

Prof. Dr. Marie Charlotte Schölmerich

ETH Zürich

D-USYS | IBP

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Research interests

Anaerobic Microbiology, Environmental Metagenomics, Extrachromosomal Elements, Intrinsic Disorder

Academic Career

- 08/2023 – present **Assistant Professor of Environmental Microbiology**
ETH Zürich, Department of Environmental Systems Sciences (D-USYS)
- 02/2021 – 07/2023 **Walter Benjamin postdoctoral fellow (DFG)**
University of California Berkeley, Innovative Genomics Institute (IGI)
Advisor: Prof. Jillian F. Banfield
- 02/2018 – 12/2020 **Junior group leader**
University of Hamburg, Microbiology & Biotechnology
Host: Prof. Wolfgang Streit
- 10/2013 – 06/2018 **Ph.D. (Dr. rer. nat.) in Biology**
Goethe University Frankfurt, Molecular Microbiology & Bioenergetics
Advisor: Prof. Volker Müller
summa cum laude
- 10/2011 – 09/2013 **Master of Science in Molecular Biosciences**
Goethe University Frankfurt
excellent (1.0, with honors)
- 10/2008 – 09/2011 **Bachelor of Science in Biochemistry**
Leipzig University

Career breaks

- 10/2016 – 01/2018 Maternity leave
03/2020 – 12/2020 Maternity leave

Grants, Awards and Memberships

- 2024 – 2028 SNSF Project Proposal Grant “Extrachromosomal elements linked to an ancient metabolism” (735,045 CHF)
- 2023 – now International Society for Microbial Ecology (ISME) Member
- 2023 – now American Society for Microbiology (ASM) Member
- 2023 – now Center for Origin and Prevalence of Life (COPL) Member
- 2023 – now Swiss Society for Microbiology (SSM) Member
- 2022 – now German Academic International Network (GAIN) Member

2022	Stipend, Career Development Fund, IGI (290 US\$)
2021	Stipend, Foster Endowment in Functional Genomics (200 US\$)
2020 – 2023	Walter Benjamin Fellowship, DFG (186,144 € + childcare costs)
2019	Research grant, Funds of the Chemical Industry (10,000 €)
2019	Full stipend, Claussen-Simon-Foundation (46,000 €)
2018	Best talk at Gordon Research Seminar for Molecular Basis of Microbial One-Carbon Metabolism, USA (1,180 €)
2018	Travel award (DAAD; 2,077 €)
2014, 2016	Travel award (Hermann-Willkomm Foundation; 2×400 €)
2012 – now	Association for General and Applied Microbiology (VAAM) Member

Invited Talks (selected)

09/2024	Annual Meeting of the Swiss Society for Microbiology (SSM), CH
08/2024	Gordon Research Conference (GRC) Molecular Basis of Microbial One-Carbon Metabolism (C1 Metabolism), USA
05/2024	Umweltmikrobiologie Seminar at Eawag, CH
05/2024	The Future of Biotechnology and Biofilm Research, GER
02/2024	Gas Fermentation, AUS
10/2023	D-BIOL, ETH Zurich, CH
05/2023	London Calling 2023 Conference, UK
04/2023	Archaea PowerHour America, USA
10/2022	SPP2002 “Small Proteins in Prokaryotes” meeting, GER
05/2022	ASM hour, Australian Society for Microbiology, AUS
03/2022	<i>Association for General and Applied Microbiology (VAAM)</i> annual meeting, GER, Special Postdoc Lecture
03/2022	Environmental Genomics Seminar, Stanford University, CA, USA
07/2021	Extreme Microbiome Seminar, USA
09/2019	NASA Ames Research Center, CA, USA
09/2019	Division of Host-Microbe Systems & Therapeutics, University of California San Diego (UCSD), CA, USA
09/2019	Civil and Environmental Engineering, Stanford University, CA, USA
10/2018	Guest Lecture, Hamburg University, GER
07/2018	Gordon Research Conference (GRC) Molecular Basis of Microbial One-Carbon Metabolism (C1 Metabolism), USA
09/2017	Advanced Concepts Team at the European Space Agency (ESA), NL

Conference Presentations (from submitted abstracts)

09/2023	Talk at VAAM annual meeting, GER
08/2023	Talk at SSM annual meeting, CH
03/2022	Talk at VAAM annual meeting, GER
03/2019	Poster at VAAM annual meeting, Mainz, GER
01/2019	Talk at C1net conference 4, Nottingham, UK
07/2018	Talk at Gordon Research Seminar (GRS) on C1 Metabolism, USA
03/2016	Poster at VAAM annual meeting, Jena, GER
03/2015	Talk at VAAM annual meeting, Marburg, GER
08/2014	Poster at GRC on C1 Metabolism, USA

Supervision and Teaching

- 2024 ETH Zürich
- Postdoctoral advisor of Hanna Zehnle
 - PhD advisor of Donat Crippa, Giulia Fiorito and Sebastian Haiss
 - Biogeochemistry of Alpine Habitats (701-0230-00L)
 - Environmental Microbiology (701-1310-00L)
 - Term Paper 1: Writing (701-1303-00L)
 - Term Paper 2: Seminar (701-1302-00L)
 - Co-examiner of PhD candidate Mathieu Verpaalen (Prof. Christophe Lacroix group, ETH Zürich)
 - Chair of Aptitude Colloquium of PhD candidate Gatwa Tshinsele-van Bellingen (Prof. Martin Ackermann group, Eawag)
- 2023 ETH Zürich
- Term Paper 1: Writing (701-1303-00L)
- 2022 UC Berkeley
- Lecture in Microbial Ecology Class (ESPM_112_2022)
- 2021 UC Berkeley
- Supervision of graduate rotation student Lucas Waldburger
- 2018 – 2020 University of Hamburg
- Supervision of master thesis of Florian Rosenbaum and Luise Goebbels, bachelor thesis of Albert Dumnitch, master rotation student Maria Gneiss
- 2013 – 2016 Goethe University Frankfurt
- Supervision of master thesis of Woung Sung, bachelor thesis of Vanessa Mijic, Alexander Katsyv, Jule Rueger, Anna Knieper, Judith Doenig, rotation students Oliver Lammerts, Oleg Bitner, Michelle Kuhns, Laura Henke (6 weeks each)
 - Organization and supervision of lab practical and seminars for master students (3 × 4 weeks)
 - Organization and supervision of literature seminars for master students

Leadership and Outreach

- 09/2024 Conference Session Chair at the Annual Meeting of the Swiss Society for Microbiology
- 08/2024 Plenary Discussion, Gordon Research Seminar (GRS) Molecular Basis of Microbial One-Carbon Metabolism (C1 Metabolism), USA
- 05/2024 invited speaker 500 Women Scientists Zurich
- 08/2022 Chair of [Gordon Research Seminar](#) for Microbial C1 Metabolism
- 01/2022 “Been in America” [interview](#) with DFG
- 08/2021 Borgs Discovery [interview](#) with IGI
- 08/2021 [Virtual GAIN21](#): Annual Conference & Talent Fair of the German Academic International Network
- 01/2019 Talk at New Year’s Symposium, Claussen-Simon Foundation, GER
- 12/2018 Guest lecture for “Ethics in Science”, Hamburg University, GER
- 2021 – now Reviewer for *Science*, *Nature*, *Nat. Comms.*, *Front. Bioeng. Biotechnol.*, *Trends Microbiol.*

Workshops & Trainings (selected)

03/2023	2023 Academic Lab Management & Leadership Symposium, Torrey Pines Training Consortium (4 half days)
03/2023	Foundations in Teaching 3-Part Workshop Series, UC Berkeley
02/2023	Scientific Leadership and Management, Visiting Scholar and Postdoc Affairs Program, UC Berkeley (3 days)
01/2023	UC Preventing Harassment & Discrimination: supervisors & faculty
05/2022	UC Ethics and Compliance Briefing for Researchers
03/2022	UC Cyber Security Awareness Fundamentals
01/2021	University of California Ethical Values and Conduct

Publication ListBefore / under peer-review

West-Roberts, J.A., P. B. Matheus-Carnevali, B. Al-Shayeb, **M.C. Schoelmerich**, A.D. Thomas, A. Sharrar, C. He, L.-X. Chen, A. Lavy, R. Keren, Y. Amano, J. F. Banfield, 2021. [The Chloroflexi supergroup is metabolically diverse and representatives have novel genes for non-photosynthesis based CO₂ fixation.](#) **bioRxiv**. doi: 10.1101/2021.08.23.457424.

Peer-reviewed publications

Valentin-Alvarado, L.E., K.E. Appler, V. De Anda, **M.C. Schoelmerich**, J. West-Roberts, V. Kivenson, A. Crits-Christoph, L. Ly, R. Sachdeva, C. Greening, D.F. Savage, B.J. Baker, J.F. Banfield, 2024. [Asgard archaea modulate potential methanogenesis substrates in wetland soil.](#) **Nat. Commun.** 15: 6384. doi:10.1038/s41467-024-49872-z.

Greening, C., & P.R. Cabotaje & L.E.V. Alvarado & P.M. Leung, H. Land, M. Senger, M.A. Klamke, M. Milton, R.J. Lappan, S. Mullen, J. West-Roberts, J. Mao, J. Song, **M.C. Schoelmerich**, C. Stairs, R. Grinter R, A. Spang A, J.F. Banfield*, G. Berggren*, 2024. [Unique minimal and hybrid hydrogenases are active in anaerobic archaea.](#) doi: 10.2139/ssrn.4520792. **Cell.** Doi: 10.1016/j.cell.2024.05.032.

Schoelmerich, M.C., L. Ly, J. West-Roberts, L.-D. Shi, C. Shen, N. Malvankar, N. Taib, S. Gribaldo, B.J. Woodcroft, C.W. Schadt, B. Al-Shayeb, X. Dai, C. Mozsary, S. Hickey, C. He, J.A. Beaulaurier, S. Juul, R. Sachdeva, J.F. Banfield, 2024. [Borg extrachromosomal elements of methane-oxidizing archaea have conserved and expressed genetic repertoires.](#) **Nat. Commun.** 15: 5414. doi:10.1038/s41467-024-49548-8.

Shi, L.D., J. West-Roberts, **M.C. Schoelmerich**, P.I. Penev, L.-X. Chen, Y. Amano, S. Lei, R. Sachdeva, J.F. Banfield, 2023. [Methanotrophic Methanoperedens archaea host diverse and interacting extrachromosomal elements.](#) **Nat. Microbiol.** doi: 10.1038/s41564-024-01740-8.

Lou Y.C., B.E. Rubin, **M.C. Schoelmerich**, K. DiMarco, A.L. Borges, R. Rovinsky, L. Song, J.A. Doudna, J.F. Banfield 2023. [Genomic analysis of cultivated infant](#)

- [microbiomes identifies Bifidobacterium 2'-fucosyllactose utilization can be facilitated by co-existing species](#). **Nat. Comms.** 14:7417.
- Schoelmerich, M.C., 2023. [Aerobic marine bacteria can use H₂ for growth](#). **Trends in Microbiol.** 31:554-555.
- Schoelmerich, M.C., R. Sachdeva, L. Waldburger, J. West-Roberts, J. F. Banfield, 2022. [Borg tandem repeats undergo rapid evolution and are under strong selection to create new intrinsically disordered regions in proteins](#). **PLoS Biol.** 21:e3001980.
- Schoelmerich, M.C., H.T. Oubouter, R. Sachdeva, P. Penev, Y. Amano, J. West-Roberts, C.U. Welte, J.F. Banfield, 2022. [A widespread group of large plasmids in methanotrophic *Methanoperedens* archaea](#). **Nat. Comms.** 13:7085.
- Al-Shayeb, B., M.C. Schoelmerich, J. West-Roberts, L. E. Valentin-Alvarado, R. Sachdeva, S. Mullen, A. Crits-Christoph, M.J. Wilkins, K.H. Williams. J. A. Doudna, J.F. Banfield, 2021. [Borgs are giant extrachromosomal elements with the potential to augment methane oxidation](#). **Nature** 610:731-736.
- Peng, M., C.-Y. Li, X.-L. Chen, B. Williams, K. Li, Y.-Na. Gao, P. Wang, N. Wang, Mr C. Gao, S. Zhang, M.C. Schoelmerich, J.F. Banfield, B. Miller, N. Le Brun, Y.-Z. Zhang, 2022. [Insights into methionine S-methylation in DMSP-producing bacteria, uncultivated bacterial and archaeal putative symbionts and plants](#). **Nat. Comms.** 13:2947.
- Jaffe, A.J., M. Fuster, M.C. Schoelmerich, L.-X. Chen, J. Colombet, H. Billard, T. Sime-Ngando, J. F. Banfield, 2021. [Long-term incubation of lake water enables genomic sampling of consortia dominated by Planctomycetes and Candidate Phyla Radiation bacteria](#). **mSystems.** 7:e00223-22.
- Rosenbaum, F.P., A. Poehlein, R. Egelkamp, R. Daniel, S. Harder, H. Schlüter, M. C. Schoelmerich, 2021. [Lactate metabolism in strictly anaerobic microorganisms with a soluble NAD⁺-dependent L-lactate dehydrogenase](#). **Env. Microbiol.** 23:4661-4672.
- A. Katsyv, M. C. Schoelmerich, M. Basen, V. Müller, 2021. [The pyruvate:ferredoxin oxidoreductase of the thermophilic acetogen, *Thermoanaerobacter kivui*](#). **FEBS Open Bio.** 11:1332-1342.
- Göbbels, L., A. Poehlein, A. Dumnitch, R. Egelkamp, C. Kröger, J. Haerdter, T. Hackl, A. Feld, H. Weller, R. Daniel, W. R. Streit, M. C. Schoelmerich, 2021. [Cysteine: an overlooked energy and carbon source](#). **Sci. Rep.** 11:1-15.
- Alio, I., M. Gudzuhn, P. Pérez García, D. Danso, M. C. Schoelmerich, U. Mamat, U. E. Schaible, J. Steinmann, D. I Yero, I. Gibert, T. A. Kohl, S. Niemann, M. I. Gröschel, J. Haerdter, T. Hackl, C. Vollstedt, M. Bömeke, R. Egelkamp, R. Daniel, A. Poehlein, W. R. Streit, 2020. [Phenotypic and Transcriptomic Analyses of Seven Clinical *Stenotrophomonas maltophilia* Isolates Identify a Small Set of Shared and Commonly Regulated Genes Involved in the Biofilm Lifestyle](#). **Appl. Env. Microbiol.** 86:e02038-20.
- Schoelmerich, M. C., A. Katsyv, J. Dönig, T. J. Hackmann and V. Müller, 2019. [Energy conservation involving 2 respiratory circuits](#). **Proc. Nat. Acad. Sci. U. S. A.** 117:1167-1173.
- Schoelmerich, M. C. and V. Müller, 2019, [Energy-converting hydrogenases: the link between H₂ metabolism and energy conservation](#). **Cell. Mol. Life Sci.** 77:1461-1481.
- Schoelmerich, M. C. and V. Müller, 2019. [Energy conservation by a hydrogenase-dependent chemiosmotic mechanism in an ancient metabolic pathway](#). **Proc. Nat. Acad. Sci. U. S. A.** 116:6329-6334.

- Schoelmerich, M. C.**, A. Katsyv, W. Sung, V. Mijic, J. Baker, N. P. Minton, A. Wiechmann, P. Kottenhahn and V. Müller, 2017. [Regulation of lactate metabolism in the acetogenic bacterium *Acetobacterium woodii*](#). **Environ. Microbiol.** 20:4587-4595.
- Weghoff, M. C.** and V. Müller, 2016. [CO metabolism in the thermophilic acetogen *Thermoanaerobacter kivui*](#). **App. Environ. Microbiol.** 82:2312-2319.
- Weghoff, M. C.**, J. Bertsch and V. Müller, 2015. [A novel mode of lactate metabolism in strictly anaerobic bacteria](#). **Environ. Microbiol.** 17:670-677. Highlight article recommended by the *Faculty of 1000*.
- Hess, V., A. Poehlein, **M. C. Weghoff**, R. Daniel and V. Müller, 2014. [A genome-guided analysis of energy conservation in the thermophilic, cytochrome-free acetogenic bacterium *Thermoanaerobacter kivui*](#). **BMC Genomics** 15:1139.