Christopher J. Sedlacek, PhD

Personal Information

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Current institution	University of Vienna, Centre for Microbiology and Environmental Systems Science, Division of Microbial Ecology, Althanstrasse 14, 1090 Vienna, Austria
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Research Interests

My long-term goal is to provide a better understanding of the genomic and ecophysiological traits of nitrifying microorganisms in order to inform nitrogen management practices in both engineered (water treatment plants) and natural (agriculture) ecosystems.

To achieve a holistic view of nitrifier ecophysiology, my research approach utilizes a combination of:

- **Specialized cultivation approaches**
  Environmental enrichment cultures, continuous culture bioreactors, mock communities
- **Molecular biology / -omic methods**
  Transcriptomics, proteomics, qPCR, microrepiration
- ***In silico* techniques**
  Comparative genomics, gene curation

Education

PhD 2009-2015	**PhD in Microbiology**, August 2015 Department of Microbiology, Miami University, Oxford, OH, USA Mentor: Dr. Annette Bollmann Dissertation: *The ecophysiology of the ammonia-oxidizing bacterium Nitrosomonas* sp. Is79
BSc 2005-2009	**BSc in Biology (Cum Laude)**, May 2009 Department of Biology, Fairmont State University, Fairmont, WV, USA Mentor: Dr. Albert Magro Research Theme: *Pharmacologically induced apoptosis in glioblastoma tumor cells*
Diploma 2001-2005	**High School Diploma**, June 2005 St. Thomas of Villanova Secondary School, LaSalle, ON, Canada

Research and Employment History

2015-current	Postdoctoral researcher, University of Vienna, Austria Mentors: Dr. Michael Wagner and Dr. Holger Daims Project: *The genomic and ecophysiological characterization of diverse nitrifiers*
2014-2015	Dissertation research fellow, Miami University, USA
2014-2015	Graduate research assistant, with Dr. Rachael Morgan-Kiss, Miami University, USA
2009-2014	Graduate research and teaching assistant, with Dr. Annette Bollmann Miami University, USA
2006-2008	Undergraduate research assistant, with Dr. Albert Magro Fairmont State University, USA

Publications (&mentored student, %over 100 citations)

2019& **Sedlacek CJ**, McGowan B&, Suwa Y, Sayavedra-Soto L, Laanbroek HJ, Stein LY, Norton J, Klotz MG, A Bollmann. A physiologic and genomic comparison of *Nitrosomonas* cluster 6a and 7 ammonia-oxidizing bacteria. *Microbial Ecology*, 78:885-894. doi:10.1007/s00248-019-01378-8.

2019 Kits KD, Jung MY, Vierheilig J, Pjevac P, **Sedlacek CJ**, Liu S, Herbold C, Stein LY, Richter A, Wissel H, Brüggemann N, Wagner M, Daims H. Low yield and abiotic origin of N_2O formed by the complete nitrifier *Nitrospira inopinata*. *Nature Communications,* 10(1):1836. doi:10.1038/s41467-019-09790-x.

2018 Kitzinger K, Koch H, Lücker S, **Sedlacek CJ**, Herbold C, Schwarz J, Daebeler A, Mueller A, Lukumbuzya M, Romano S, Leisch N, Karst SM, Kirkegaard R, Albertsen M, Nielsen PH, Wagner M, Daims H. Characterization of the first *Nitrotoga* isolate reveals metabolic versatility and separate evolution of widespread nitrite-oxidizing bacteria. *mBio*, 9(4):e01186-18. doi:10.1128/mBio.01186-18.

2018 Daebeler A, Herbold C, Vierheilig J, **Sedlacek CJ**, Pjevac P, Albertsen M, Kirkegaard RH, Daims H, Wagner M. Cultivation and Genomic Analysis of "Candidatus Nitrosocaldus islandicus," an obligately thermophilic, ammonia-oxidizing thaumarchaeon from a hot spring biofilm in Graendalur Valley, Iceland. *Frontiers in Microbiology*, 9:193. doi:10.3389/fmicb.2018.00193.

2017% Kits KD, **Sedlacek CJ**, Lebedeva EV, Han P, Bulaev A, Pjevac P, Daebeler A, Romano S, Albertsen M, Stein LY, Daims H, Wagner M. Kinetic analysis of a complete nitrifier reveals an oligotrophic lifestyle. *Nature*, 549(7671) 269-272. doi: 10.1038/nature23679.

2016 **Sedlacek CJ**, Gries K, Nielsen S, Revsbeck NP, Laanbroek HJ, Bollmann A. The effect of bacterial community members on the proteome of the ammonia-oxidizing bacterium *Nitrosomonas* sp. Is79. *Applied and Environmental Microbiology,* 82(15) 4776-88. doi: 10.1128/AEM.01171-16.

2013 Bollmann A, **Sedlacek CJ**, Norton J, *et al*., Complete genome sequence of *Nitrosomonas* sp. Is79, an ammonia-oxidizing bacterium adapted to low ammonium concentrations. *Standards in Genomic Sciences*, 7(3) 469-82. doi: 10.4056/sigs.3517166.

Manuscripts In Review (*available as a preprint on bioRxiv, #corresponding author)

2019* **Sedlacek CJ#**, Giguere AT, Dobie MD, Mellbye BL, Ferrell RV, Woebken D, Sayavedra-Soto LA, Bottomley PJ, Daims H, Wagner M, Pjevac P. Transcriptomic response of a continuous *Nitrosomonas europaea* culture to reduced oxygen availability. [In press at *mSystems* since November 2019]. doi:10.1101/765727.

2019* Wang Z, Ho H, Egan R, Yao S, Kang D, Froula J, Sevim V, Schulz F, Shay JE, Macklin D, McCue K, Orsini R, Barich DJ, **Sedlacek CJ**, Li W, Morgan-Kiss RM, Woyke T, Slonczewski JL. A new method for rapid genome classification, clustering, visualization, and novel taxa discovery from metagenomes. [In review at *Nature biotechnology* since November 2019]. doi:10.1101/812917.

2019 **Sedlacek CJ#**, Giguere AT, Pjevac P. Is too much fertilizer a problem? [In press at *Frontiers for young minds* since December 2019].

Manuscripts In Preparation

(anticipated submission before April 2020, #corresponding author, @shared first authorship)

2020 **Sedlacek CJ#** et al. Winogradsky *et al*: The discovery of nitrifiers. (Review article)

2020 **Sedlacek CJ**, Pjevac P, Bayer B, Romano S, Herbold C, Daims H, Wagner M, *et al*. The effect of photo and photooxidative stress on the activity and growth of ammonia-oxidizing archaea. (Research article)

2020 Jung MY@, **Sedlacek CJ@**, Kits KD, Lebedeva E, Herbold C, Han P, Hink L, Nicol G, Bayer B, Pjevac P, Daims H, Wagner M *et al*. Ammonia-oxidizing archaea: A survey of ammonia oxidation kinetics. (Research article)

Teaching Experience (*graduate student class)

2017-2018*	Diversity and function of uncultured microbes in medical and environmental samples Laboratory course, 15 students, multiple sessions, University of Vienna
2013	Introduction to microbiology and human disease Lecture course, 80 students, Miami University
2010-2014*	Medical bacteriology and bacterial pathogenesis Laboratory course, 20 students, multiple sessions, Miami University
2010-2011*	Immunology principles and practices Laboratory course, 20 students, multiple sessions, Miami University
2009	Biological concepts: ecology, evolution, genetics, and diversity Laboratory course, 20 students, multiple sessions, Miami University

Research Mentoring Experience

2019-current	**Anna Aplenc** (BSc Environmental Microbiology): *Comammox ecophysiology*
2018-2019	**Angelika Lehrer** (BSc Molecular Biology): *Raman spectroscopy method development*
2018-2019	**Max Schuster** (BSc Molecular Biology): *The starvation response of Nitrospira inopinata*
2012-2015	**Rhea Johnson** (BSc Microbiology): *Niche differentiation between nitrite-oxidizing bacteria*
2012-2013	**Julie Potz** (BSc Microbiology): *Physiological characterization of nitrite-oxidizing bacteria*
2011-2014	**Brian McGowan** (BSc Bioengineering): *Characterization of Nitrosomonas* sp. Is79
2010	**Lisa Farinella** (BSc Microbiology): *Effect of heavy metal uranium stress on bacterial consortia*

Funded Grants

2017	Research network chemistry meets microbiology joint interdisciplinary research (University of Vienna) *Investigating interactions of ammonia-oxidizing archaea and co-enriched heterotrophic bacteria by stable isotope labeling and metabolomics* (Co-PI)	€7,000
2016	Career relocation grant (Austrian Research Promotion Agency, FFG)	€2,000
2014	Doctoral undergrad opportunities for scholarship, Miami University, USA *Physiological comparison of nitrite-oxidizing bacteria* (PI)	$1,000
2013	Doctoral undergrad opportunities for scholarship, Miami University, USA *The role of divergent amoC genes in Nitrosomonas* sp. Is79 (PI)	$1,000

Grant In Review (currently under review)

Current	Young independent research group program (Austrian Science Fund, FWF) *Interplay between biological nitrification inhibitors, nitrogen cycling, and agronomic nitrogen use efficiency* (Co-PI)	Total grant ~€2,000,000 (portion €400,000)

Scientific Service

2016-current **Ad-hoc reviewer for:**

Nature Communications	International Society for Microbial Ecology (ISME)
Frontiers in Microbiology	FEMS Microbiology Letters
Environmental Microbiology	Applied Microbiology and Biotechnology
Annals of Microbiology	Water Research
Applied Science	Microbial Biotechnology

Scientific and Public Outreach

2018	Co-organizer: Microbial University for Kids workshop (University of Vienna)
2017-current	Scientist for the "Skype A Scientist" program (www.skypeascientist.com) Skype seminars with >20 classrooms across 6 countries and 11 states
2017	Co-chair: Cultivation in the age of culture independent studies The 11th Innovative Techniques In Microbial Ecology Meeting, Aalborg, Denmark
2017	Co-organizer: Early career and graduate student workshop The 5th International Conference on Nitrification, University of Vienna, Austria
2015	Co-chair: N-cycle ecology, ecogenomics, and niche differentiation session Young Investigators Workshop, The 4th International Conference on Nitrification, University of Alberta, Canada.

Scholarships, Fellowships, and Awards

2015	Dissertation research fellowship, Miami University, USA
2014	American Society for Microbiology student travel award
2013-2014	American Society for Microbiology science teaching fellow
2013	Nitrification network conference travel award
2012-2015	Graduate student association travel award, Miami University, USA
2012-2015	Graduate school travel award, Miami University, USA
2012-2015	Excellence in graduate studies travel award, Miami University, USA
2012	Orton K Stark graduate award in research and teaching, Miami University, USA
2009	Outstanding senior biology student award, Fairmont State University, USA
2005-2009	Athletic swimming scholarship, Fairmont State University, USA

Field Site Experience

2019	Karst Caves, Croatia *The isolation of novel cave dwelling microorganisms*
2014	McMurdo Dry Valleys, Antarctica *Protist diversity and function in the McMurdo Dry Valley lakes*
2012-2014	Acton Lake, OH, USA *In situ growth comparisons of nitrifying microorganisms*

Professional Development: Workshops Attended

2016	Unisense microsensor workshop, Aarhus, Denmark *Principles and applications of microsensors*
2014	American Society for Microbiology: Undergraduate teaching workshop *M(icro)OOCs Webinar Series: Documenting your perspective on teaching*

Oral Presentations (*invited, #keynote)

2019*# Nitrification 2.0: Where do we go from here? The 6th International Conference on Nitrification, Xiamen University, China.

2019 Ammonia-oxidizing archaea posses a wide range of substrate affinities. Gordon Research Seminar (GRS): Archaea Ecology, Metabolism, and Molecular Biology. Les Diablerets, Switzerland.

2015 The proteomic response of the ammonia-oxidizing bacterium *Nitrosomonas* sp. Is79 in co-culture. Ohio Branch of the ASM, Lorain County Community College, OH, USA.

2013 Physiologic and genomic characterization of ammonia-oxidizing bacteria adapted to low ammonium environments. 3rd International Conference on Nitrification, Chuo University, Tokyo, Japan.

2013 Culturing oligotrophic ammonia-oxidizing bacteria. Young Researcher Workshop at the 3rd International Conference on Nitrification, Chuo University, Tokyo, Japan.

2012* Ammonia-oxidizing bacteria adapted to low ammonium environments. Department of Biology, Fairmont State University, WV, USA.

10 Select Poster Presentations (10 of 26 listed, &included work of a mentored undergraduate student)

2019 Ammonia-oxidizing archaea posses a wide range of substrate affinities. Gordon Research Conference (GRC): Archaea Ecology, Metabolism, and Molecular Biology. Les Diablerets, Switzerland.

2018& With a little help from my friend: A catalase-positive bacterium protects an ammonia-oxidizing archaeon from photoinhibition. 17th International Symposium on Microbial Ecology (ISME). Leipzig, Germany.

2017& *Nitrososphaera gargensis*: combating oxidative stress. 5th International Conference on Nitrification (ICON 5). University of Vienna, Vienna, Austria.

2016 Insufficient oxidative stress response in the ammonia-oxidizer *Nitrososphaera gargensis*: Implications for cultivation and ecology. 16th International Symposium on Microbial Ecology (ISME). Montreal, Canada.

2015 The proteomic response of the ammonia-oxidizing bacterium *Nitrosomonas* sp. Is79 to co-culture with bacterial community members. 4th International Conference on Nitrification (ICON 4). University of Alberta, Edmonton, Canada.

2014& Characterization and comparison of ammonia-oxidizing Bacteria adapted to different substrate concentrations. 114th General Meeting of the American Society for Microbiology (ASM). Boston, MA, USA.

2013& Physiologic and genomic characterization of ammonia-oxidizing bacteria. Ohio Branch of the American Society for Microbiology (OBASM). Ashland University, Ashland, OH, USA.

2012& Physiologic and genomic characterization of ammonia-oxidizing bacteria. Gordon Research Conference (GRC): Molecular Basis of one carbon metabolism. Bates College, Lewiston, ME, USA.

2012& Physiological characterization of ammonia-oxidizing bacteria adapted to low substrate availability. Ohio Branch of the American Society of Microbiology (OBASM). Mason, OH, USA.

2007 Pharmacologically induced apoptosis reduces cell surface determinants. 82nd Meeting of the West Virginia Academy of Science. Marshall University, Huntington, WV, USA.

References

Prof. Dr. Dr. h. c. Michael Wagner (Postdoctoral mentor)
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Dr. Annette Bollmann (PhD mentor and collaborator)
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