changing uses of herbarium data in an era of global change: An overview using automated content analysis. *BioScience* 69:812-822. [*\*featured on cover of Oct 2019 issue*]
17. **Heberling, J.M.**, Burke, D.J. Utilizing herbarium specimen roots to quantify historical mycorrhizal communities. *Applications in Plant Sciences* 7(4):e1223. [*\*Special Issue on Methods in Belowground Botany*]
16. **Heberling, J.M.**, McDonough Mackenzie, C., Fridley, J.D., Kalisz, S. & Primack, R.B. Phenological mismatch with trees reduces wildflower carbon budgets. *Ecology Letters* 22:616-623. [*\*winner of 2020 George Mercer Award from the Ecological Society of America*]
15. **Heberling, J.M.**, Cassidy, S., Fridley, J.D. & Kalisz, S. Carbon gain phenologies of spring-flowering perennials in a deciduous forest indicate a novel niche for a widespread invader. *New Phytologist* 221:778-788.
- 2018 14. **Heberling, J.M.** & Isaac, B.L. iNaturalist as a tool to expand the research value of museum specimens. *Applications in Plant Sciences* 6(11):e1193.
13. **Heberling, J.M.** & Mason, N.W.H. Are endemics functionally distinct?: Leaf traits of native and invasive woody species in a New Zealand forest. *PLOS ONE* 13(5):e0196746
- 2017 12. Shouman, S., Mason, N.W.H., Kichey, T., **Heberling, J.M.**, Closset-Kopp, D. & Decocq, G. Functional shift of sycamore (*Acer pseudoplatanus* L.) towards greater plasticity and shade tolerance in its invasive range. *Perspectives in Plant Ecology, Evolution, & Systematics* 29:30-40.
- 2017 11. **Heberling, J.M.** & Isaac, B.L. Herbarium specimens as exaptations: new uses for old collections. *American Journal of Botany* 104(7):963-965.

- 2017
10. Wavrek, M., **Heberling, J.M.**, Fei S. & Kalisz, S. Herbaceous invaders in temperate forests: a systematic review of their ecology and proposed mechanisms. *Biological Invasions* 19(11):3079-3097.
  9. **Heberling, J.M.**, Brouwer, N.L. & Kalisz, S. Effects of deer on the photosynthetic performance of invasive and native forest herbs. *AoB PLANTS* 9:plx011. [\*Special Issue on Interactions between white-tailed deer and invasive plants in North American forests]
  8. **Heberling, J.M.**, Jo, I., Kozhevnikov, A., Lee, H. & Fridley, J.D. Biotic interchange in the Anthropocene: strong asymmetry in East Asian and eastern North American plant invasions. *Global Ecology and Biogeography* 26:447-458.
- 2016
7. **Heberling, J.M.** & Fridley, J.D. Invaders do not require high resource levels to maintain physiological advantages in a temperate deciduous forest. *Ecology* 97:874-884
  6. **Heberling, J.M.**, Kichey, T., Decocq, G. & Fridley, J.D. Plant functional shifts in the invaded range: a test with reciprocal forest invaders of Europe and North America. *Functional Ecology* 30:875-884
- 2013
5. **Heberling, J.M.** & Fridley, J.D. Resource-use strategies of native and invasive plants in Eastern North American forests. *New Phytologist* 200:523-533.
- 2012
4. **Heberling, J.M.** & Fridley, J.D. Biogeographic constraints on the worldwide leaf economics spectrum. *Global Ecology and Biogeography* 21:1137-1146.
  3. Siefert, A., Ravenscroft, C., Althoff, D., Alvarez-Yapiz, J., Carter, E., Glennon, K., **Heberling, J.M.**, Jo, I., Pontes, A., Sauer, A., Willis, A. & Fridley, J.D. Scale dependence of vegetation-environment relationships: a meta-analysis of multivariate data. *Journal of Vegetation Science* 23:942-951.
- 2011
2. Russo, L., Stehouwer, R., **Heberling, J.M.** & Shea, K. The composite insect trap: an innovative combination trap for biologically diverse sampling. *PLoS ONE* 6(6):e21079.
  1. Zhang R., **Heberling, J.M.**, Haner, E. & Shea, K. Tolerance of two invasive thistles to repeated disturbance. *Ecological Research* 26:575-581.

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#### INVITED RESEARCH PRESENTATIONS (scientific & public audiences)

- 2022 Department of Biological Sciences, University of Cincinnati
- 2021 Department of Biodiversity, Earth & Environmental Science, Drexel University, Philadelphia, PA

- 2021 Academy of Natural Sciences of Drexel University, Philadelphia, PA  
Niagara Frontier Botanical Society, Buffalo, NY  
Department of Biology, West Virginia University, Morgantown, WV  
New England Botanical Club, Cambridge, MA  
Pennsylvania Botany Symposium, Penn State University, State College, PA
- 2020 Royal Botanic Gardens, Kew, London, United Kingdom  
Carnegie Discoverers, Carnegie Museum of Natural History, Pittsburgh, PA  
Convolvulaceae Network, international research group (virtual)  
Department of Botany, Smithsonian National Museum of Natural History, Washington, DC  
Department of Biological Sciences, University of Pittsburgh, Pittsburgh, PA  
GBIF Governing Board Meeting 27, Global Biodiversity Information Facility (GBIF) Secretariat, Copenhagen, Denmark  
Mount Lebanon Nature Conservancy, Mt. Lebanon, PA
- 2019 “Rethinking the herbarium specimen in the digital age,” 45th Annual Southern California Botanists Symposium, *New Frontiers in Botany: Discoveries and Emerging Tools*, Pomona College, Claremont, CA  
“Rethinking the museum specimen in the digital age” *R.W. Moriarty Science Seminar Series*, Carnegie Museum of Natural History, Pittsburgh, PA  
“Stories from the dead: What museums specimens tell us about the living world” *Scientist Lecture Series*, Holden Arboretum, Kirkland, OH  
“All about timing: Plant phenology and mismatch in our changing forests” Pymatuning Laboratory of Ecology, University of Pittsburgh  
“Measuring change through a century of invasion” [keynote speaker] *Plants in the City: Mid-Atlantic Megalopolis Project symposium*, Rutgers University, New Brunswick, NJ  
“Of wildflowers and weeds: Our changing Pittsburgh forests” Mt. Lebanon Nature Conservancy, Mt. Lebanon, PA
- 2018 *Biophilia public seminar series*, Phipps Conservatory and Botanical Gardens, Pittsburgh, PA
- 2017 *NSF Postdoc Research Symposium*, Harvard University, MA
- 2016,2018 Botanical Society of Western Pennsylvania, Pittsburgh, PA
- 2016 *Biological Invasions in Forests Workshop*, International Union of Forest Research Organizations, Shepherdstown, WV
- 2015 R.W. Moriarty Seminar Series, Carnegie Museum of Natural History
- 2014 Department of Biological Sciences, University of Pittsburgh, Pittsburgh, PA
- 2013 Ecology and Dynamics of Human Influenced Systems (EDYSAN), Université de Picardie Jules Verne, Amiens, France

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**CONFERENCE PRESENTATIONS** (presenting author only)

- 2021            **Heberling, J.M.** & Isaac, B.L. “Monstrosities and archiving variation” Society of Herbarium Curators annual symposium entitled “NOT your average specimen!” Botany Meeting 2021 (Lightning talk; virtual).
- Heberling, J.M.** & Muzika, R. “Why do some deciduous plants retain dead leaves through winter?: Exploring marcescence” Botany Meeting 2021 (Contributed talk; virtual).
- Heberling, J.M.**, Miller, J., Noesgaard, D., Weingart, S. & Schigel, D.S. “Data integration enables global biodiversity synthesis” Ecological Society of America Annual Meeting. (Poster; virtual)
- 2020            **Heberling, J.M.**, McDonough MacKenzie, C., Fridley, J.D., Kalisz, S., Kuebbing, S., Miller, T. & Primack, R.B. “Phenological mismatch between trees and wildflowers under climate change and plant invasions” Ecological Society of America Annual Meeting (poster; virtual)
- 2019            **Heberling, J.M.** “Emerging roles for herbaria in functional trait ecology” *Special symposium: Early career innovators in herbarium-enabled research*, Society of Herbarium Curators, Tucson, AZ (invited talk)
- 2018            **Heberling, J.M.**, Tonsor, S.J. & Prather, L.A. “The changing roles of herbaria in an era of global change: A systematic review” Ecological Society of America Annual Meeting, New Orleans, LA, USA. \*Organized Oral Session: “New Uses For Old Collections: Herbarium Data in an Era of Ecological Change” [\*Heberling organized oral session with S. Tonsor and A. Prather]
- 2017            **Heberling, J.M.** “The changing roles of herbaria in an era of global change” International Council of Museums Committee for Museums and Collections of Natural History (ICOM NAT HIST) Annual Meeting, Pittsburgh, PA, USA.
- Heberling, J.M.** “Old collections with new uses: the roles of herbaria in the Anthropocene” Northeast Natural History Conference, Cromwell, CT, USA.
- 2016            **Heberling, J.M.** & Kalisz, S. “Physiological mechanisms behind *Alliaria petiolata* success and native decline: deer increase invader photosynthetic rates” 101th Ecological Society of America Annual Meeting, Ft. Lauderdale, FL, USA.
- Heberling, J.M.**, Brouwer, N.L. & Kalisz, S. “Plant invasion mediated by deer overabundance: linking demographic patterns and ecophysiological mechanisms” Botany 2016 Meeting (Botanical Society of America), Savannah, GA, USA.

- 2015 **Heberling, J.M.** & Fridley, J.D. "Physiological ecology of forest invaders along experimental light and nutrient gradients: does invader advantage depend on disturbance?" 100th Ecological Society of America Annual Meeting, Baltimore, MD, USA.
- 2014 **Heberling, J.M.**, Kichey, T., Decocq, G., Fridley, J.D. "Pre-adapted to invade? Resource-use strategies of reciprocal woody invaders in Northeastern US and France." Northeast Natural History Conference, Springfield, MA, USA.
- 2013 **Heberling, J.M.** & Fridley, J.D. "Functional comparisons of native and invasive plants in Eastern North American forests: do they differ in resource-use strategies?" 56th International Association of Vegetation Science Annual Symposium, Tartu, Estonia.
- 2012 **Heberling, J.M.** & Fridley, J.D. "East Asian plants in Eastern US forests: Are invaders pre-adapted for more efficient resource use?" International symposium on the East Asian flora and its role in the formation of the world's vegetation. Botanical-Garden Institute, Russian Academy of Sciences, Vladivostok, Russia.
- 2011 **Heberling, J.M.** & Fridley, J.D. "Biogeographic constraints on the worldwide leaf economic spectrum." 96th Ecological Society of America Annual Meeting, Austin, TX, USA.
- 2010 **Heberling, J.M.**, Russo, L., Yang, S. & Shea, K. "Complex plant community responses to invasion by the thistle *Carduus acanthoides*." 95th Ecological Society of America Annual Meeting, Pittsburgh, PA, USA.

### TEACHING EXPERIENCE (academic)

- 2015 Instructor (sole), Function and Structure of Organisms, Penn State New Kensington, New Kensington, PA
- 2013-present Occasional guest lecturer for: *Inside Natural History Museums* (Museum Studies, University of Pittsburgh), *Plant Biology* (University of Pittsburgh), *Population Biology* (University of Pittsburgh), *Ecology* (Onondaga Community College, Syracuse, NY)
- 2012 Teaching assistant, *Physiology Lab* (advanced undergraduate), Syracuse University
- 2011 Teaching assistant, *Introductory Biology*, Syracuse University
- 2011-2014 Teaching fellow, Future Professoriate Program, Syracuse University

### OUTREACH

- 2017-present *Collected On This Day* ([www.collectedonthistoday.com](http://www.collectedonthistoday.com))  
Weekly blog featuring specimens and collectors in the Carnegie Museum Herbarium. I work with CM staff to contribute these posts to various social



media platforms (e.g., Facebook, Instagram, Tumblr). Facebook posts have reached an estimated 76,833 people (as of 8 Aug 2017).

- 2012 Volunteer, Early College High School Summer Science Institute, with Department of Education, Syracuse University. Guided Syracuse 10-12th grade students through biology hands-on modules.
- 2012 High School Science Tutor, Say Yes to Education program, Nottingham High School, Syracuse City School District. Tutored individual students and small groups in Biology, Earth Science, and Algebra.
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## SCIENTIFIC SERVICE

- 2011-present Reviewer for >40 manuscripts: *Current Biology* (x3), *Nature Communications* (x2), *Journal of Ecology*, *Taxon*, *Systematics & Biodiversity*, *BioScience* (x2), *Functional Ecology* (x2), *American Journal of Botany* (x3), *Annals of Carnegie Museum*, *Ecological Applications*, *Global Change Biology*, *Applications in Plant Sciences* (x3), *Scientific Reports* (x2), *Oecologia* (x4), *New Phytologist* (x4), *Castanea*, *Botany Letters*, *Plant Ecology*, *Photosynthesis Research*, *PLoS ONE* (x2), *Forest Ecology and Management*, *Journal of the Torrey Botanical Society*, *Nature Plants*, *Biological Invasions* (x5), *Ecology Letters*, *Global Ecology and Biogeography* (x2), *Journal of Ecology*, *Journal of Plant Ecology* (x2), *Diversity and Distributions*, *Journal of Vegetation Science* (x3), *Botanica Pacifica*, *International Journal of Plant Biology*, *Botanical Studies*, *Northeastern Naturalist* (x3)
- \*Verified review record here:  
<https://publons.com/researcher/1312551/mason-heberling/#>
- 2022 Proposal reviewer, Botany-In-Action Graduate Fellowships, Phipps Conservatory and Botanical Gardens
- 2021 External book manuscript reviewer, Yale University Press
- 2020 External expert reviewer, Dutch Research Council (NWO)
- 2020 Ad hoc reviewer, NSF Division of Environmental Biology
- 2018 Organized Oral Session: "New Uses For Old Collections: Herbarium Data in an Era of Ecological Change" (Heberling organized oral session with S. Tonsor and L.A. Prather)  
<https://eco.confex.com/eco/2018/meetingapp.cgi/Session/14000>
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## ACADEMIC AND MUSEUM SERVICE

- 2019-present Co-Chair of Collections, Carnegie Museum of Natural History
- 2021 External PhD dissertation pre-examiner, University of Helsinki, Finland
- 2020-2021 Member, Human Remains Policy Working Group, Carnegie Museum of Natural History

2013,2014	Graduate Representative, Undergraduate Curriculum Committee, Department of Biology, Syracuse University
2013	Panelist, Pre-doctoral Fellowship Workshops, Office of Research, Syracuse University
2012	Vice President, Biology Graduate Student Organization, Syracuse University
2012	Library Committee Member and Biology Department Senator, Graduate Student Organization, Syracuse University

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## **ADVISING AND THESIS COMMITTEES**

### Postdoctoral advisees

2021-present	Molly Ng (Rea Postdoctoral Fellow)
2021-present	Benjamin R. Lee (NSF Postdoctoral Research Fellow in Biology)

### Graduate advisees

2019-present	Rachel Reeb (PhD committee), University of Pittsburgh
2021-present	Cheyenne Moore (PhD committee), University of Pittsburgh
2021-present	Amber Stanley (PhD committee), University of Pittsburgh
2021-present	Hannah Assour (PhD committee), University of Pittsburgh

### Undergraduate mentorship

2021-2022	Abby Yancy (NSF REPS student), CMNH
2021-present	Alyssa McCormick (research internship), Chatham University
2022-present	John Mamas (research internship), Chatham University
2021-2022	Koa Reitz (research technician), University of Pittsburgh
2021-2022	Meri Raughley (research technician), University of Pittsburgh

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## **LABORATORY/TEACHING PROTOCOLS (not peer-reviewed)**

2013	Heberling, J.M. A practical guide to measuring leaf-level photosynthesis. [online resource: <a href="https://sites.google.com/site/fridleylab/home/protocols">https://sites.google.com/site/fridleylab/home/protocols</a> ].
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## **PROFESSIONAL AFFILIATIONS**

Ecological Society of America (ESA), Society of Herbarium Curators (SHC), Botanical Society of America (BSA), Botanical Society of Western Pennsylvania, International Association for Vegetation Science (IAVS), Society for the Preservation of Natural History Collections (SPNHC), International Council of Museums (ICOM), American Alliance of Museums (AAM)

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