

# Caroline Andrea Werlang

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## Education

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| 2016 - present | <b>Ph.D. Biological Engineering</b><br>GPA: 5.0/5.0                            | <i>Massachusetts Institute of Technology</i> |
| 2011 - 2015    | <b>B.S. Chemical Engineering</b><br>Major GPA: 3.9/4.0    Overall GPA: 3.7/4.0 | <i>California Institute of Technology</i>    |

## Research

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| Jan 17 – present | <b>NSF Graduate Research Fellow</b><br>• Discovered that salivary mucin glycans shut down quorum sensing and horizontal gene transfer of <i>Streptococcal</i> species<br>• Analyzed role of glycans in reducing pathogenicity in bacterial vaginosis<br>• Designed and evaluated mucin-mimetic polymers with collaborators | <i>Katharina Ribbeck, MIT</i>             |
| Sep 15 – Aug 16  | <b>Fulbright Fellow</b><br>• Measured protein-RNA binding interactions using PDMS microfluidics<br>• Developed methods for <i>in vitro</i> real-time monitoring of RNA synthesis with the fluorescent RNA aptamer Spinach  | <i>Sebastian Maerkl, ÉPFL</i>             |
| Jan 14 – Jun 15  | <b>Amgen Scholar</b><br>• Assisted in the implementation of an algorithm for guiding directed mutagenesis to aid in NAD(P)H cofactor switching<br>• Engineered a pathway for extracellular electron transport using directed evolution of heterologously expressed proteins from <i>S. oneidensis</i>                      | <i>Frances Arnold, Caltech</i>            |
| Jun 13 – Sep 13  | <b>Research Fellow</b><br>• Evaluated the efficacy of statins delivered through polymer-microparticle scaffolds on bone tissue development   | <i>Tony Mikos, Rice University</i>        |
| Mar 12 – Sep 12  | <b>Research Fellow</b><br>• Characterized and developed nanoparticle catalyst (Ni-Mo) for electrochemical hydrogen evolution   | <i>Harry Gray and Nate Lewis, Caltech</i> |

## Publications

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1. Werlang, C.; Chen, W.; Aoki, K.; Wheeler, K.; Tymm, C.; Milet, C.; Tiemeyer, M.; Ribbeck, K. "Mucin glycans suppress quorum sensing and associated virulence traits in *Streptococcus mutans*." *Nature Microbiology* – *in revision*
2. Werlang, C.; Cárcamo-Oyarce, G.; Ribbeck, K. "Engineering mucus to study and influence the microbiome." *Nature Materials Reviews* 2019
3. Schuergers, N.; Werlang, C.; Ajo-Franklin, C.; Boghossian, A. "A synthetic biology approach to engineering living photovoltaics." *Energy & Environmental Science* 2017
4. 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

5. Shah, S.; Werlang, C.; Kasper, F.; Mikos, A., "Novel Applications of Statins for Bone Regeneration." *National Science Review* 2014
6. McKone, J.; Sadtler, B.; Werlang, C.; Lewis, N.; Gray, H., "Ni–Mo Nanopowders for Efficient Electrochemical Hydrogen Evolution." *ACS Catalysis* 2012

## Awards and Fellowships

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|      |  |  |
|------|--|--|
| 2020 | <b>Siebel Scholarship</b>                  | <i>Siebel Foundation</i>                 |
| 2019 | <b>Graduate Women of Excellence Award</b>  | <i>MIT Dean of Grad. Education</i>       |
| 2019 | First Place Poster Award                   | <i>MIT Polymer Day</i>                   |
| 2019 | First Place Poster Award                   | <i>MIT-Harvard Microbiome Symposium</i>  |
| 2019 | Travel Award                               | <i>MIT Graduate Student Council</i>      |
| 2018 | <b>Teaching Assistant Excellence Award</b> | <i>MIT Biological Engineering</i>        |
| 2015 | <b>NSF Graduate Research Fellowship</b>    |  |
| 2015 | <b>Fulbright Fellowship, Switzerland</b>   |  |
| 2014 | Caltech-Cambridge Scholars Program         | <i>St. John's College, Cambridge, UK</i> |
| 2014 | Summer Research Fellowship                 | <i>Amgen Scholars Program</i>            |
| 2013 | Summer Research Fellowship                 | <i>Monticello Foundation</i>             |
| 2013 | Latinos on Fast Track Fellowship           | <i>ExxonMobil</i>                        |
| 2012 | Summer Research Fellowship                 | <i>Caltech</i>                           |

## Teaching

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|-----------------|--|----------------|
|                 | <b>Teaching Assistant</b>  |                |
| Spring 18       | • Tissue Engineering and Applied Dev. Biology (Linda Griffith)   | <i>MIT</i>     |
| Spring 15       | • Dynamics and Control of Chemical Systems (John Seinfeld)   | <i>Caltech</i> |
| Winter 15       | • Chemical Reaction Engineering (Frances Arnold)   | <i>Caltech</i> |
| Spring 13,14,15 | • Principles of Biology (Dianne Newman)  | <i>Caltech</i> |
| Fall 13         | • Experimental Chemistry Laboratory (Jeff Mendez)  | <i>Caltech</i> |
|                 | <b>Training: Teaching College-Level Science &amp; Engineering</b>  |                |
| Fall 17         | • Opt-in 25 hour course on research-based teaching methods   | <i>MIT TLL</i> |
|                 | <b>MIT J-WEL Teaching Ambassador</b>   |                |
| Summer 19       | • Coached visiting international professors on MIT-style course content during the Jameel World Education Lab Curriculum Design Workshop |                |

## Research Mentoring

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|-----------|---------------------------|---|
| Summer 19 | Carly Tymms (Dartmouth)   | <i>NSF Materials Research REU</i>                   |
| Summer 18 | Cassidy Miletic (Cornell) | <i>MIT Amgen Scholars Program</i>                   |
| Summer 18 | Tooba Shahid (MIT)        | <i>MIT iGEM</i>                                     |
| Spring 18 | Evie Mayner (MIT)         | <i>MIT Undergrad Research Opportunities Program</i> |

## University Service

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|------------------|---|--|
| Aug 17 – present | <b>Peer Conflict Management Coach &amp; Advocate</b>  | <i>MIT BE REFS</i>                             |
|                  | <ul style="list-style-type: none"> <li>• Held one-on-one conflict coaching sessions; developed resources and led seminars to help peers navigate graduate school challenges</li> <li>• Underwent a four day training course in conflict management</li> </ul> |  |
| Feb 19 – present | <b>President and Co-founder</b>   | <i>MIT Glycobio Club</i>                       |
|                  | <ul style="list-style-type: none"> <li>• Gained funding for and organized a literature analysis group that provides a monthly meeting for interdisciplinary trainees in glycobiology</li> </ul>   |  |
| Sep 19 – present | <b>Title IX Student Advisory Committee</b>  | <i>MIT IDHR</i>                                |
|                  | <ul style="list-style-type: none"> <li>• Designed outreach campaigns &amp; bystander training for student leaders</li> </ul>  |  |
| Sep 19 – present | <b>Graduate Student Advisory Group</b>  | <i>MIT Dean of Engineering</i>                 |
|                  | <ul style="list-style-type: none"> <li>• Piloted Advising Philosophy Statement program to improve mentor/ee fit</li> </ul>  |  |
| Sep 19 – present | <b>Advising &amp; Mentoring Subcommittee</b>  | <i>MIT Graduate Student Council</i>            |
|                  | <ul style="list-style-type: none"> <li>• Helped develop an “Advisor Fit” workshop for graduate orientation</li> </ul>   |  |
| Aug 18 – present | <b>Coordinator for Boston Events</b>  | <i>Caltech Alumni Association</i>              |
|                  | <ul style="list-style-type: none"> <li>• Organized monthly networking events for Massachusetts Alumni</li> </ul>  |  |
| Sep 16 – Sep 19  | <b>Secretary</b>  | <i>MIT BE Graduate Student Board</i>           |
|                  | <ul style="list-style-type: none"> <li>• Led a student initiative to rewrite and digitize the BE Graduate Handbook</li> </ul>   |  |
| Sep 17 – May 19  | <b>Executive Committee</b>  | <i>MIT Eastgate Residence</i>                  |
| Sep 20           | <b>Discussion Section Leader</b>  | <i>Virtual Streptococcal Trainee Symposium</i> |
| Feb 20           | <b>Application Review Committee</b>   | <i>MIT Summer Research Program</i>             |
| Jun 19           | <b>Discussion Section Leader</b>  | <i>Carbohydrates Gordon Research Seminar</i>   |
| May 19           | <b>Travel Award Judge</b>   | <i>MIT Graduate Student Council</i>            |
| Mar 19           | <b>Biopolymers Session Chair</b>  | <i>American Physical Society</i>               |
| Nov 18, 19       | <b>Graduate Admissions Panellist</b>  | <i>MIT Living Machines Program</i>             |

## Outreach

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|                         |  |                                 |
|-------------------------|--|---------------------------------|
| Fall 16, 17, 18, 19, 20 | <b>MIT BE Application Assistance Program</b>   |                                 |
|                         | <ul style="list-style-type: none"> <li>• Helped 4 applicants from underrepresented groups improve their essays and CVs for graduate admissions and the NSF GRFP</li> </ul> |                                 |
| Apr 19                  | <b>Outreach Demo Leader and Presenter</b>  | <i>MIT NSF MSRP</i>             |
|                         | <ul style="list-style-type: none"> <li>• Trained volunteers, developed and prepared demo, and led a session on building solar cells for high school girls</li> </ul>       |                                 |
| Aug 17, 18, 19          | <b>Mucus Outreach Demo Presenter</b>   | <i>Boston Museum of Science</i> |
| Apr 19                  | <b>Mucus Activity Volunteer</b>  | <i>Cambridge Science Fair</i>   |
| Apr 18, 19              | <b>Vaccine Activity Coordinator and Volunteer</b>  | <i>Cambridge Science Fair</i>   |
| Nov 17, 18, 19          | <b>Volunteer for Biological Engineering Demo</b>   | <i>MIT Girl's Day</i>           |
| Jun 18 – Aug 18         | <b>Volunteer English Night Tutor for MIT employees</b>   | <i>MIT ESL</i>                  |
| Aug 12 – Jun 15         | <b>URM Recruitment Assistant</b>   | <i>Caltech Admissions</i>       |
|                         | <ul style="list-style-type: none"> <li>• Coordinated mentors and activities for overnight recruitment visits</li> </ul>  |                                 |

## Presentations

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1. "Mucin glycans suppress quorum sensing and genetic transformation in *Streptococcus mutans*". *Virtual Streptococcal Trainee Symposium*. Sep 2020
2. "Flash talk: Mucin glycans suppress quorum sensing and genetic transformation in *Streptococcus mutans*". *Boston Bacterial Meeting*. July 2020
3. "Saliva and mucin glycans reduce virulence of *Streptococcal* species". *MIT Bioengineering and Toxicology Seminar, Cambridge, MA*. February 2020
4. (Invited) "Salivary mucins reduce genetic transfer and virulence of *Streptococcus mutans*." *MIT Department of Biological Engineering Annual Retreat, Boston, MA*. October 2019
5. "Flash talk: Salivary mucin glycopolymers reduce virulence of *Streptococcus mutans*." *Carbohydrates Gordon Research Conference, Hong Kong*. June 2019
6. "Salivary mucin glycopolymers reduce virulence traits of cavity-causing *Streptococcus mutans*." *American Physical Society March Meeting, Boston, MA*. March 2019
7. "A Mucin-Specific Protease Enables Molecular and Functional Analysis of Human Cancer-Associated Mucins – by Malaker *et. al.*" *MIT Glycobio Club, Cambridge, MA*. January 2019
8. "Mucin's influence on bacterial phenotypes: a look at the oral niche." *Boston Microbiome Meetup, Boston, MA*. November 2018
9. "Salivary Mucins Suppress Virulence Traits of Cavity-causing *Streptococcus mutans*." *MIT Bioengineering and Toxicology Seminar, Cambridge, MA*. September 2018
10. "Teaching analytical skills to bioengineers: a case study in course development." *The Abdul Latif Jameel World Education Lab, Cambridge, MA*. July 2018
11. "Improving Extracellular Electron Transport by Directed Evolution." *Caltech Seminar Day, Pasadena, CA*. August 2014
12. "Assessing the Role of Molybdenum in Nickel-Molybdenum Alloy Electrocatalysts." *Caltech Seminar Day, Pasadena, CA*. October 2012

## Posters

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|----------------|--|
| Jun 19         | • Carbohydrates Gordon Research Conference, <i>Hong Kong</i>                       |
| May 19         | • Harvard Chan Center for the Microbiome in Public Health Symposium, <i>Boston</i> |
| Mar 19         | • MIT-Harvard Microbiome Symposium, <i>Cambridge</i>                               |
| Oct 18, 19     | • MIT Materials Day, <i>Cambridge</i>  |
| Apr 18, 19     | • MIT Polymer Day, <i>Cambridge</i>  |
| Apr 18, 19     | • MIT Center for Environmental Health Sciences Poster Session, <i>Cambridge</i>    |
| Oct 17, 18, 19 | • MIT Biological Engineering Department Retreat, <i>Cambridge</i>                  |
| Mar 17, 19, 20 | • MIT Biological Engineering Interview Weekend, <i>Cambridge</i>                   |