

Curriculum vitae and Track Record

PERSONAL DETAILS

Family name, First name: Abs, Elsa

Researcher unique identifier: ORCID 0000-0001-9501-1412

URL for web sites: <https://elsaabs.github.io/>

• EDUCATION

- 2015 - 2019** **PhD, Eco-Evo Mathematics**, University of Paris Sorbonne, France
Supervisor: Pr. Regis Ferriere and Pr. Scott R. Saleska.
- 2013 - 2015** **Msc, Applied Mathematics to Biology**, Ecole Normale Supérieure of Ulm, Paris, France.
- 2010 - 2013** **Bsc, Agricultural and Environmental Engineering**, AgroParisTech, Paris, France.
- 2007 - 2010** Preparatory Classes, Biology, Physics, Chemistry and Mathematics, Lycee Thiers of Marseille, France

• CURRENT POSITION

- 2023 - present** **Marie Curie Individual Fellow**, Laboratory of Environmental and Climate Sciences (LSCE), Paris, France. Funded by H2020-MSCA-IF-891576 grant.
- 2023 - present** **Research affiliate**, Department of Ecology and Evolutionary Biology, University of California Irvine, USA.

• PREVIOUS POSITION

- 2021 - 2023** **Marie Curie Individual Fellow**, Department of Ecology and Evolutionary Biology, University of California, Irvine, USA.
- 2019 - 2021** **Postdoctoral Associate**, Department of Ecology and Evolutionary Biology, University of California, Irvine, USA.

• RESEARCH ACHIEVEMENTS AND PEER RECOGNITION

1. Research achievements

I am an author of 8 peer-reviewed publications, of which 5 as first author. My h-index is 5, and my work has been cited 130 times.

Relevant publications

- Abs E***, Leman H, Ferriere R. [A multi-scale eco-evolutionary model of cooperation reveals how microbial adaptation influences soil decomposition](#). *Communications Biology*. 2020 Sep 21;3(1):520. doi: 10.1038/s42003-020-01198-4. *Corresponding author. *This study is the first rigorous mathematical work to scale up microbial decomposition from molecular to population, and to include evolution along a continuous trait space. We show that lower soil diffusivity selects for higher enzyme production, and that microbial evolution leads to significant changes in substrate decomposition rate. This study contributes to the increasing evidence that microbial adaptation is a determinant driver of the response of soil organic carbon decay to environmental change at the microbial community scale.*
- Abs E***, Saleska SD, Ferriere R. [Microbial eco-evolutionary responses amplify global soil carbon loss with climate warming](#). *Nature ResearchSquare*. *Corresponding author. *This study is the first to apply evolutionary theory to a microbial model of soil decomposition. We show that global warming generally selects for higher microbial investment into enzyme production, and that this adaptation leads to larger soil carbon loss. Applying this model at the global scale using CLM4 model for global litter predictions and RCP8.5 for global temperature predictions, we find that microbial adaptation amplifies by 1.8 global the soil carbon losses predicted without adaptation. This study proposes a potentially essential process to increase the realism and decrease the uncertainty of current soil ecosystem models.*
- Abs E***, Chase AB, Allison SD. [How do soil microbes shape ecosystem biogeochemistry in the context of global change?](#) *Environmental Microbiology*. *Corresponding author. *I led this review to highlight the current burning questions in environmental microbiology based on the most recent literature. In particular, the goal of this review is to provide state-of-the-art knowledge on the type of microbial information that is needed to accurately predict biogeochemical cycling to help the new generation of*

ecosystem modelers know which microbial processes need to be integrated in biogeochemical models.

4. Xianjin H, Abramoff R, **Abs E**, Georgiou K, Zhang H, Goll DS. Contribution of carbon inputs to soil carbon accumulation cannot be neglected. *BioRxiv*. I joined this effort to respond to the recently published paper Tao et al. (2023), entitled “Microbial carbon use efficiency promotes global soil carbon storage” and published in *Nature*. In our paper, we show that their claim that higher microbial carbon use efficiency (CUE) promotes soil carbon (SOC) storage might be too presumptuous. We argue that the relationship between CUE and SOC might be more a correlation than a causation, and that their result might not be robust to a different model structure. We analyze their data to show that a similar correlation between litter input and SOC, and we show that we would get higher sensitivity to litter input with a different microbial model. This response contributes to advance our understanding of the effect of microbes on global soil carbon storage.
5. Defrenne CE, **Abs E**, Cordeiro AL, Dietterich L, Hough M, Jones JM, Kivlin SN, Cusack D, Franco ALC, Khasanova A, Stover D, Romero-Olivares AL. The Ecology Underground coalition: building a collaborative future of belowground ecology and ecologists. *New Phytologist*. 2021 Mar;229(6):3058-3064. doi: 10.1111/nph.17163. I joined this large review effort gathering empiricists and modelers in soil ecology following the organization of a two-days live event associated with the 2020 Annual Conference of the Ecological Society of America (ESA). The goal of this review was to gather

Book chapters

1. **Abs E***, Ferriere R. Modeling Microbial Dynamics and Heterotrophic Soil Respiration: Effect of Climate Change. *American Geophysical Union*. 2020.

2. Peer recognition

Fellowships and awards

2021 - 2024	MSCA Individual Global Postdoctoral Fellowship, €257, 620
2019	Center of Interdisciplinary Research Travel Grant, €1,000
2018-2019	Paris Sorbonne University Labex Memolife Fellowship, €8,000
2015-2018	Frontiers in Life Sciences PhD Fellowship, €70,000
Total	€336,620

Conferences

I presented my work 20 times in the most relevant international conferences in the field, such as an invited talk at the Annual Meeting of the American Geophysical Union (AGU) in Fall 2019 and an invited “inspire talk” at the Annual Meeting of the Ecological Society of America (ESA) in Summer 2022. I have also been invited to give departmental seminars, including at Duke University by Jean Gilbert in the Department of Biology in October 2022, at Lawrence Berkeley National Lab by Eoin Brodie in February 2023, at University of Texas at Austin by Caroline Farrior in the Department of Integrative Biology in November 2022, and at the Institute of Evolutionary Science of Montpellier (ISEM) by Sonia Kefi in September 2021.

Scientific societies

2022 - present	European Geophysical Union (EGU)
2021 - present	American Geophysical Union (AGU)
2021 - present	French Society of Ecology and Evolution (SFE ²)
2019 - present	Ecological Society of America (ESA)

Supervising and mentoring experience

University of California Irvine: I mentored 3 graduate students and 2 Postdoctoral Fellows: 2 of the graduate students graduated this year, 1 was awarded a MSCA Individual Fellowship in 2020, and 1 of the Postdoctoral Fellows obtained an Assistant Professor position at Rutgers University in the US in 2023.

Ecole Normale Supérieure of Ulm: I have mentored 3 undergraduate students and 2 graduate students, who both successfully graduated and are now Postdoctoral Fellows.

Teaching activities

2015-2019	Lecturer of course E480/580, Discrete and Continuous Models in Ecology and Evolutionary
------------------	---

Biology, University of Arizona, US.

2015 Directed lab work (computational simulations) for Pr. Regis Ferriere's course on Adaptive Dynamics, Ecole Normale Superieure of Ulm, France.

Reviewing activities

2019 - present Guest Editor, Elementa: Science of the Anthropocene, University of California Press.

Journal reviewer: Nature Communication Biology, The ISME Journal, Environmental Microbiology, Elementa: Science of the Anthropocene, Federation of European Microbiological Societies (FEMS) Microbiology Ecology.

Major collaborations

Antoine **Abou Fayad**, Microbiome-ecosystem feedbacks, Faculty of Medicine, American University of Beirut, Beirut, Lebanon (organization of conference)

Eoin **Brodie**, Integration of meta-omics data in trait-based models, Earth and Environmental Sciences Area, Lawrence Berkeley National Laboratory, Berkeley, USA (research collaboration)

Alexander **Chase**, Integration of meta-omics data in trait-based models, Department of Earth Sciences, South Methodist University, Dallas, USA (one joint publication, one joint publication in review, one research proposal in preparation)

David **Coulette**, Computational soil modeling, Unit of Mathematics, Pure and Applied (UMPA), Ecole Normale Superieure, Lyon, France (two joint publications in preparation)

Moira **Hough**, Microbiome-ecosystem feedbacks, Michigan Tech University, USA (two joint publications, one joint publication in review, organization of three conference sessions)

Helene **Leman**, Mathematical modeling of fitness in spatially heterogeneous systems, UMPA, National Institute for Research in Digital Science and Technology (INRIA), Lyon, France (one joint publication, one in preparation)

Ashish **Malik**, Integration of meta-omics data in trait-based models, School of Biological Sciences, University of Aberdeen, Scotland, UK (research collaboration)

India **Mansour**, Microbiome-ecosystem feedbacks, Freie Universität, Berlin, Germany (organization of conference)

Jennifer **Martiny**, Integration of meta-omics data in trait-based models, School of Biological Sciences, University of California Irvine, USA (research collaboration)

Jeremy **Puissant**, Modeling of microbial temperature response, Laboratory of Alpine Ecology, CNRS, Grenoble, France (research collaboration)

Alejandra **Rodriguez Verdugo**, Microbial evolution with species interactions, School of Biological Sciences, University of California Irvine, Irvine, USA (research collaboration)

Maria **Rebolleda-Gomez**, Microbial eco-evolutionary adaptation to warming, School of Biological Sciences, University of California Irvine, Irvine, USA (research collaboration)

Adriana **Romero-Olivares**, Microbiome-ecosystem feedbacks, School of Biological Sciences, University of New Mexico State University, USA (one joint publication, organization of three conference sessions)

Research dissemination

I strive for transparent, reproducible, and high-quality research. This includes posting pre-prints before publication, publishing open access, pre-registering, and providing others access to collected data. It also means that I actively communicate my findings to a non-scientific audience. I have been interviewed twice about our responsibility, as climate scientists, to speak up in the political sphere about climate change. I also use Twitter and LinkedIn regularly for research dissemination. I was also invited to serve as a panel speaker for the day of seminar "ClimActions", that took place at the Laboratory of Environmental and Climate Science (LSCE) in June 2023.

Additional information

Career breaks, diverse career paths and major life events. I started an environmental engineering career before switching in 2014 to a research one. I was awarded a Marie Curie fellowship in 2020 but had to postpone its start to 2021 due to the limited visa offers during the Trump administration and COVID-19. In 2022, I transitioned to a non-binary gender identity.

Other contributions to the research community. I have been volunteering at Marie Curie Alumni Association for three years (since 2020) as a board member and USA West Coast Coordinator of the Association's North America chapter. I organized multiple events to fellows concerning climate change, anti-racism and inclusiveness in Academia. At the University of California Irvine, I was also for three years (2020-2023) an elected member of the Anti-racism, Diversity, Equity and Inclusion (ARDEI) council in the Ecology and Evolutionary Biology (EEB) department, for which I participated to the creation and socialization of this council through the creation of bylaws approved by vote by the department, and to the organization of the first inclusive EEB seminar series.