

Claire Duvallet

CONTACT duvallet@mit.edu 9 Seattle St
 [cduvallet.github.io](https://github.com/cduvallet) Allston, MA 02134

EDUCATION **Massachusetts Institute of Technology**, *Cambridge, MA* 2014 – 2019
 Ph.D., Biological Engineering
 GPA: 5.0/5.0

 Columbia University, *New York, NY* 2009 – 2013
 B.S., Biomedical Engineering, *cell and tissue engineering track*
 GPA: 4.1/4.0, Summa cum laude

RESEARCH **Massachusetts Institute of Technology** 2015 – present
 Department of Biological Engineering
 Supervisor: Eric J. Alm, Ph.D.

I study the relationship between the microbiome and health and disease, and am generally interested in personalized medicine approaches for public health applications.

- Performed a meta-analysis of 28 case-control gut microbiome studies across 10 disease states
- Characterized the lung, gastric, and oropharyngeal microbiomes of pediatric patients with impaired swallow function
- Mining untargeted metabolomics data from residential sewage to identify human-derived biomarkers
- Developing a metagenomics-based metric to quantify selective pressure and risk for antimicrobial resistance in sewage and environmental samples
- Developing methods to process and analyze untargeted metabolomics of blood for precision diagnostics and outcome prediction

Columbia University 2011 – 2013
Molecular and Microscale Bioengineering Laboratory
Supervisor: Samuel L. Sia, Ph.D.

As an undergraduate research assistant, I worked on developing a point-of-care microfluidic device to diagnose multi-drug resistant tuberculosis.

- Designed and developed the DNA amplification and detection modules of point-of-care diagnostic
- Optimized primers, detection probes, reagents, and reaction conditions for multiplex, fast, and isothermal PCR reactions

Ecole Polytechnique Summer 2012
Laboratoire de Biochimie,
Supervisor: Cedric Norais, Ph.D.

As an international undergraduate research intern, I studied the acquired-immunity CRISPR system in *E. coli*.

- Constructed plasmids to study components of the CRISPR system in *E. coli* and expressed and purified CasBCD*E protein complex

PUBLICATIONS

1. **Claire Duvallet**, Kara Larson, Scott Snapper, Sonia Iosim, Ann Lee, Katherine Freer, Kara May, Eric J. Alm, and Rachel Rosen. (2018)
“Altered relationships between gastric, lung, and oropharyngeal microbiomes in patients with aerodigestive symptoms.”
Microbiome, *submitted*.
2. Sean M. Gibbons, **Claire Duvallet**, and Eric J. Alm. (2018)
“Correcting for batch effects in case-control microbiome studies.”
PLoS Computational Biology. doi: 10.1371/journal.pone.0176335.
3. **Claire Duvallet**. (2018)
“Meta-analysis generates and prioritizes hypotheses for translational microbiome research.”
Microbial Biotechnology. doi: 10.1111/1751-7915.13047.
4. **Claire Duvallet**, Sean M. Gibbons, Thomas Gurry, Rafael A. Irizarry, and Eric J. Alm. (2017)
“Meta-analysis of gut microbiome studies identifies disease-specific and shared responses.”
Nature Communications. doi: 10.1038/s41467-017-01973-8.
5. Scott W. Olesen, **Claire Duvallet**, and Eric J. Alm. (2017)
“dbOTU3: A new implementation of distribution-based OTU calling.”
PloS ONE. doi: 10.1371/journal.pone.0176335.
6. [Non-peer reviewed blog post] **Claire Duvallet**. (2017)
“Beyond dysbiosis: disease-specific and shared microbiome responses to disease.”
Nature Microbiology Community Forum.
7. [Dataset] **Claire Duvallet**, Sean M. Gibbons, Thomas Gurry, Rafael A. Irizarry, and Eric J. Alm. (2017)
“MicrobiomeHD: the human gut microbiome in health and disease.”
Zenodo. doi: 10.5281/zenodo.797943

PRESENTATIONS

Oral presentations

1. “Predictive power of the microbiome.” International Conference on Microbiome Engineering (ICME 2018). Boston, MA. Nov. 2018. *Invited*.
2. “Distribution-based methods to increase power and reduce redundancy in microbiome data.” Teaching and Developing QIIME 2 Workshop. San Diego, CA. May 2018. *Selected*.
3. “Meta-analysis to identify consistent disease-associated microbiome shifts.” MIT-Harvard Microbiome Symposium. Cambridge, MA. March 2018. *Selected*.
4. “Meta-analysis to identify consistent disease-associated microbiome shifts.” MIT Department of Biological Engineering Retreat. Cambridge, MA. October 2017. *Invited*.

Poster presentations

1. “Meta-analysis of gut microbiome studies identifies disease-specific and shared responses.” *Women in Data Science Cambridge*, March 2018 and *Pacific Symposium on Biocomputing*, January 2018
2. “Empirical signatures of compositional stability in the gut microbiome.” *Statistical and Algorithmic Challenges in Microbiome Data Analysis Workshop*, MIT Center for Informatics and Therapeutics and The Simons Center for Data Analysis, February 2016.

SOFTWARE

Percentile normalization

Correcting batch effects in case-control microbiome studies. (Gibbons *et al.*, 2018).

Python implementation: github.com/seangibbons/percentile_normalization (*contributor*)

QIIME 2 plugin: github.com/cduvallet/q2-perc-norm (*developer*)

Distribution-based OTU calling

New implementation of Preheim *et al.*'s distribution-based OTU clustering algorithm. (Preheim *et al.*, 2013; Olesen *et al.*, 2017).

Python implementation: github.com/swo/dbotu3 (*contributor*)

QIIME 2 plugin: github.com/cduvallet/q2-dbotu (*developer*)

Amplicon sequencing pipeline

End-to-end pipeline to process 16S data.

Python: github.com/thomasgurry/amplicon_sequencing_pipeline (*co-developer*)

LEADERSHIP & SERVICE

Academic and professional

MIT Biotech Group 2017 – present

Beyond the Bench Initiative board member

MIT Microbiome Club 2016 – present

Co-Founder, President, Executive board member

MIT-Harvard Microbiome Symposium 2016 and 2017

Co-Founder and organizing committee

Departmental and MIT

Biological Engineering Department Visiting Committee 2018

Graduate student representative

Graduate Student Advisory Group for Engineering (GradSAGE) 2017 – present

Advisory group to the Dean of the School of Engineering

Advisor/Advisee Relations Sub-Committee

MIT Graduate Student Council 2017 – present

Diversity and Inclusion Subcommittee

Department and Classroom Inclusion co-coordinator, Vice Chair

BE Resources for Easing Friction and Stress 2016 – present

Confidential conflict management coach and graduate student advocate

BE Graduate Student Board 2015 – present

Diversity Chair

Co-Founder, BE Application Assistance Program

Lead author, BE Departmental Values Statement

Co-Lead, 2016 BE Diversity Survey

Reviewer

MIT Summer Research Program (MSRP) Review 2018

MIT Committed to Caring Selection Committee 2017

MIT IDEAS Global Challenge Reviewer 2015 – present

FELLOWSHIPS &
AWARDS

Fellowships

National Defense Science and Engineering Graduate Fellowship <i>NDSEG Recipient</i>	2016 – 2018
National Science Foundation Graduate Research Fellowship <i>Honorable Mention</i>	2015
Henry Luce Foundation <i>Luce Scholar</i>	2013 – 2014

Awards

MIT Graduate Women of Excellence	2017
Salutatorian <i>Columbia University Fu Foundation School of Engineering and Applied Science</i>	2013
Richard Skalak Award in Biomedical Engineering <i>Columbia University Department of Biomedical Engineering</i>	2013
Robert E. and Claire S. Reiss Prize in Biomedical Engineering <i>Columbia University Department of Biomedical Engineering</i>	2013
King's Crown Bronze Leadership Award <i>Columbia University</i>	2012
Tau Beta Pi, The Engineering Honor Society	2012
Valedictorian <i>James Bowie High School, ranked first out of 636 students</i>	2009

TEACHING
EXPERIENCE

Teaching Assistant

Fall 2015

20.106 Systems Microbiology, *Massachusetts Institute of Technology*

I was a TA for seven advanced undergraduate students in a new course on the human microbiome, emerging disease, phylogenetics, and host-microbe interactions.

- Developed problem sets and guided lecture content for a module on processing and analyzing 16S data
- Facilitated and participated in paper discussions on various topics in zoonotic disease, viral communities, host immune responses, and the human microbiome
- Mentored students on project re-processing and re-analyzing published microbiome datasets with machine learning tools

Lecturer

2013 – 2014

Biomedical Equipment Technology Department, *University of Puthisastra*
Engineering World Health, *Phnom Penh, Cambodia*

As a Luce Scholar, I worked as a lecturer for Engineering World Health at the University of Puthisastra for the new Associate Bachelors program in Biomedical Equipment Technology.

- Developed curricula and syllabi for anatomy and physiology, troubleshooting skills, and math

- Prepared and delivered lectures, exams, assignments, in-class activities, and demos for two classes of 12-18 Cambodian students and technicians (in English, with a translator)
- Managed Cambodian student-teaching staff during main supervisors absence and supported foreign and local teaching staff

Teaching Assistant

2012-2013

The Art of Engineering, *Columbia University*

My senior year at Columbia, I TAed the biomedical engineering section of the intro to engineering course for freshmen.

- Assisted the students in designing and building a vital-signs monitoring device
- Guiding students through the engineering design process
- Taught concepts in MATLAB and circuitry required for projects