

Biosketch

Assist.-Prof. Michael Zumstein, PhD

Position in CoE: Key Researcher

Personal Details

Place of birth	Lucerne, Switzerland
Nationality	Swiss
Children	2020, 2023
Affiliation:	University of Vienna
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List of publications	ORCID: 0000-0002-1099-5174
Academic age	7 years since PhD



Academic Career and Positions Held

I obtained a **BSc** and an **MSc** degree in Biochemistry at **ETH Zurich (CH)** and experienced an Erasmus exchange semester at Imperial College London (UK). I subsequently conducted **PhD and Postdoctoral Research** in Environmental Chemistry at **ETH Zurich**, **Cornell University (USA)**, and at the **Swiss Federal Institute of Aquatic Science and Technology (Eawag, CH)**. This research focused on the biodegradation of synthetic polyesters by soil microbiomes and on the biotransformation of small molecules (including pharmaceuticals) in wastewater systems. In 2021, I joined the Centre for Microbiology and Environmental Systems Science at the **University of Vienna** as a **Assistant Professor** to research and teach at the interphase between environmental chemistry and environmental microbiology.

Scientific Achievements and Scientific Contribution to the CoE

Scientific Achievements. My research focuses on the **biotransformation and biodegradation of anthropogenic organic chemicals** in natural and engineered systems. The insights gained through this research are fundamental for **understanding the environmental fate of chemicals** and for informing strategies for environmental management. For example, we have extensively worked in an **academia–industry cooperation** on promising **biodegradable substitutes for water-soluble polymers** that are essential in home and personal care products. Funded through an Ambizione Fellowship by the Swiss NSF, we have investigated extracellular peptidases in wastewater and revealed that these peptidases are highly active especially in raw wastewater – with highly conserved substrate specificities. Besides research, I am enthusiastically contributing to **university-level education** and one of my courses (*Towards Zero Pollution: Environmental Biotransformation of Organic Chemicals*) has recently been recognized with the **UNIVIE Teaching Award**.

Scientific Contribution to the CoE. Within the CoE, I will focus on the **interplay between pharmaceuticals and human-associated and environmental microbiomes** (within Work Package 3.1). Specifically, our group will apply analytical chemical techniques to investigate the kinetics and pathways of the **microbial biotransformation of selected pharmaceuticals in human gut and wastewater systems** – with the aim to derive structure-reactivity relationships that can inform the development of effective and sustainable pharmaceuticals and wastewater treatment processes. I will additionally support **Method Facility 2** for aspects related to **Environmental Mass Spectrometry**.

10 Most Important Publications (*relevant for the CoE)

1. *Wichmann, N.; J. Meibom; T. Kohn; **M. Zumstein**. Conserved Specificity of Extracellular Wastewater Peptidases Revealed by Multiplex Substrate Profiling by Mass Spectrometry. *Environ Chem Lett*, 2025, 13, 102972.
2. Kintzi, A.; S. Daturpalli; G. Battagliarin; **M. Zumstein**. Biodegradation of water-soluble polymers by wastewater microorganisms: challenging laboratory testing protocols. *Environ Sci Technol*, 2024, 58, 34, 15246-15256 <https://doi.org/10.1021/acs.est.4c05808>.
3. *Wichmann, N.; R. Gruseck; **M. Zumstein**. Hydrolysis of Antimicrobial Peptides by Extracellular Peptidases in Wastewater. *Environ Sci Technol*, 2024, 58 (1), 717-726. <https://doi.org/10.1021/acs.est.3c06506>.
4. **Zumstein, M.**; G. Battagliarin; A. Kuenkel; M. Sander. Environmental biodegradation of water-soluble polymers: key considerations and ways forward. *Acc Chem Res*, 2022, 55, 16, 2163–2167. <https://doi.org/10.1021/acs.accounts.2c00232>.
5. *Rich, S.; **M. Zumstein**; D.E. Helbling. Identifying Functional Groups that Determine Rates of Micropollutant Biotransformations Performed by Wastewater Microbial Communities. *Environ Sci Technol*, 2022, 56 (2), 984-994. <https://doi.org/10.1021/acs.est.1c06429>.
6. ***Zumstein, M.**; J.J. Werner; D.E. Helbling. Exploring the specificity of extracellular wastewater peptidases to inform the design of sustainable peptide-based antibiotics. *Environ Sci Technol*, 2020, 54 (18), 11201-11209. <https://doi.org/10.1021/acs.est.0c02564>.
7. **Zumstein, M.**; R. Narayan; H.-P. Kohler; K. McNeill; M. Sander. Dos and do nots when assessing the biodegradation of plastics. *Environ Sci Technol*, 2019, 53 (17), 9967-9969. <https://doi.org/10.1021/acs.est.9b04513>.
8. ***Zumstein, M.**; D.E. Helbling. Biotransformation of antibiotics: Exploring the activity of extracellular and intracellular enzymes derived from wastewater microbial communities. *Water Res*, 2019, 155, 115-123. <https://doi.org/10.1016/j.watres.2019.02.024>.
9. **Zumstein, M.**; A. Schintlmeister; T.F. Nelson; R. Baumgartner; D. Wobken; M. Wagner; H.-P. Kohler; K. McNeill; M. Sander. Biodegradation of synthetic polymers in soils: tracking carbon into CO₂ and microbial biomass. *Sci Adv*, 2018, eaas9024. <https://doi.org/10.1126/sciadv.aas9024>.
10. **Zumstein, M.**; D. Rechsteiner; N. Roduner; V. Perz; D. Ribitsch; G.M. Guebitz; H.-P. Kohler; K. McNeill; M. Sander. Enzymatic hydrolysis of polyester thin films at the nanoscale: effect of polyester structure and enzyme active-site accessibility. *Environ Sci Technol*, 2017, 51 (13), 7476-7485. <https://doi.org/10.1021/acs.est.7b01330>.