SCOTT R. SALESKA — CURRICULUM VITAE

Ecology and Evolutionary Biology □ University of Arizona □ Biosciences West 310 □ Tucson, AZ 85721
Phone: (520) 626-1500 Fax: (520) 621-9190 E-mail: saleska@email.arizona.edu
Web page: www.saleskalab.org

(A) CHRONOLOGY OF EDUCATION

1998 University of California, Berkeley (Ph.D., Energy and Resources, Advisor: John Harte)
Dissertation: "Global Climate Change and Ecosystem Carbon Storage: An Experimental Investigation of Ecologically-Mediated Feedbacks to Climate in Montane Meadows"
1986 Massachusetts Institute of Technology (B.S., Physics, minor: Electrical Engineering)

(B) CHRONOLOGY OF EMPLOYMENT

2017-present: *Full Professor*, University of Arizona, Ecology & Evolutionary Biology
Sept-Dec 2019: *Visiting Academic*, Ecole Normale Superieure, Paris, France (on sabbatical)
2011-2017: *Associate Professor*, University of Arizona, Ecology & Evolutionary Biology
01-06/2012: *Visiting Academic*, University of Queensland, Brisbane, Australia (on sabbatical)
2008-present: Joint courtesy appointment, UA Soil Water, and Environmental Sciences (SWES)
2005-present: Faculty affiliate, UA Institute of Environment (IE)
2005-2011: *Assistant Professor*, University of Arizona, Ecology & Evolutionary Biology
2002-2004: *Research Associate*, Harvard University, Dept. of Earth & Planetary Sciences
1999-2001: *Post-Doctoral Fellow*, Harvard University, Dept. of Earth & Planetary Sciences
(Post-doctoral Advisor: Steven C. Wofsy)

(C) HONORS AND AWARDS

Fellow of the Ecological Society of America (elected 2019)
University of Arizona, Agnese Nelms Haury Faculty Fellow in Environment and Social Justice (2014-2016)
Doctoral Dissertation Improvement Grant recipient, NSF (1996-1998)
Global Change Fellow, NASA (1994-1997)

(D) SELECT KEY PEER-REVIEWED PUBLICATIONS, BY TOPIC (19 OUT OF 127 TOTAL INDEXED ON ISI)

Google Scholar	h-index=51 (41 since 2015); total citations: 11,015
Thompson ISI Web-of-Science	h-index=36; total citations: 5,962

During the last 5-year period (2015-2019), Dr. Saleska published 67 journal articles. Some of his papers are in top journals (including *PNAS, Science,* and *Nature*).

key: Authors who are members of the Saleska lab are highlighted **in bold**
Collaborative papers are classified as follows
† = Led by Saleska lab (first and last-authors), in which collaborator contribution was critical
a = largely co-equal collaboration, in which Saleska lab played a key role in advancing the ideas, analysis, and writing of the paper (may be first-authored by my lab or collaborator's lab).
b = collaboration to which I/my lab contributed substantively to ideas, experiment, analysis, or writing, but that was primarily led by the collaborator's lab.

Plant Functional ecology (focus: climate-response traits, and ontogeny of traits)

1. [a] Barros, FV*; Bittencourt, PRL*; **Brum, M**.*, **N. Restrepo-Coupe,**; L Pereira, G.S. Teodoro, **S.R. Saleska,** L.S. Borma, B.O. Christoffersen, D. Penha, L.F. Alves , A.J.N. Lima, V.M.C.

Carneiro, P. Gentine, J-E. Lee, L.E.O.C. Aragão, V. Ivanov, L S. M. Leal, A. C. Araujo, R.S. Oliveira. **2019**. Hydraulic traits explain differential responses of Amazonian forests to the 2015 El Nino-induced drought, *New Phytologist.* 223: 1253-66. doi.org/10.1111/nph.15909.
**These authors contributed equally to this work.*

2. [a] **Tyeen Taylor**, Sean M. McMahon, **Marielle N. Smith**, Brad Boyle, Cyrille Violle, Joost van Haren, Irena Simova, Plinio B. de Camargo, Leandro V. Ferreira, Antonio C. L. da Costa, Patrick Meir, Brian J. Enquist, **Scott R. Saleska**. **2018**. Isoprene emission structures tropical tree biogeography and community assembly responses to climate. *New Phytologist.* 220, pp. 435-446. **doi.org/10.1111/nph.15304**. 5 citations (Google)

3. [a] **Wu**, J., C. Chavana-Bryant, N. **Prohaska**, S.P. Serbin, K. Guan, L.P. **Albert**, X. Yang, W.J.D. van Leeuwen, **A.J. Garnello**, G. Martins, Y. Malhi, F. Gerard, R.C. Oliviera, and ***S.R. Saleska***. **2017**. Convergence in relations among leaf traits, spectra and age across diverse canopy environments and two contrasting tropical forests. *New Phytologist*. doi: 10.1111/nph.14051. 30 citations

Ecological Scaling from organs to ecosystems (implications of tropical phenology & of novel isotopic partitioning of temperate net ecosystem fluxes)

4. [a] **Wehr R**, Commane R, Munger JW, McManus JB, Nelson DD, Zahniser MS, **Saleska SR**, Wofsy SC **2017**. Dynamics of canopy stomatal conductance, transpiration, and evaporation in a temperate deciduous forest, validated by carbonyl sulfide uptake. *Biogeosciences*. 14:389–401. 41 citations

5. † **Wu**, J., L.P. **Albert**, A.P. Lopes, N. **Restrepo-Coupe**, M. Hayek, K.T. **Wiedemann**, K. Guan, S.C. **Stark**, B. **Christoffersen**, N. **Prohaska**, J.V. Tavares, S. Marostica, H. Kobayashi, M.L. Ferreira, K.S. Campos, R. da Silva, P.M. Brando, D.G. Dye, T.E. Huxman, A.R. Huete, B.W. Nelson, and ***S.R. Saleska,*** **2016**. Leaf development and demography explain photosynthetic seasonality in Amazon evergreen forests. *Science,* 35 (6272): 972-976. 173 citations (Google)

6. † **Wehr**, R.A., J.W. Munger, J.B. McManus, D.D. Nelson, M.S. Zahniser, E.A. Davidson, S.C. Wofsy, and ***S.R. Saleska***. **2016**. Seasonality of Temperate Forest Photosynthesis and Daytime Respiration, *Nature*, 534: 680-683. DOI:10.1038/nature17966. 113 citations (Google)

Remote Sensing Ecology (tropical forest drought response and LiDAR-derived forest dynamics)

7. † **M.N. Smith**, Stark, SC; **Taylor, TC**; Ferreira, ML; de Oliveira, E; **Restrepo-Coupe, N**; **Chen, S**; **Woodcock, T**; Dos Santos, DB; Alves, LF; Figueira, M; de Camargo, PB; de Oliveira, RC; Aragao, LEOC; Falk, DA; McMahon, SM; Huxman, TE; ***Saleska, SR.*** **2019**. Seasonal and drought-related changes in leaf area profiles depend on height and light environment in an Amazon forest. *New Phytologist*. Vol 222 (3), 1284-129. DOI:10.1111/nph.15726.

8. † ***Saleska***, S.R., J. **Wu**, K. Guan, A.C. Araujo, A. Huete, A.D. Nobre, N. **Restrepo-Coupe**. **2016**. Brief Communications Arising: Dry-season greening of Amazon forests. *Nature*. 531(7594): E4-E5. doi:10.1038/nature16457. 64 citations (Google)

9. † **Stark**, Scott C.; V. **Leitold**; J. **Wu**; M.O. Hunter; M.A. Lefsky; M. Keller; L.F. **Alves**; S. McMahon; G. Parker; C. Castilho; J. Schietti; F.R. Costa; Y.E. Shimabukuro; D.O. Brandão; R.C. Oliveira; M.T. Shimabukuro; N. Higuchi; T.K. ***Woodcock***; P.B. Camargo; S. R. ***Saleska***. **2012**. Differences in Amazon forest growth and carbon dynamics predicted by profiles of canopy leaf area and light environment, *Ecology Letters*. 15 (12): 1406-1414. 117 citations (Google)

10. [a] ***Saleska***, S.R., K. Didan, A.R. Huete, and H.R. da Rocha. **2007**. Amazon forests green-up during 2005 drought. *Science*, 318: 612. doi: 10.1126/science.1146663. 507 citations (Google)

Scaling Microbial ecology from Genes to Ecosystems (carbon cycling in thawing Permafrost)

11. [a]**Abs**, E., ***Saleska, S.R.,*** Ferriere, R. Microbial evolution reshapes soil carbon feedbacks to climate change, in review at *Ecology Letters.* (bioRxiv: doi.org/10.1101/641399)
    first author Ph.D. student co-advised by Ferriere and Saleska
12. [b] B.J. Woodcroft, C.M. Singleton, J.A. Boyd, P.N. Evans, J.B. Emerson, A.AF. Zayed, R.D. Hoelzle, T.O. Lamberton, C.K. McCalley, S.B. Hodgkins, R.M. Wilson, S.O. Purvine, C.D. Nicora, C. Li, S. Frolking, J.P. Chanton, P.M. Crill, **S.R. Saleska**, V.I. Rich, G.W. Tyson. **2018**. Genome-centric metagenomic insights into microbial carbon processing across a permafrost thaw gradient. *Nature*. 560, pp. 49–54. http://doi.org/10.1038/s41586-018-0338-1 53 citations (Google)
13. [b] Singleton C.M., McCalley C.K., Woodcroft B.J., Boyd J.A., Evans P.N., Hodgkins S.B., Chanton J.P., Frolking S., Crill P.M., **Saleska S.R.**, Rich V. I., Tyson G.W. **2018**. Methanotrophy across a natural permafrost thaw environment. *ISME J*. 12:2544–2558. 27 citations (Google)
14. [b] Emerson JB, Roux S, Brum JR, Bolduc B, Woodcroft BJ, Jang HB, Singleton CM, Soden LM, Naas AE, Boyd JA, Hodgkins SB, Wilson RM, Trubl G, Li C, Frokings S, Pope PB, Wrighton KC, Crill PM, Chanton JP, ***Saleska SR***, Tyson GW, Rich VI, Sullivan MB. **2018**. Host-linked soil viral ecology along a permafrost thaw gradient. *Nature Microbiology*. 3:870–880. 47 citations (Google)
15. [a] **McCalley, C.K**., Woodcroft BJ, Hodgkins SB, **Wehr, R.A**., Kim EH, Mondav, R.; Crill PM, Chanton J, Rich VI, Tyson GW, ***Saleska*** SR, **2014**. Methane dynamics regulated by microbial community response to permafrost thaw, *Nature*, 514: 478-481. 199 citations (Google)

Ecologically mediated carbon cycle feedbacks to climate (tropical forests & subalpine meadows)

16. † **Restrepo-Coupe, N**, HR da Rocha, LR Hutyra, AC da Araujo, LS Borma, **B Christoffersen**, OM Cabral, PB de Camargo, FL Cardoso, AC Lola da Costa, DR Fitzjarrald, ML Goulden, B Kruijt, JM Maia, YS Malhi, AO Manzi, SD Miller, AD Nobre, C von Randow, LD Abreu Sá, RK Sakai, J Tota, SC Wofsy, FB Zanchi, SR ***Saleska.*** **2013**. What drives the seasonality of photosynthesis across the Amazon basin? A cross-site analysis of eddy flux tower measurements from the Brasil flux network. *Ag. Forest Meteorol.* 182–183: 128–144. 189 citations (Google)
17. ***** ***Saleska***, S.R., S.D. Miller, D.M. Matross, M.L. Goulden, S.C. Wofsy, H. da Rocha, P.B. de Camargo, P.M. Crill, B.C. Daube, C. Freitas, L. Hutyra, M. Keller, V. Kirchhoff, M. Menton, J.W. Munger, E.H. Pyle, A.H. Rice, H. Silva. **2003**. Carbon in Amazon forests: unexpected seasonal fluxes and disturbance-induced losses. *Science*. 302: 1554-1557. 712 citations (Google)
    ** postdoctoral work that laid foundation for a line of work to the present
18. [a] Harte, J., S.R. ***Saleska***, and C. Levy. **2015**. Convergent ecosystem responses to 23-year ambient and manipulated warming link advancing snowmelt and shrub encroachment to transient and long-term climate-soil carbon feedback. *Global Change Biology*. doi: 10.1111/gcb.12831.
    (dissertation follow-on work validating initial experimental warming predictions in Saleska et al., 1999, 2002, with real-world drought responses) 41 citations (Google)
19. ***** ***Saleska***, Scott R., John Harte, and Margaret S. Torn. **1999**. Effect of experimental ecosystem warming on CO_2 fluxes in montane meadows. *Global Change Biology.* 5: 125-141.
    * Ph.D. dissertation work 201 citations (Google)

(E) SYMPOSIA TALKS, INVITED SEMINARS, AND OTHER PRESENTATIONS

Invited Oral Presentations and Seminars (18 since January 2015)

- Oxford University Centre on Tropical Forests weekly seminar series, Oxford, U.K., November 8, 2019. Title: "Amazon forest responses to drought: scaling from individuals to ecosystems"
- World Agroforestry Centre (ICRAF) weekly seminar, Nairobi, Kenya, October 30, 2019. Title: "What is the ecological function of the Amazon in the face of deforestation, fire and climate change?"
- Institute of Biology departmental seminar, École Normale Supérieure, Paris, France, October 22, 2019. Title: "What is the function of the Amazon Rainforest in the Earth System?"
- European Molecular Biology Laboratory (EMBL) annual retreat, Heidelberg, Germany, September 19, 2019. "Scaling from 'atoms to ecosystems' with molecular ecosystems to advance understanding of earth processes"
- Perspective on 'Soil-Microbe-Plant Dynamics from Native to Basin Scales', UC Berkeley Lab, US DOE, Watershed Science Collaboration Workshop, September 24, 2018.
- Ecosystem Genomics seminar series, University of Arizona, Tucson, AZ, September 8, 2018
- Eminent Scholars Seminar Series in Ecology, Evolution, and Environmental Change, Department of Biological Sciences, University of Notre Dame, Notre Dame, IN. April 4, 2017.
- Departmental seminar, Ecology and Evolutionary Biology, Brown University, Providence RI. February 7, 2017.
- Distinguished Ecologist Lecture Series, School of Forest Resources and Environmental Science, Michigan Technological University, Houghton, MI. October 6-7, 2016.
- Departmental seminar, Ecology and Evolutionary Biology, University of Arizona, September 19, 2016. Title: "The importance of ecology in scaling carbon cycling from organisms to ecosystems"
- Seminar, L'Institut national de la recherche agronomique (INRA, French National Institute of Agricultural Research), Bordeaux, France. June 22, 2016. Presentation title: "Scaling vegetation dynamics from organisms to ecosystems: what is the seasonality of tropical forest photosynthesis, and why?"
- Departmental seminar, Institute of Biology, École Normale Supérieure (ENS), Paris, France. June 20, 2016. Title: "Scaling vegetation dynamics from organisms to ecosystems: the seasonality of tropical forest photosynthesis"
- Departmental seminar, Department of Environmental Science, Federal University of West-Pará, Santarem, Brazil. May 31, 2016. Title: "What is the seasonality of photosynthesis in Amazônia?"
- Departmental seminar, University of California, Davis. Joint seminar, Departments of Land Air and Water Resources; Ecology; and Plant Sciences, April 1, 2016, Presentation title: "Scaling biological dynamics from organisms to the atmosphere: understanding carbon cycle feedbacks to climate, from the Amazon to the Arctic"
- Department seminar, Weizmann Institute of Science, Earth and Planetary Sciences, Tel Aviv, Israel, November 2015. Title: "Scaling carbon cycling from organisms to ecosystems: insights from novel isotopic measurements in temperate forests and thawing permafrost wetlands"
- Symposium seminar, Summer Institute at Friday Harbor Lab, Program on Climate Change, University of Washington, September 2015. Presentation title: "Scaling vegetation dynamics from organisms to ecosytems: What drives the seasonality of tropical forest photosynthesis?"

- Departmental seminar, Institute of Biology, École Normale Supérieure (ENS), Paris, France. June, 2015. Title: "Methane, microbes, and permafrost: Can genome-scale resolution improve earth system models of climate change?"
- Departmental seminar, Institute of Ecology and Evolutionary Biology, University of Oregon. April 1, 2015. Title: "Scaling carbon-cycle feedbacks to climate, from the Arctic to the Amazon."

(E) GRANTS

Dr. Saleska's grantsmanship includes leadership of an international research and training grant (NSF PIRE in Amazônia, 2007-2013); of a NASA international Data-Model Intercomparison Project (DMIP) collaboration to test models of tropical forests (2009-2013), and of two successive DOE grants ($3M in 2010, and $4M in 2013) supporting a large international collaboration (7 institutions in U.S., Sweden, and Australia) to study the 'ecosystem genomics' of carbon cycling in thawing arctic permafrost (#5 below is the 3rd in this series, now led by former Saleskalab postdoc V. Rich).
Currently active grants are:

1. **NSF**: "Collaborative Research: The other side of tropical forest drought: Do shallow water table regions of Amazonia act as large-scale hydrological refugia from drought?"
   Funding: $1.1M total; $288,645 to UA: 1/1/2020 – 12/31/2023
   Role: Co-PI (PI: Scott Stark, Michigan State University; collaborators: Flavia Costa, Juliana Schietti, INPA, Manaus, Brazil)

2. NSF: "Collaborative Research: Are Amazon forest trees source or sink limited? Mapping hydraulic traits to carbon allocation strategies to decipher forest function during drought"

Funding: $1.5M total; $1,054,480 to UA: 7/1/2018 – 6/3/2021

Role: PI (Co-PI's: Scott Stark, Michigan State University; Valeriy Ivanov, University of Michigan, Luciana Alves, University of California, Los Angeles)

3. DOE, Facilities Integration Collaboration for Users Science (FICUS), "Investigating the carbon cycling implications of changing microbial leaf litter decomposition across a permafrost thaw gradient"; Funding: in services (sequencing at JGI and mass spec at EMSL): 9/1/2017-8/31/2019 (extended to spring 2020); Role: PI

4. NASA: "Testing satellite-based scaling of tropical forest photosynthesis with a new network of cameras and fluorescence spectrometers in Amazonia"; Funding: $1,099,785: 3/1/2017 – 2/29/2020; Role: PI (with co-PI Scott Stark, Michigan State University)

5. DOE: "Illuminating the pathways to carbon liberation: a systems and modeling approach to resolving the 'consequential unknowns' of carbon transformation and loss from thawing permafrost peatlands"; Funding: UA subcontract, $708,186 (out of total of $3,287,334), 8/15/2016 to 8/14/2019, in no-cost extension to 8/14/2020; Role: Co-Lead PI (PI: Virginia Rich OSU) with 5 US institutions and 2 International institutions)

6. NSF & São Paulo State Science Foundation (FAPESP): "Dimensions US-BIOTA-Sao Paulo: Collaborative Research: Integrating Dimensions of Microbial Biodiversity Across Land use Change in Tropical Forests"; UA: $457,205: Total Collaborative: $1,998,630: 1/1/2015 – 12/31/2019 (in no-cost extension to 8/31/20); Co-PI (PI. J. Rodrigues, UC Davis, for NSF; S.M. Tsai, University of São Paulo, for FAPESP)

(F) SELECT PROFESSIONAL ACTIVITY

(i) Research and Development

- Science Advisory Board for Tara Oceans Project (2019-present)
- Science Advisory Board for DOE Watershed Function Scientific Focus Area (2016-2020)
- Led large collaborative research efforts in Brazilian Amazônia and Arctic Sweden (see grants)

(ii) Communication and Outreach (selected events)

- "*How do we learn the fate of tropical rainforests under climate change?*": a multimedia exhibition of scientists and students at work in Amazonia. Mar. 2014-Aug. 2015: Biosphere 2. Funding: NSF, Communicating Research to Public Audiences (CRPA), Philoecology Foundation
- "*What Happens in the Rainforest doesn't stay in the Rainforest*": an exhibition of the work of Photographer Jake Bryant, Ironwood Art Gallery. Sept. 19-Oct. 25, 2015: Arizona-Sonora Desert Museum (http://www.crpasaleskalab.com/). Funded by NSF grant in Communicating Research to Public Audiences (CRPA), and the ASDM Art Institute.
- TEDx-Phoenix, "Survival of the Sphere?: a celebration of the Tropical Rainforests of Amazonia" (joint with pianist Simone Machado), (November 6, 2009: Mesa Arts Center, Phoenix, AZ). (http://www.tedxphoenix.com/speakers/2009-tedxphoenix-speakers/)

(iii) Teaching and Pedagogy

- Advising: Chaired 8 completed Ph.D.s; 2 completed M.S.; 3 current Ph.D.s; 10 current/former Postdocs; Served on 8 completed Ph.D. student committees; 16 current/former undergrads
- Director and PI, *Amazon-PIRE*, an NSF-funded $2.7M, 5-year + extensions (2007-2013) "Partnership for International Research and Education" (PIRE) focusing on training international cohorts of U.S. and Brazilian students on Amazon forest-climate interactions.
- Proposed PI for the submission of UA's Ecosystem Genomics Initiative for $3M to the NSF Research and Training (NRT) program. Title: "NRT-URoL: Building Resources for InterDisciplinary training in Genomic and Ecosystem Sciences (BRIDGES)" (currently in review)

(iv) Application to policy (select efforts)

- EPA Policy, Chris Mooney reports: "'This … follows from the basic laws of physics': Scientists rebuke Scott Pruitt on climate change" (on Scientist's letter to Scott Pruitt on climate change; Saleska helped organize letter and was one of 3 UA faculty signatories), Mar. 13, 2017, *Washington Post* (https://www.washingtonpost.com/news/energy-environment/wp/2017/03/13/this-follows-from-the-basic-laws-of-physics-scientists-rebuke-scott-pruitt-on-climate/)
- Organized and co-authored U.S. Supreme Court Brief of *Amici Curiae* climate scientists, David Battisti, William E. Easterling, Christopher Field, Inez Fung, James E. Hansen, John Harte, Eugenia Kalnay, Daniel Kirk-Davidoff, Pamela A. Matson, James C. McWilliams, Mario J. Molina, Jonathan T. Overpeck, F. Sherwood Rowland, Joellen Russell, Scott R. ***Saleska***, Edward Sarachik, John M. Wallace, and Steven C. Wofsy, in support of petitioners, in the Supreme Court of the United States, Aug. 31, 2006. (in Massachusetts v. EPA, the first case on global Climate Change to reach the U.S. Supreme Court).

STATEMENT

The Saleska lab studies biology as part of global climate, and how ecological and evolutionary mechanisms (most studied and best understood at the level of the organ, organism or community) can be scaled to ecosystems or regions to understand biological feedbacks to large scale climate processes. In 2018, my lab led four key new papers advancing this science in the tropics (from dissertation chapters of 4 former lab members); contributed to a suite of *Nature* journal papers in the Arctic, about how microbial ecology structures ecosystem response to thawing permafrost (from the 'ecosystem genomics' collaboration my group started in 2011); and was awarded a $1.5M NSF grant (a multi-institution collaboration that I lead) to pursue these questions. Our ecosystem genomics cluster was also selected by UA to submit a $3M NRT training grant to NSF; I led submission of this now in-review proposal.

Much of this work focused on **phenology in tropical systems**, having pioneered use of tower-mounted cameras for tracking phenology of individual tree crowns (detailed in 2016 in Science[1] and Nature[2]): dissertation papers from my lab now explicitly connect, for the first time, ecosystem fluxes to branch-scale phenological dynamics (L. Albert, et al, 2018), and advance understanding of within-canopy radiation transfer, and hence, satellite-based sensing of phenology (J. Wu, et al., 2018). Marielle Smith (listed publication #7, above) extended phenological concepts from organism to ecosystem scales by using our uniquely high-resolution (monthly) lidar observations of forest canopy structure. Smith et al show that large canopy trees and small trees in gaps have opposite phenologies -- i.e., that tropical evergreen forest "phenology" is not unitary, but bifurcated (at least) by canopy structure into multiple phenologies, in multiple light environments. This work highlights importance of accounting for size structure and differential responses by different sized trees in predicting forest response to drought.

Contributing to **trait-based approaches for understanding climate change**, T. Taylor's chapter (co-senior-authored with B. Enquist) (publication #2, above) goes beyond the growing literature on the biochemistry and physiology of plant isoprene emission (which shows that production of this volatile secondary compound enhances plant thermal tolerance), to advance the ecology and biogeography of plants with this key trait. This work shows for the first time evidence that isoprene emissions structure tropical tree species compositions across climates, and hence that community selection for isoprene-emitting species may be a potential mechanism for enhanced forest resilience to climatic change.

In the Arctic is our project to discover functional relationships for **scaling microbial communities to ecosystem biogeochemistry** of CH_4 and CO_2 -- first demonstrated in a 2014 *Nature* paper led by my lab (pub #15, above), and now much augmented by a steady stream of papers, including three in *Nature* journals to which we contributed in 2018: Woodcroft et al (pub #12) mapping pathways of carbon metabolism from metagenomics, Singleton et al (pub # 13) on how microbial ecology structures methanotrophic amelioration of CH_4 emissions; and Emerson et al (pub #14) on the critical role of viruses in soil biogeochemistry. The recent "genes-to-ecosystems" theme in my lab is also a basis for UA's Ecosystem Genomics Initiative and University-wide cluster hire that I helped advance (in 2018-19 I co-chair, with K. Dlugosch, a **search to recruit two new 'ecosystem genomics' faculty to UA**).

Finally, bringing our cutting-edge approach for *isotopic partitioning of ecosystem-scale carbon fluxes* between photosynthesis and respiration in the temperate zone (which, as published in *Nature*[3], shows suppression of daytime forest respiration) to our *traits-to-ecosystem phenology work* in the tropics, I led a successful collaboration to win **a $1.5M ($1.1M at UA) award from NSF's ecosystem panel**. This synergizes well with my $1.1M NASA grant awarded in 2017 to use new technologies for remotely detecting chlorophyll fluorescence to investigate variability in tropical photosynthesis. I was proud to learn recently that these and other grants helped place **my lab's average 5-year grant expenditures in the top 10 faculty in the UA College of Science**.

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[1] Wu et al., 2016. Leaf development and demography explain photosynthetic seasonality in Amazon evergreen forests, *Science,* 5 (6272): 972-976.

[2] Saleska et al., Brief Communications Arising: Dry-season greening of Amazon forests. *Nature*. 531(7594): E4-E5.

[3] Wehr et al., 2016. Seasonality of Temperate Forest Photosynthesis and Daytime Respiration, *Nature*, 534: 680-683.