

Curriculum vitae Martin Ackermann

May 2023

Career

- 2023 – present Director, Eawag, Switzerland
- 2022 – present Full Professor for Microbial Systems Ecology, EPFL, Switzerland
- 2015 – present Full Professor for Microbial Systems Ecology, ETH Zurich, Switzerland
- 2012 – 2022 Head of the Department of Environmental Microbiology, Eawag, Switzerland
- 2008 – 2015 Associate Professor for Molecular Microbial Ecology, ETH Zurich, Switzerland
- 2006 – 2008 SNF Professor for Microbial Evolution, ETH Zurich, Switzerland
- 2004 – 2006 Senior Scientist, ETH Zurich, Switzerland, in the group of Prof. S. Bonhoeffer
- 2002 – 2004 Postdoctoral Researcher, UC San Diego, USA, in the group of Prof. L. Chao
- 2002 PhD in Biology, University of Basel, Switzerland, with Profs. U. Jenal and S. Stearns

Research Group

Since 2023: co-lead of the research group with Dr. Olga Schubert

Microbial Systems Ecology group, Eawag, ETH and EPFL: Located at the Eawag Department of Environmental Microbiology, and the ETH Department of Environmental Systems Science.

Supervision of students and postdocs since 2006

- 14 PhD theses (6 ongoing) as direct scientific supervisor
- 26 Postdocs and scientists (8 ongoing)

All former group members have successfully completed their PhD or postdoctoral studies.
22 out of 26 PhD students and postdocs under my direct supervision stayed in academic research.
14 former group members are now principal investigators in academia or have been offered PI positions.

Research Interests

Microbial communities: assembly, dynamics and emergent properties of microbial communities.

Bacterial interactions: mutualistic and antagonistic interactions between bacterial cells; the impact of interactions on processes in natural systems.

Bacterial individuality: molecular mechanisms and adaptive significance of phenotypic heterogeneity in clonal populations; relevance of phenotypic heterogeneity in natural environments; bacterial behaviour in dynamic environments.

Bacteria under adverse conditions: genetic and phenotypic responses to antibiotics and other stressors at the single-cell level.

Invited Seminars and Talks

More than 120 invited talks since 2009.

Selected examples 2014-2022:

2022 Weizmann Institute, Rehovot, Israel

- Kavli Institute of Physics, UC Santa Barbara, Santa Barbara CA, USA
Biozentrum of the University of Basel, Basel, CH
Belgian Society for Microbiology annual symposium, Brussels, BE
Anniversary Symposium of the Max Planck Institute for Marine Microbiology, Bremen, DE
Department of Biology, Humboldt University, Berlin, DE
Microbial Community Meeting, Ohio State University, USA (online)
- 2021** (all seminars before August 2021 cancelled because of work in the Swiss National COVID-19 Science Task Force see below)
PBEE Seminar, Emory University, USA (online)
Center for Biofilm Engineering, Montana State University, USA (online)
- 2020** (all seminars cancelled because of work in the Swiss National COVID-19 Science Task Force, see below)
- 2019** Institute of Physics, London, UK
Department of Biology, Leiden Univ., NL
FEMS Conference, Glasgow, UK
Max Planck Institute for Marine Microbiology, Bremen, DE
SPP1617 International Meeting, Schloss Hohenkammer, DE
University of Luxembourg, Luxembourg, LU
- 2018** Weizmann Institute, Rehovot, IL
Gordon Conference on Marine Microbiology, Lucca, IT
Lake Arrowhead Microbial Genomics Meeting, Lake Arrowhead, CA, USA
Meeting of the Royal Society on Single-cell Ecology, London, UK
Department of Biology, KU Leuven, BE
- 2017** Northeastern University, Department of Biology, Boston, MA, USA
Gordon Conference on Molecular Mechanisms of Evolution, Easton, MA, USA
FEMS Conference, Valencia, ES
- 2016** Yale University, Dep. of Molecular, Cellular and Developmental Biology, New Haven, CO, USA
MIT, Environmental Sciences Seminar, Boston, MA, USA
Caltech, CEMI symposium, Pasadena, CA, USA
UC San Diego, qBio Seminar, San Diego, CA, USA
Gordon conference on microbial stress response, South Hadley, MA
March Meeting of the American Physical Society, Baltimore, MD, USA
- 2015** California Institute of Technology, Pasadena, CA, USA
University of British Columbia, Biodiversity Seminar, Vancouver, CA
University of Groningen, Groningen Lectures in Theoretical Biology, Groningen, NL
IOP Institute of Physics, The Physics of Microorganisms, London, UK
ESF conference on Bacterial Networks, San Feliu, ES
- 2014** Meeting of the Joint Genome Institute, Walnut Creek, Ca, USA
International Conference on Microbial Communication, Jena, DE
SPP1617 International conference on Phenotypic Heterogeneity, Kloster Irsee, DE
International Society of Microbial Ecology Conference, Seoul, South Korea
Isaac Newton Institute for Mathematical Sciences, University of Cambridge, UK

Main Recent Grants

- 2021 Simons Foundation, 10 PI project on 'Principles of Microbial Ecosystems' (lead: Roman Stocker and Otto Cordero), 1.2 million USD for MA for 5 years.

- 2020 SNF NCCR, 20 PI project on 'Microbiomes' (lead: Jan-Roelof van der Meer and Julia Vorholt), 677'000 SFR. for MA for 4 years.
- 2019 SNF, research grant, single PI: SFR. 1'073'000 for 4 years.
- 2017 Simons Foundation, 10 PI project on 'Theory of Microbial Ecosystems' (lead: Roman Stocker and Otto Cordero), 1.4 million USD for MA for 5 years.
- 2016 SNF, research grant, single PI: SFR. 783'000 for 3 years.
- 2009-21 Host for 7 Marie-Curie Postdoctoral Fellows, 5 ETH Fellows, 2 SNF Ambizione Fellows, 1 SystemsX Fellow, 2 EMBO Fellows

Recognition and Service to the Academic Community

Member of the European Academy of Microbiology, from 2017 on.

Member of the Advisory Board for the MPI in Terrestrial Microbiology, Marburg, 2016-2020.

Editorial Board member of 'Environmental Microbiology' since 2014.

Reviewer for over 50 different scientific journals (including Nature, Science, PNAS, PLOS Biology, Elife), and for 12 national and international funding agencies (including the Swiss National Science Foundation, NSF, ERC, MacArthur Foundation).

Member of more than 60 doctoral committees in Switzerland and abroad.

Public Service

August 2020 - August 2021: President of the Swiss National COVID-19 Science Task Force.

April 2020 - July 2020: Vice-president of the Swiss National COVID-19 Science Task Force.

Publications

Google Scholar: H-index 52, i10 index 93, total 10640 citations (May 2023).

<https://scholar.google.com/citations?user=kk5lwecAAAAJ&hl=en>

In addition to the publications listed below, members of my research group have published more than 40 papers since 2006 while being in the group without me as a co-author. I am only a co-author on papers from my group if I make a concrete scientific contribution.

D'Souza, G., Ebrahimi, A., Stubbusch, A., Daniels, M., Keegstra, J., Stocker, R., Cordero, O. & Ackermann, M. Cell aggregation is associated with enzyme secretion strategies in marine polysaccharide-degrading bacteria. *The ISME Journal*, 2023, 1-9.

Dal Co, A., Ackermann, M., & van Vliet, S. (2023). Spatial self-organization of metabolism in microbial systems: A matter of enzymes and chemicals. *Cell Systems*, 2023, 14(2), 98-108.

Schemm, S., Grund, D., Knutti, R., Wernli, H., Ackermann, M., & Evensen, G. Learning from weather and climate science to prepare for a future pandemic. *Proceedings of the National Academy of Sciences*, 2023, 120(4), e2209091120.

- Daniels, M., van Vliet, S., & Ackermann, M. Changes in interactions over ecological time scales influence single-cell growth dynamics in a metabolically coupled marine microbial community. *The ISME Journal*, 2023, 1-11.
- Huelsmann M, Ackermann M. Community instability in the microbial world. *Science*. 2022 Oct 7;378(6615):29-30.
- Wang M, Chen X, Liu X, Fang Y, Zheng X, Huang T, Tang YQ, Ackermann M, Nie Y, Wu XL. Even allocation of benefits stabilizes microbial community engaged in metabolic division of labor. *Cell Reports*, 2022, Sep 27;40(13):111410.
- Hemmerle, L., Maier, B. A., Bortfeld-Miller, M., Ryback, B., Gäbelein, C. G., Ackermann, M., & Vorholt, J. A. Dynamic character displacement among a pair of bacterial phyllosphere commensals in situ. *Nature communications*, 2022, 13(1), 1-14.
- van Vliet, S., Hauert, C., Fridberg, K., Ackermann, M., & Dal Co, A. Global dynamics of microbial communities emerge from local interaction rules. *PLoS computational biology*, 2022, 18(3), e1009877
- Hockenberry, A. M., Micali, G., Takacs, G., Weng, J., Hardt, W. D., and M. Ackermann. Microbiota-derived metabolites inhibit *Salmonella* virulent subpopulation development by acting on single-cell behaviors. *Proceedings of the National Academy of Sciences*, 2021. 8(3).
- van Gestel, J., Bareia, T., Tenennbaum, B., Dal Co, A., Guler, P., Aframian, N., Puyesky, S., Grinberg, I., D'Souza, G.G., Erez, Z., Ackermann, M. and A. Eldar. Short-range quorum sensing controls horizontal gene transfer at micron scale in bacterial communities. *Nature communications*, 2021. 12(1), pp.1-11.
- Nguyen, J., Fernandez, V., Pontrelli, S., Sauer, U., Ackermann, M., and R. Stocker, R. A distinct growth physiology enhances bacterial growth under rapid nutrient fluctuations. *Nature Communications*, 2021. 12(1), 1-12.
- D'Souza, G. G., Povolo, V. R., Keegstra, J. M., Stocker, R., and M. Ackermann. Nutrient complexity triggers transitions between solitary and colonial growth in bacterial populations. *The ISME Journal*, 2021. 1-13.
- Rodríguez-Verdugo, A., and M. Ackermann. Rapid evolution destabilizes species interactions in a fluctuating environment. *The ISME Journal*, 2021. 15(2), 450-460.
- Benz, F., J.S. Huisman, E. Bakkeren, J.A. Herter, T. Stadler, M. Ackermann, M. Diard, A. Egli, A.R. Hall, and W.-D. Hardt, Plasmid- and strain-specific factors drive variation in ESBL-plasmid spread in vitro and in vivo. *The ISME journal*, 2021. 15(3): p. 862-878.
- Sun, L., P. Ashcroft, M. Ackermann, and S. Bonhoeffer, Stochastic gene expression influences the selection of antibiotic resistance mutations. *Molecular biology and evolution*, 2020. 37(1): p. 58-70.
- Schreiber, F. and M. Ackermann, Environmental drivers of metabolic heterogeneity in clonal microbial populations. *Current Opinion in Biotechnology*, 2020. 62: p. 202-211.
- Moreno-Gómez, S., D.J. Kiviet, C. Vulin, S. Schlegel, K. Schlegel, G.S. van Doorn, and M. Ackermann, Wide lag time distributions break a trade-off between reproduction and survival in bacteria. *Proceedings of the National Academy of Sciences*, 2020. 117(31): p. 18729-18736.

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- Bosshard, L., S. Peischl, M. Ackermann, and L. Excoffier, Dissection of the mutation accumulation process during bacterial range expansions. *BMC Genomics*, 2020. 21: p. 1-11.
- van Gestel, J., M. Ackermann, and A. Wagner, Microbial life cycles link global modularity in regulation to mosaic evolution. *Nature Ecology & Evolution*, 2019.
- Schiessl, K.T., A. Ross-Gillespie, D.M. Cornforth, M. Weigert, C. Bigosch, S.P. Brown, M. Ackermann, and R. Kummerli, Individual- versus group-optimality in the production of secreted bacterial compounds. *Evolution*, 2019.
- Rodriguez-Verdugo, A., C. Vulin, and M. Ackermann, The rate of environmental fluctuations shapes ecological dynamics in a two-species microbial system. *Ecology letters*, 2019.
- Povolo, V.R. and M. Ackermann, Disseminating antibiotic resistance during treatment. *Science*, 2019. 364(6442): p. 737-738.
- Leventhal, G.E., M. Ackermann, and K.T. Schiessl, Why microbes secrete molecules to modify their environment: the case of iron-chelating siderophores. *Journal of the Royal Society Interface*, 2019. 16(150).
- Dal Co, A., S. van Vliet, and M. Ackermann, Emergent microscale gradients give rise to metabolic cross-feeding and antibiotic tolerance in clonal bacterial populations. *Philosophical Transactions of the Royal Society B*, 2019.
- Dal Co, A., M. Ackermann, and S. van Vliet, Metabolic activity affects response of single cells to a nutrient switch in structured populations. *Journal of the Royal Society Interface*, 2019.
- Bosshard, L., S. Peischl, M. Ackermann, and L. Excoffier, Mutational and selective processes involved in evolution during bacterial range expansions. *Molecular biology and evolution*, 2019.
- Balaban, N.Q., S. Helaine, K. Lewis, M. Ackermann, B. Aldridge, D.I. Andersson, M.P. Brynildsen, D. Bumann, A. Camilli, and J.J. Collins, Definitions and guidelines for research on antibiotic persistence. *Nature Reviews Microbiology*, 2019. 17(7): p. 441-448.
- Zimmermann, M., S. Escrig, G. Lavik, M.M.M. Kuypers, A. Meibom, M. Ackermann, and F. Schreiber, Substrate and electron donor limitation induce phenotypic heterogeneity in different metabolic activities in a green sulphur bacterium. *Environmental Microbiology Reports*, 2018. 10(2): p. 179-183.
- Vulin, C., N. Leimer, M. Huemer, M. Ackermann, and A.S. Zinkernagel, Prolonged bacterial lag time results in small colony variants that represent a sub-population of persisters. *Nature Communications*, 2018. 9.
- van Vliet, S., A. Dal Co, A.R. Winkler, S. Spriewald, B. Stecher, and M. Ackermann, Spatially Correlated Gene Expression in Bacterial Groups: The Role of Lineage History, Spatial Gradients, and Cell-Cell Interactions. *Cell Systems*, 2018. 6(4): p. 496-+.

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