# Rebecca Carlson

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## EDUCATION

**Michigan State University |** *East Lansing, MI* *May 2017*

GPA: 4.0/4.0

B.S. Chemical Engineering, Honors College, Concentration: Biochemical Engineering.
Minor, Chinese, studied Chinese at Xi'an International Studies University in summer 2014.
Completed three graduate courses in biochemistry and two graduate courses in biostatistics.

## RESEARCH AND PROFESSIONAL EXPERIENCE

**Evergrande Scholar in Dr. Vijay Kuchroo's Lab at the Evergrande Center for Immunologic Diseases**

*Harvard Medical School | Boston, MA* *June-August 2016*

- Took course on cutting-edge immunology research led by Harvard Medical School faculty
- Examined role of Tim-1 in regulatory B cells through characterization of conditional knockout mice
- Summarized and interpreted data using FlowJo and an original dimensionality reduction analysis pipeline (Barnes-Hut SNE followed by hierarchical clustering in *R*)

**Summer Research Intern in Dr. Iain Fraser's Lab**

*National Institute of Allergy and Infectious Diseases, NIH | Bethesda, MD* *May-August 2015*

- Independently developed scripts in *R* to analyze high-content imaging data of human and mouse macrophages, reducing analysis time
- Conceptualized and implemented data visualization methods (violin plots, heatmaps, PCA, tSNE)
- Conducted experiments to characterize key results of a genome-wide siRNA screen

**Research Assistant in Dr. S. Patrick Walton's Applied Biomolecular Engineering Lab**

*Michigan State University | East Lansing, MI* *September 2013-Present*

- Autonomously optimized and collected chemiluminescence assay data used for publication
- Collaboratively investigated siRNA functional asymmetry by analyzing strand loading and activity
- Assisted in expressing, purifying, and assessing bioactivity of brain-derived neurotrophic factor from *B. choshinensis*
- Independently generated CRISPR-Cas9 plasmid vectors for use in directed neural stem cell differentiation
- Designed procedure for synthesis of an EGFP siRNA library; currently examining library binding to key RNAi protein to determine features predictive of activity
- Currently working on original project, examining features that lead to cell-type-specific differences in CRISPR-mediated editing
- Principal research mentor of an undergraduate student since September 2016

**Undergraduate Research Ambassador**

*Undergraduate Research Office | East Lansing, MI* *April 2015-Present*

- Promoted undergraduate research through facilitation of workshops and blog articles
- Worked with team of ambassadors to provide new opportunities for student involvement in research

**Tutor**

*College of Engineering Residential Experience (CoRe) | East Lansing, MI* *August 2014-Present*

## LEADERSHIP

**Engineering Professorial Assistant (PA) Program |** *Leader* *September 2014-Present*

- Led committee of over 10 students in planning annual orientation for over 50 undergraduate researchers
- Developed and led first Engineering PA Research Symposium in spring 2016
- Authored a 30-page orientation handbook to provide insight for new researchers
- Developed biweekly newsletter and social media group for undergraduate researchers

**Women in Engineering |** *Mentor* *September 2014-present*

- Met weekly with a freshman female engineer; currently co-leading a group of six mentees

**Bridges International |** *Leadership Team* *September 2013-September 2016*

- Organized international connection events for over 50 international students
- Implemented restructuring of weekly meetings to facilitate conversations

**Red Cedar Undergraduate Research Journal |** *Student Editorial Board* *September 2014-Present*

- Identified peer reviewers for articles and communicated with authors regarding reviewer comments

## SERVICE

Refugee Development Center | *Taught English classes for adult refugees* *September 2016-Present*

Italian Club | *Member, taught students conversational Italian* *January 2014-December 2015*

Annual Alumni Distinguished Scholarship Competition | *Ambassador* *February 2014, 2015, 2016*

Middle School Girls Math and Science Day | *Volunteer* *March 2014*

## AWARDS AND HONORS

- Fannie & John Hertz Foundation Fellow *2017*
- NSF Graduate Research Fellowship *2017*
- Michigan State University Board of Trustees Award *2017*
- Student Service Award, Michigan State University College of Engineering *2017*
- First place, National AIChE Student Design Competition, team category *2016*
- Phi Beta Kappa member *2016*
- Barry M. Goldwater Scholarship (awarded as a sophomore) *2015-2017*
- American Institute of Chemical Engineers Annual Meeting, 3rd place poster in Food, Pharmaceutical, and Biotechnology category *2015*
- Top student in Chemical Engineering class, College of Engineering *2014-2017*
- University Undergraduate Research and Arts Forum, 1st place poster in Engineering category *2014*
- Hanna M. Rasmussen Alumni Distinguished Scholarship, full academic merit scholarship (Awarded to 15 students annually out of over 7000 freshmen) *2013-2017*
- Professorial Assistantship (2-year paid research appointment awarded to top 1% of students) *2013*
- National Merit Scholarship Finalist *2013*

## PUBLICATIONS

Angart, P. A., **Carlson, R. J.**, Adu-Berchie, K., Walton, S. P. (2016). Terminal duplex stability and nucleotide identity differentially control siRNA loading and activity in RNA interference. *Nucleic Acid Therapeutics*. http://dx.doi.org/10.1089/nat.2016.0612.

Angart, P. A., **Carlson, R. J.**, Thorwall, S. A., Walton, S. P. (Accepted). Expression of Bioactive Brain Derived Neurotrophic Factor in *Brevibacillus choshinensis*. *Microbial Cell Factories.*

## SELECTED PRESENTATIONS

**Carlson, R. J.***, Rose, A. R.* (2016, November). *Cell Therapy for Spinal Cord Injuries: Commercial Manufacturing Facility*. Invited to present national first place design, National AIChE Meeting, San Francisco, CA. * Authors contributed equally.

Angart, P. A., **Carlson, R. J.**, Adu-Berchie, K., Walton, S. P. (2016, November). *Specific siRNA-Target Interactions Influence siRNA Activity*. Poster, National AIChE Meeting, San Francisco, CA.

Angart, P. A., **Carlson, R. J.**, Thorwall, S. A., Walton, S. P. (2016, November). *Bioactive BDNF Expression Using Brevibacillus Choshinensis*. Poster, National AIChE Meeting, San Francisco, CA.

**Carlson, R. J.**, Kilpatrick, J. T., Xiao, S., Kuchroo, V. K. (2016, August). *Association of Tim-1 Signaling with Regulatory B Cell Activity*. Poster, Harvard Immunology Summer Poster Session, Boston, MA.

Vayttaden, S. J., Smelkinson, M., **Carlson, R. J.**, Benet, Z., Gottschalk, R. A., Germain, R. N., Meier-Schellersheim, M., Varma, R. R., Fraser, I. D. C. (2016, January). *IRAK1 as a Sensor of Multi-TLR Activation and a Shunt to Different PRR Pathways*. Poster, Systems Immunology Keystone Symposium, Big Sky, MT.

**Carlson, R. J.**, Vayttaden, S. J., John, S. P., Fraser, I. D. C. (2015, November). *Investigation of TLR Pathway Activation in Macrophages by Single and Dual Ligands*. Poster, National AIChE Meeting, Salt Lake City, UT.

Adu-Berchie, K., **Carlson, R. J.**, Angart, P. A., Walton, S. P. (2015, April). *Characterization of siRNA Asymmetry*. Oral presentation, University Undergraduate Research and Arts Forum**,** East Lansing, MI.

**Carlson, R. J**., Thorwall, S. A., Angart, P. A., Walton, S. P. (2014, April). *Design of Functionally Asymmetric siRNAs*. Poster presentation, University Undergraduate Research and Arts Forum, East Lansing, MI.

**Carlson, R. J.**, Chase, K. A., Johnson, J. M., Reddy, E. C. (2013, December). *Assistive Calculus Tools for Visually Impaired Students*. Selected as one of top EGR 100 teams to present poster at Design Day, East Lansing, MI.

## SELECTED RESEARCH SKILLS

### EXPERIMENTAL PROCEDURES

- Western blots, dot blots, gel electrophoresis
- Immunoprecipitation (IP), Co-IP
- RNA isolation, RT-qPCR, stem-loop RT-qPCR
- Cell culture (immortalized and primary lines)
- Transfection of siRNA, sgRNA, lentivirus
- Dual luciferase chemiluminescence assays
- Flow cytometry
- Mouse dissection and immune organ isolation
- ELISA
- Protein quantification (Bradford/microBCA)
- *E. coli* and *B. choshinensis* culture
- Cas9 sgRNA design, screening via T7E1 assay
- Plasmid propagation and verification

### COMPUTATIONAL TOOLS

- ACCENSE
- FlowJo
- Galaxy (completed one JHU Coursera course)
- Git (completed one JHU Coursera course)
- GraphPad Prism
- ImageJ
- MATLAB (used in three engineering courses)
- PyMol protein modeling software
- Python (completed one JHU Coursera course)
- R (intermediate)
- SAS (beginner)
- STATA (beginner)

## LANGUAGE SKILLS

Italian - native fluency; French and Chinese - limited business proficiency; Twi - elementary proficiency