

# MARY A. HESKEL

The Ecosystems Center  
Marine Biological Laboratory  
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## PROFESSIONAL APPOINTMENTS

- Rosenthal Postdoctoral Scholar, Marine Biological Laboratory  
The Ecosystems Center  
Advisor: Jianwu Tang 2014-present
- Postdoctoral Associate, University of Minnesota  
Department of Forest Resources  
Advisors: Peter Reich and Owen K. Atkin (Australian National University) 2014
- Postdoctoral Research Fellow, Australian National University  
Division of Plant Sciences, Research School of Biology  
Advisor: Owen K. Atkin 2013-2014

## EDUCATION

- Ph.D. Ecology, Evolution, & Environmental Biology, Columbia University 2013  
M.A. Ecology, Evolution, & Environmental Biology, Columbia University 2011  
Advisors: Kevin L. Griffin and Hilary Callahan  
Dissertation: "Environmental controls of foliar respiration in Arctic tundra plants"
- M.A. Education, concentration in Secondary Science Education, *with honors*,  
City College of New York 2008
- B.A. Biology, minor in History of Art, *cum laude*, University of Pennsylvania 2006  
Semester at James Cook University, Townsville, QLD, Australia

## PUBLICATIONS (\*Undergraduate co-author)

19. Tcherkez G, Gauthier P, Buckley T, Busch F, Barbour MM, Bruhn D, **Heskel MA**, Gong XY, Crous KY, Griffin KL, Way DA, Turnbull MH, Adams M, Atkin OK, Farquhar GD, Cornic G. (2017) Leaf day respiration: low CO<sub>2</sub> flux but high significance for metabolism and carbon balance. *New Phytologist*. *Accepted*.
18. Yang H, Yang X, **Heskel M**, Sun S, Tang J. (2017) Seasonal variations of leaf and canopy properties tracked by ground based NDVI imagery in a temperate forest. *Scientific Reports*. 7: 1267.
17. Prager C, Naeem S, Boelman N, Eital J, Greaves H, **Heskel MA**, Magney T, Menge D, Vierling L, Griffin KL. (2017) A gradient of nutrient enrichment reveals non-linear impacts of fertilization on Arctic plant diversity and ecosystem function. *Ecology & Evolution*. 7(7): 2449-2460 doi: 10.1002/ece3.2863
16. Tcherkez G, Gauthier P, Buckley T, Busch F, Barbour MM, Bruhn D, **Heskel MA**, Gong XY, Crous KY, Griffin KL, Way DA, Turnbull MH, Adams M, Atkin OK, Bender M, Farquhar GD, Cornic G. (2017) Tracking the origins of the Kok effect, 70 years after its discovery. *New Phytologist*. 214 (2):506-510 doi: 10.1111/nph.14527
15. Yang H, Yang X, Zhang Y, **Heskel MA**, Lu X, Munger W, Sun S, Tang J. Chlorophyll fluorescence

- tracks seasonal variations of photosynthesis from leaf to canopy in a temperate forest. (2017) *Global Change Biology*. Online early. doi: 10.1111/gcb.13590
14. O'Sullivan OS, **Heskel MA**, Reich PB, Tjoelker MG, Weerasinghe KWLK, Penillard A, Zhu L, Egerton JJG, Bloomfield KJ, Creek D, Bahar NHA, Griffin KL, Hurry V, Meir P, Turnbull MH, Atkin OK. (2017) Thermal limits of leaf metabolism across biomes. *Global Change Biology*. 23 (1) 209-223 doi: 10.1111/gcb.13477
  13. Carey JC, Tang J, Templer PH, Kroeger KD, Crowther TW, Burton AJ, Dukes JS, Emmet B, Frey SD, **Heskel MA**, Jiang L, Machnuller M, Mohan J, Panetta AM, Reich PB, Reinsch S, *et al.* (>20 authors). (2016) Temperature response of soil respiration largely unaltered with experimental warming. *Proceedings of the National Academy of Sciences*. 113 (48) 13797-13802 doi:10.1073/pnas.1605365113
  12. **Heskel MA**, O'Sullivan OS, Reich PB, Tjoelker MG, Weerasinghe L, Penillard A, Egerton J, Creek D, Bloomfield K, Xiang J, Sinca F, Stangl Z, Martinez-de la Torre A, Griffin KL, Huntingford C, Hurry V, Meir P, Turnbull MH, Atkin OK. (2016) Reply to Adams *et al.*: Empirical versus process-based approaches to modelling temperature responses of leaf respiration. *Proceedings of the National Academy of Sciences*. 113 (41) doi: 10.1073/pnas.1612904113
  11. **Heskel MA**, O'Sullivan OS, Reich PB, Tjoelker MG, Weerasinghe L, Penillard A, Egerton J, Creek D, Bloomfield K, Xiang J, Sinca F, Stangl Z, Martinez-de la Torre A, Griffin KL, Huntingford C, Hurry V, Meir P, Turnbull MH, Atkin OK. (2016) Convergence in the temperature response of leaf respiration across biomes and plant functional type. *Proceedings of the National Academy of Sciences*, 113 (14) 3832-3837. doi: 10.1073/pnas.1520282113
  10. Murren CJ, Auld JR, Callahan HS, Ghalambor CK, Handelsman CA, **Heskel MA**, Kingsolver J, Maclean HJ, Masel J, Maughan H, Pfennig DF, Relyea RA, Seiter S, Snell-Rood E, Steiner UK, Schlichting CD. (2015) Constraints on the evolution of phenotypic plasticity: limits and costs of phenotype and costs of plasticity. *Heredity*, 115: 293-301 doi: 10.1038/hdy.2015.8
  9. Atkin OK, KJ Bloomfield, PB Reich, MG Tjoelker, GP Asner, D Bonal, G Bönisch, M Bradford, LA Cernusak, EG Cosio, D Creek, KY Crous, T Domingues, JS Dukes, JJG Egerton, JR Evans, GD Farquhar, NM Fyllas, PPG Gauthier, E Gloor, TE Gimeno, KL Griffin, R Guerrieri, **MA Heskel**, C Huntingford, FY Ishida, J Kattge, H Lambers, MJ Liddell, CH Lusk, RE Martin, TC Maximov, AP Maksimov, Y Mahli, BE Medlyn, P Meir, LM Mercado, N Mirotnick, D Ng, Ü Niinemets, OS O'Sullivan, OL Philips, L Poorter, P Poot, IC Prentice, N Salinas, LM Rowland, MG Ryan, S Sitch, M Slot, NG Smith, MH Turnbull, MC VanderWel, F Valladares, EJ Veneklaas, LK Weerasinghe, C Wirth, IJ Wright, K Wythers, J Xiang, S Xiang, J Zaragoza-Castells. (2015) Global variability in leaf respiration in relation to climate, plant functional types, and leaf traits. *New Phytologist*, 206 (2) 614-636. doi:10.1111/nph.13253
  8. **Heskel MA**, Greaves HE\*, Turnbull MH, O'Sullivan OS, Shaver GR, Griffin KL, Atkin OK (2014) Thermal acclimation of shoot respiration in an Arctic woody plant species subjected to 22 years of warming and altered nutrient supply. *Global Change Biology*, 20 (8) 2618-2630. doi: 10.1111/gcb.12544
  7. Murren CJ, Maclean HJ, Diamond SE, Steiner UK, **Heskel MA**, Handelsman CA, Ghalambor CK, Auld JR, Callahan HS, Pfennig DW, Relyea RA, Schlichting CD, Kingsolver J (2014) Evolutionary change in continuous reaction norms. *The American Naturalist*, 183(4): 453-467. doi: 10.5061/dryad.4s286
  6. **Heskel MA**, Bitterman D\*, Atkin OK, Turnbull MH, Griffin KL (2014) Seasonality of foliar respiration in two dominant plant species from the Arctic tundra: response to long-term warming and short-term temperature variability. *Functional Plant Biology*, 41(3): 287-300. doi: 10.1071/FP13137

5. **Heskel MA**, Atkin OK, Turnbull MH, Griffin KL (2013) Bringing the Kok effect to light: A review on the integration of daytime respiration and net ecosystem exchange. *Ecosphere*, 4: art 98. doi:10.1890/ES13-00120.1
4. **Heskel M**, Greaves HE\*, Gough L, Kornfeld A, Atkin OK, Turnbull MH, Shaver GR, Griffin KL (2013) Differential physiological responses to environmental change promote woody shrub expansion. *Ecology and Evolution*, 3 (5) 1149-1162. doi: 10.1002/ece3.525
3. Kornfeld A, **Heskel M**, Atkin OK, Gough L, Griffin KL, Horton TW, Turnbull MH (2013) Respiratory flexibility and efficiency are affected by simulated global change in Arctic plants. *New Phytologist*, 197 (4): 1161-1172. doi:10.1111/nph.12083
2. Griffin KL & **Heskel M** (2013) Breaking the cycle: How light, CO<sub>2</sub>, and O<sub>2</sub> affect plant respiration. *Plant, Cell & Environment*, 36 (2): 498-500. doi: 10.1111/pce.12039
1. **Heskel MA**, Anderson OR, Atkin OK, Turnbull MH, Griffin KL (2012) Leaf- and cell-level carbon cycling responses to a nitrogen and phosphorus gradient in two Arctic tundra species. *American Journal of Botany*, 99 (10): 1702-1714. doi: 10.3732/ajb.1200251

*In revision:*

Huntingford C, Atkin OK, Martinez-de la Torre A, Mercado L, **Heskel MA**, Harper A, Bloomfield K, O'Sullivan O, Reich PB, Wythers K, Butler E, Chen M, Griffin KL, Meir P, Tjoelker MG, Turnbull MH, Sitch S, Wiltshire A, Mahli Y. Implications of improved representations of plant respiration in a changing climate. *Nature Communications*.

Patterson AE, Arkebauer R, Quallo C, **Heskel MA**, Li X, Boelman N, Griffin KL. Temperature response of respiration and respiratory quotients of sixteen co-occurring temperature species. *Tree Physiology*.

*In prep:*

**Heskel MA**, Atkin OK, Montgomery RA, Reich PB. Warming and species range mediate the temperature response of respiration in plants at the temperate-boreal ecotone. Target journal: *Functional Ecology*

**Heskel MA**, Tang J. Daytime leaf carbon exchange varies with season, canopy height, and temperature: Implications for ecosystem fluxes in a temperate deciduous forest. Target Journal: *Tree Physiology*

## BOOK CHAPTERS

**Heskel MA**. Practicing scientific values and skills in Environmental Science courses. *Connecting Ecojustice Research and Teaching: Narratives from the Field*. Eds: Rivera Maulucci MS, Callahan H, Pfirman S. Environmental Discourses in Science Education, Springer International. *In prep*, anticipated publish date Fall 2019.

## TEACHING EXPERIENCE

- |   |              |
|---|--------------|
| Lecturer and Research Mentor, Ecosystems Center, Marine Biological Laboratory<br>Terrestrial Productivity unit, <i>Semester in Environmental Science</i><br>Developed new laboratory approach for leaf-level measurements<br>Served as independent research mentor for Melissa Martinez (Clarkson University) | 2015-present |
| Lead Lecturer, Columbia University<br><i>Nature in the City: Ecology of NYC's Ecosystems</i><br>Selected as a Summer Teaching Scholar by Graduate School of Arts and Sciences<br>Created original syllabus, curriculum, and assessments for a 6-week course   | Summer 2012  |
| Head Teaching Assistant, Columbia University<br><i>Environmental Biology</i>  | Fall 2011    |

Teaching Assistant, Columbia University	
<i>Life Systems</i>	Spring 2010
<i>Environmental Biology</i>	Fall 2009
Teacher, New York City Department of Education	2006-2008
Urban Assembly Academy for Government and Law in the Lower East Side, NY	
Taught original curriculum for 9 <sup>th</sup> grade Human Biology and Regents	
Living Environment courses with lab at a high-need high school	
Student Teacher, New York City Department of Education	Summer 2006
Wadleigh Secondary School in Harlem, NY	
Undergraduate Teaching Assistant, University of Pennsylvania	2003-2004
Introductory Biology	

### GRANTS & FELLOWSHIPS

Planting Science Fellow (\$2000)	2017
Ray Leuning Scholarship to attend Flux Course (\$2850)	2016
Rosenthal Postdoctoral Scholar & Northeast Climate Science Center Fellow (\$125,000)	2014 - present
Summer Teaching Scholar, School of Arts & Sciences, Columbia University (\$5500)	2012
New Phytologist Symposium Travel Grant (\$1000)	2011
Torrey Botanical Society Graduate Student Research Fellowship (\$1000)	2010
New Phytologist Symposium Travel Grant (\$1000)	2010
Summer Travel Research Grant, E3B Department, Columbia University (\$2500)	2009
Thune Fellowship, History of Art Department, University of Pennsylvania (\$2500)	2005

### SYNERGISTIC ACTIVITIES & PROFESSIONAL DEVELOPMENT

Planting Science Fellow, Digging Deeper Program	2017
Selected to participate in a collaborative workshop and mentoring program with scientists and secondary school teachers	
Flux Course Participant, Mountain Research Center, Colorado	2016
Attended two-week course on measuring and modeling ecosystem fluxes; awarded Ray Leuning Scholarship by course organizers	
Invited participant, 18 <sup>th</sup> New Phytologist Workshop: <i>The Kok effect: beyond the artefact, emerging leaf mechanisms</i> , July 6-8, Angers, France	2016
Woods Hole Bayesian Statistics Course	2016
Attended two-week course on Bayesian statistics led by Prof. Tom Hobbs conducted at Woods Hole Research Center	
Fellow, Northeast Climate Science Center	2014- present
Working Group Participant, Powell Center for Analysis and Synthesis, USGS	2014-2015
“Advancing understanding of ecosystem responses to climate change with warming experiments: What we have learned and what is unknown?”	
Lead PIs: Kevin Kroeger (USGS), Jim Tang (MBL); Pam Templer (BU)	
Working Group Participant, National Evolutionary Synthesis Center (NESCent)	2009-2011
“Costs of Phenotypic Plasticity to Novel Environments”	
Lead PIs: Courtney Murren (College of Charleston) and Carl Schlichting (UConn)	

Research Assistant, Goldman Lab, Penn Muscle Institute, University of Pennsylvania 2005-2006  
Purified and fluorescently labeled calmodulin, myosin and actin from tissue for  
nanomolecular microscopy assays

## **PRESENTATIONS**

### **2017**

Changing Canopies and Future Fluxes: Tracking physiology from leaf to ecosystem in a warming world. Forestry and Natural Resource Management Departmental Seminar, SUNY-ESF. March 21 (Invited)

### **2016**

Shedding light on the ‘dark side’ of carbon cycling: Environmental impacts on plant respiration. Biology Department Seminar, Syracuse University. December 1. (Invited)

Shedding light on the ‘dark side’ of carbon cycling: Environmental impacts on plant respiration. Department of Ecology and Evolution Seminar, University of Michigan, Ann Arbor. October 13. (Invited)

Light inhibition of respiration in arctic ecosystems. 18<sup>th</sup> New Phytologist Workshop: *The Kok effect: beyond the artefact, emerging leaf mechanisms*, July 6-8, Angers, France.

The impact of phenology on the temperature response of photosynthesis and respiration in the dark and light. Poster. March 15. Annual Harvard Forest Ecology Symposium, Petersham, MA.

### **2015**

Global patterns in leaf respiration and its temperature response. December 15. American Geophysical Union Fall Meeting. San Francisco, CA. (Invited)

Warming and species range mediate the temperature response of respiration in plants at the temperate-boreal ecotone. August 12. 100<sup>th</sup> Annual Meeting of the Ecological Society of America, Baltimore, MD.

Convergence in the temperature response of leaf respiration across biomes and plant functional types. Poster. May 6. Harvard Plant Biology Symposium, Harvard Arboretum, Boston, MA.

Phenological patterns and temperature sensitivity of daytime carbon cycling: Linking leaf-level physiology, canopy imagery, and net ecosystem exchange. Poster. March 17. Annual Harvard Forest Ecology Symposium, Petersham, MA.

### **2014**

Plant Respiration in a Changing World: Global Patterns and Evidence from the Arctic. May 2. The Ecosystems Center, Marine Biological Laboratory, Woods Hole, MA. (Invited)

Plant Respiration in a Changing World: Tales from the Arctic and Beyond. April 14. Biology and Marine Biology Departmental Seminar, University of North Carolina, Wilmington. (Invited)

Environmental controls on respiration in arctic plants: Seasonality and acclimation. March 3. Plant Ecophysiology Seminar, Division of Plant Sciences, Australian National University. Canberra, ACT.

### **2012**

Examining vertical trends in Arctic tundra shrub canopies: Implications for carbon cycling in a changing environment. Poster. December 7. American Geophysical Union Fall Meeting. San Francisco, CA.

Seasonal dynamics of photosynthesis and respiration in Arctic tundra plants. August 7. 97<sup>th</sup> Annual Meeting of the Ecological Society of America. Portland, OR.

Environmental controls on foliar respiration in Arctic tundra plants. Poster. March 23. Arctic LTER Annual Meeting. Marine Biological Laboratory, Woods Hole, MA.

## 2011

Mitochondria and leaf-level respiration response to a nitrogen and phosphorus gradient in arctic tundra species. Poster. September 25-28. 27<sup>th</sup> New Phytologist Symposium: Stoichiometric flexibility in terrestrial ecosystems under global change. Biosphere 2, Oracle, AZ.

Seasonal and canopy dynamics of gas exchange. Oral presentation. February 1. Department of Ecology, Evolution and Environmental Biology Student Seminar. Columbia University, New York, NY.

Fundamentals of photosynthesis, respiration, and photorespiration. January 25. Guest lecture for Plant Physiology course, Barnard College, New York, NY.

## 2010

Mitochondrial response to fertilization and warming in two dominant tundra species. Poster. August 5. 95<sup>th</sup> Annual Meeting of the Ecological Society of America. Pittsburgh, PA.

Mitochondrial response to fertilization and warming in two dominant tundra species. Poster. April 13. 24<sup>th</sup> New Phytologist Symposium: Plant respiration and climate change: scaling from mitochondria to the globe. St. Hugh's College, Oxford, UK.

Mitochondrial response to fertilization and warming in two dominant tundra species. Poster. March 5. Arctic LTER Annual Meeting. Marine Biological Laboratory, Woods Hole, MA.

## 2009

Mitochondrial respiration in Arctic plants. Oral presentation. November 24, 2009. Department of Ecology, Evolution and Environmental Biology Student Seminar. Columbia University, New York, NY.

Plasticity of Respiration Physiology in High Latitude Plants. Oral presentation. October 24, 2009. Northeastern Phenotypic Evolution Extravaganza! (NEPEE). Fordham University, New York, NY.

## PROFESSIONAL SERVICE

Board of Advisors, *New Phytologist*

Reviewer for: *Nature Climate Change*, *Global Change Biology*, *Journal of Experimental Botany*, *PLOS One*, *Physiologia Plantarum*, *Plant Ecology*, *New Phytologist*, *Annals of Botany*, *Plant, Cell & Environment*, *Ecosystems*, *Arctic*, *Antarctic*, & *Alpine Research*, *Estuaries and Coasts*, *Biogeochemistry*

Proposal Reviewer:

NSF Division of Environmental Biology - Population & Community Ecology      Fall 2015

Panelist:

DOE Biological & Environmental Research Critical Ecosystems – Arctic      Spring 2016

Department Representative, Women in Science at Columbia (WISC)      2011-2012

## PUBLIC OUTREACH & VOLUNTEER EXPERIENCE

Scientist Mentor, Planting Science      2013-present  
Online, interactive mentoring of high school science classes

Volunteer, Mount Hope Learning Center      2014-2015  
Afterschool mentor at Dr. Martin Luther King Jr. Elementary in Providence, RI

Graduate Mentor, Barnard College and Columbia University      2009-2013  
Involved local female high school students in research projects  
Mentored multiple Barnard undergraduates for research programs

Mentor, Urban Assembly High School for Green Careers      2011-2013

Advise female students with an after-school group at a local public high school  
Instructor, Brooklyn Brainery, Brooklyn, NY 2011  
Taught *Intro to Plant Biology* and *Climate Change and the Arctic*  
Instructor, The Fortune Society, Queens, NY 2009  
Taught weekly literacy and math classes to ex-incarcerated men and women  
Tutor, West Philadelphia Tutoring Project 2003-2006  
Tutored in high-need elementary, middle and high schools

**MEMBERSHIPS & AFFILIATIONS**

Ecological Society of America, American Geophysical Union, AmeriCorps Alumni, New York City Teaching Fellows (Cohort 11)