Caroline Werlang

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NSF GRFP fellow experienced in microbiology, glycobiology, bacterial physiology, synthetic biology, and host-microbe interactions. Highly effective scientific and interpersonal communicator, recognized with awards for excellence in teaching, scientific communication, and leadership. Trained conflict resolution coach.

Education

MIT, Ph.D. Biological Engineering September 7, 2021
ÉPFL, Fulbright Research Fellow 2016
Caltech, B.S. Chemical Engineering 2015

Skills

• **Collaboration**: multidisciplinary team project management, written and oral communication
• **Cell culture**: bacterial culture, anaerobic culture, basic mammalian cell culture, in-vitro assays
• **Bacterial physiology**: cell-based assays, pathway analysis, microscopy, phenotypic analysis
• **Gene expression**: RNA sequencing, RT-qPCR, primer design
• **Protein expression and purification:** FPLC, HPLC, cloning, gels, cell-free systems
• **Data analysis:** Python, MATLAB, R, KEGG, Git, Prism
• **Other:** Biomaterials, Microfluidics

Research Experience

MIT, *NSF Graduate Research Fellow & Siebel Scholar* 2017 – present
• Supervised by Prof. Katharina Ribbeck
• Discovered that mucin glycans prevent quorum sensing and horizontal gene transfer of Streptococcal species, developing an *ex vivo* human saliva model to study biofilm formation
• Led collaboration with groups at MGH and Harvard to analyze the role of mucin in recurrent bacterial vaginosis, discovering a novel treatment for *Gardnerella vaginalis* infections
• Led collaboration with Kaplan lab at Tufts to design and evaluate mucin-mimetic polymers

École polytechnique fédérale de Lausanne, *Fulbright Fellow* 2015 – 2016
• Supervised by Prof. Sebastian Maerkl
• Used cell-free synthetic biology and PDMS microfluidics to measure protein-RNA interactions
• Developed methods for in vitro real-time monitoring of RNA synthesis

Caltech, *Undergraduate Research Assistant & Amgen Scholar* 2014 – 2015
• Supervised by Prof. Frances Arnold and Prof. Ardemis Boghossian
• Assisted in the implementation of an algorithm for guiding directed mutagenesis
• Engineered a pathway for extracellular electron transport using directed evolution of heterologously expressed proteins from *Shewanella oneidensis*

Rice University, *Monticello Foundation Research Fellow* Summer 2013
• Supervised by Prof. Tony Mikos
• Evaluated the efficacy of statins delivered through polymer-microparticle scaffolds on bone tissue development and screened for statin-antibiotic synergy for fighting *S. aureus* infections

Caltech, *Summer Undergraduate Research Fellow* Summer 2012
• Supervised by Prof. Harry Gray and Prof. Nate Lewis
• Synthesized and characterized nanoparticle catalyst for electrochemical hydrogen evolution

Publications

- **Werlang, C.;** Chen, W.; Aoki, K.; Wheeler, K.; Tymm, C.; Mileti, C.; Burgos, A.; Kim, K.; Tiemeyer, M.; Ribbeck, K. “Mucin glycans suppress quorum sensing pathways and genetic transformation in *Streptococcus mutans.” Nature Microbiology* (2021)
- **Werlang, C.;** Cárcamo-Oyarce, G.; Ribbeck, K. “Engineering mucus to study and influence the microbiome.” *Nature Materials Reviews* (2019)
- Schuergers, N**.; Werlang, C.**; Ajo-Franklin, C.; Boghossian, A. “A synthetic biology approach to engineering living photovoltaics.” *Energy & Environmental Science* (2017)
- Cahn, J.; **Werlang, C.;** Baumschlager, A.; Brinkmann-Chen, S.; Mayo, S.; Arnold, F. “A general tool for engineering the NAD/NADP cofactor preference of oxidoreductases.” *ACS Synthetic Biology* (2016)
- Shah, S.; **Werlang, C.**; Kasper, F.; Mikos, A., “Novel Applications of Statins for Bone Regeneration.” *National Science Review* (2014)
- McKone, J.; Sadtler, B.; **Werlang, C.;** Lewis, N.; Gray, H., “Ni–Mo Nanopowders for Efficient Electrochemical Hydrogen Evolution.” *ACS Catalysis* (2012)

Mentoring and Teaching

MIT, Graduate Resident Advisor Spring 2021
• Live-in mentor for 30 undergraduate students in a MIT dormitory during the pandemic

MIT, Research Mentor 2018 – 2020
• Supervised projects of 4 undergraduate students and 3 rotation students

MIT, Teaching Assistant Spring 2018
• Tissue Engineering and Applied Developmental Biology with Prof. Linda Griffith
• Took a 25-hour course on research-based teaching methods with Dr. Janet Rankin
• Recognized with one of three department Teaching Assistant Excellence Awards

Caltech, Teaching Assistant 2013 – 2015
• 2 chemical engineering courses, 1 chemistry lab, and 3 biology courses

Community and University Service

Peer Conflict Management Coach & Advocate, MIT BE REFS 2017 – present
• Held one-on-one conflict coaching sessions; developed and led 3 annual workshops to help peers navigate graduate school challenges
• Underwent a 30-hour course in conflict management with 4 years of continued training

Co-founder and President, MIT Glycobio Club 2019 – present
• Gained funding for and organized a literature analysis group that provides a monthly meeting for interdisciplinary trainees in glycobiology; also coordinated visiting speakers

MIT Institute Discrimination and Harassment Response Committee 2019 – present
• Designed bystander training for student leaders & reporting mechanisms for BE department

MIT Science Policy Initiative 2021 – present
• Advocated for increased federal science funding during the March Congressional Visit Day
• Took a 25-hour course on Science & Technology Policy with Bill Bonvillian

MIT BE Application Assistance Program 2016 – 2020
• Helped 6 applicants from underrepresented groups improve their essays and resumes for graduate admissions and fellowships (1 NSF GRFP winner)

Coordinator for Boston Events, Caltech Alumni Association 2018 – 2020
• Organized monthly networking events for Massachusetts Alumni

Other
• Served on the leadership of 3 other MIT graduate student organizations and 2 dormitories
• Led a student-faculty collaboration to remove the GRE from admissions
• Organized 4 outreach demo sessions, volunteered at 6 others, engaged in virtual outreach
• Chaired 3 sessions at conferences (APS, GRC Carbohydrates, GRC Strep.)
• Co-captain of biological engineering intramural tennis team for 6 seasons

Awards and Fellowships

- Siebel Scholarship ($35k dissertation fellowship awarded for leadership) 2020
- Graduate Women of Excellence Award, *MIT Dean of Graduate Education* 2019
- First Place Poster Award, *MIT Polymer Day* 2019
- First Place Poster Award, *MIT-Harvard Microbiome Symposium* 2019
- Travel Award, *MIT Graduate Student Council* 2019
- Teaching Assistant Excellence Award, *MIT Dept. of Biological Engineering* 2018
- NSF Graduate Research Fellowship 2015
- Fulbright Fellowship, *ÉPFL, Lausanne, Switzerland* 2015
- Caltech-Cambridge Scholars Program, *St. John's College, Cambridge, UK* 2014
- Summer Research Fellowship, *Amgen Scholars Program* 2014
- Summer Research Fellowship, *Monticello Foundation* 2013
- Latinos on Fast Track Fellowship, *ExxonMobil* 2013
- Summer Research Fellowship, *Caltech* 2012

Presentations

- (Selected) Boston Bacterial Meeting, *Virtual* Jun 2021
- American Institute of Chemical Engineers Annual Meeting, *Virtual* Nov 2020
- (Selected) Streptococcal Trainee Symposium, *Virtual* Sep 2020
- MIT Bioengineering and Toxicology Seminar, *Cambridge, MA* Feb 2020
- (Invited) MIT Dept. of Biological Engineering Annual Retreat, *Boston, MA* Oct 2019
- American Physical Society March Meeting, *Boston, MA* Mar 2019
- MIT Glycobio Club, *Cambridge, MA* Jan 2019
- Boston Microbiome Meetup, *Boston, MA* Nov 2018
- MIT Bioengineering and Toxicology Seminar, *Cambridge, MA* Sep 2018
- The Abdul Latif Jameel World Education Lab, *Cambridge, MA* Jul 2018
- Caltech Seminar Day, *Pasadena, CA* Aug 2014
- Caltech Seminar Day, *Pasadena, CA* Oct 2012

Posters

- (Flash talk) Boston Bacterial Meeting, *Virtual* Jul 2020
- Carbohydrates Gordon Research Conference, *Hong Kong* Jun 2019
- Harvard Chan Center for the Microbiome in Public Health Symposium, *Boston* May 2019
- MIT-Harvard Microbiome Symposium, *Cambridge* Mar 2019, 2021
- MIT Materials Day, *Cambridge* Oct 2018, 2019
- MIT Polymer Day, *Cambridge* Apr 2018, 2019
- MIT Center for Environmental Health Sciences Poster Session, *Cambridge* Apr 2018, 2019
- MIT Biological Engineering Department Retreat, *Cambridge* Oct 2017, 2018, 2019